Thirteenth Annual Report

OF THE

Kentucky Agricultural Experiment Station

OF THE

State College of Kentucky

LEXINGTON, KY.

FOR THE YEAR 1900.

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LETTER OF TRANSMITTAL.

To His Excellency,

HON. J. C. W. BECKHAM,

Governor of Kentucky:

SIR:—

Under the authority of the Board of Control, and in accordance with an act of Congress, approved March 2, 1887, and entitled "An Act to establish Agricultural Experiment Stations in connection with the Agricultural Colleges established in the several states, under the provision of an Act approved July 2, 1862, and of the Acts supplementary thereto," and of the Act of the Legislature of the State of Kentucky, approved February 20, 1888, and entitled "An Act to accept the provisions of an Act passed by the Congress of the United States, approved March 2, 1887, for the establishment and maintenance of Agricultural Experiment Stations in connection with the Agricultural Colleges established by the several States and Territories under an Act of Congress, approved July 2, 1862," I herewith submit the Thirteenth Annual Report of the Kentucky Agricultural Experiment Station.

Very respectfully,

M. A. SCOVELL,
Director.

Agricultural and Mechanical College
OF KENTUCKY.

BOARD OF TRUSTEES.

His Excellency, Gov. J. C. W. Beckham, ex-Officio, Chairman.
James K. Patterson, President of the College, ex-Officio.
Gen. E. H. Hobson, Greensburg, Green County.
John B. Kennedy, Esq., Paris, Bourbon County.
Judge George B. Kinkead, Lexington, Fayette County.
Hon. William R. Ramsey, London, Laurel County.
Capt. Thomas Todd, Shelbyville, Shelby County.
Hon. W. T. Fowler, Hopkinsville, Christian County.
D. F. Frazee, Esq., Lexington, Fayette County.
L. N. Lindsey, Esq., Frankfort, Franklin County.
J. B. Marcum, Esq., Jackson, Breathitt County.
R. C. Stoll, Esq., Lexington, Fayette County.
Hon. B. W. Bradburn, Bowling Green, Warren County.
Judge Henry S. Barker, Louisville, Jefferson County.
Hon. McDowell Ferguson, Paducah, McCracken County.
Hon. J. F. Hager, Ashland, Boyd County.
Hon. R. W. Nelson, Newport, Campbell County.
V. E. Muncy, Secretary.

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LIST OF OFFICERS.

BOARD OF CONTROL.

THOMAS TODD, Shelbyville, Ky.
J. B. MARCUM, Jackson, Ky.
D. F. FRAZEE, Lexington, Ky.
J. K. PATTERSON, President of the College.
M. A. SCOVELL, Director, Secretary.

STATION OFFICERS.

M. A. SCOVELL, Director.
A. M. PETER, Chemist.
H. E. CURTIS, Chemist.
H. GARMAN, Entomologist and Botanist.
C. W. MATHEWS, Horticulturist.
W. H. SCHERFFIUS, Assistant Chemist.
L. O. BEATTY, Assistant Chemist.
R. M. ALLEN, Clerk.
J. D. TURNER, Secretary to the Director.

Address of the Station,

LEXINGTON, KENTUCKY.

The Kentucky Agricultural Experiment Station,

In Account with the United States Appropriation.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1900, as per Act of Congress, approved March 2, 1887. $15,000.00

Expenditures:

By Salaries	$9,990.00	
Labor	3,050.11	
Publications	338.96	
Postage and stationery	207.43	
Freight and express	50.84	
Heat, light and water	100.28	
Chemical supplies	10 18	
Seed, plants, and sundry supplies	131.82	
Library	578.16	
Tools, implements and machinery	138.90	
Furniture and fixtures	65.75	
Scientific apparatus	11.25	
Traveling expenses	149.96	
Contingent expenses	110.47	
Building and repairs	65.89	
		$15,000.00

We, the undersigned, duly appointed Auditors of the Corporation, do hereby certify that we have examined the books and Accounts of the Kentucky Agricultural Experiment Station for the fiscal year ending June 30, 1900; that we found the same well kept and classified as above and that the receipts for the year from the Treasurer of the United States are

shown to have been $15,000.00 and the corresponding disbursements $15,000.00 for all of which proper vouchers are on file and have been by us examined and found correct.

And we further certify that the expenditures have been solely for the purposes set forth in the Act of Congress, approved March 2, 1887.

Signed:

(SEAL) THOMAS TODD.

JAMES B. MARCUM.

Auditors.

Attest:

V. E. MUNCY.

ANNUAL REPORT

OF THE

Kentucky Agricultural Experiment Station

FOR 1900.

REPORT OF THE DIRECTOR.

THE WORK.

The work of the Station may be properly divided into three parts:

1. The work of the Station proper.
2. The Fertilizer Control Work.
3. The Food Control Work.

THE WORK OF THE STATION PROPER.

CHEMICAL DIVISION.

Prof. Peter has had charge of the purely scientific work of this Division, as distinguished from the purely technical work of fertilizer and food inspection. He has been assisted by Mr. L. O. Beatty.

Some four hundred analyses have been made, excluding fertilizer and food analyses. Soil investigations have occupied most of Dr. Peter's time. He has also been investigating methods of analysis in connection with the Association of Official Agricultural Chemists. A number of grass analyses have been made during the year, which are incorporated in bulletin 87. There have been numerous samples of minerals, ores, rocks, and miscellaneous materials examined and passed upon. These and other analyses may be found in the report of the Chemical Division, published in this report.

ENTOMOLOGICAL AND BOTANICAL DIVISION.

Prof. Garman has given attention this year to a study of insects and fungi injurious to cucumbers, and related plants; to potato scab; to insects affecting seeds and stored grains; to the study of tobacco insects, and of lettuce diseases. Under a state law Prof Garman has inspected all the nurseries. In two or three instances he has ordered trees destroyed on account of the diseased condition of the nurseries. Prof. Garman teaches a class in advanced entomology during the winter term, and has been called upon by the Commissioner of Agriculture to assist in a number of institutes during the year.

HORTICULTURAL DIVISION.

The work of the year has, as heretofore, been limited only to a few subjects in the way of experiments, and mainly with grapes, strawberries and potatoes.

AGRICULTURAL DIVISION.

Under the direction of Mr. Harper, experiments have been continued in testing fertilizers on wheat, hemp, tobacco, corn, oats, potatoes, and meadow, and variety tests of wheat and oats. Some forty varieties of wheat were tested and thirty varieties of oats. Some experiments are being conducted to see if the gluten content can be increased in wheat. The dairy experiments have been continued, and a pig feeding experiment has just been completed. The results of experiments with fertilizers on hemp show conclusively that the fiber is improved by the use of a potash fertilizer—even where the yield is not materially increased.

THE FERTILIZER CONTROL WORK.

The work under this Division is increasing. During the year 583 analyses were made and over 600,000 tags were issued to manufacturers.

THE FOOD CONTROL WORK.

An Act Regulating the Sale and Manufacture of Foods, and placing the enforcement of its provisions in the Station, became a law in 1898, but not much could be accomplished

until lately, owing to the Auditor's delay in paying accounts accruing under the law. The Courts having decided the law constitutional recently, the Auditor now pays the accounts.

Bulletin 86, published at the beginning of this year, contains a report of the work done under the food law in 1898 and 1899.

PUBLICATIONS.

We have published during the year the following bulletins:

Bulletin No. 86.—

Inspection and Analyses of Foods.

Bulletin No. 87.—

1. Kentucky Forage Plants—The Grasses.
2. Analyses of Some Kentucky Grasses.

Bulletin No. 88.—

Commercial Fertilizers.

Bulletin No. 89 —Wheat.

1. Test of Varieties.
2. Test of Fertilizers.
3. Description of Varieties.

Bulletin No. 90.—

Commercial Fertilizers.

More detailed statements of the work may be found in reports which follow, after which the bulletins published during the year are made a part of this report.

M. A. SCOVELL,
Director.

REPORT OF THE DIVISION OF CHEMISTRY.

By ALFRED M. PETER.

The work of the Division of Chemistry in 1900 comprised the regular analysis of some 1211 samples, of which 599 were commercial fertilizers and fertilizer materials, etc., analyzed under the operation of the State fertilizer law, 251 were foods, analyzed under the State Food Law and the remaining 361 samples were agricultural products, potable and mineral waters, soils, minerals, rocks and other materials analyzed in connection with the general work of the Station. In this connection, also, in addition to these 361 samples which required more or less quantitative work, many other samples have been qualitatively examined for correspondents of the Station and reported upon direct to the senders.

The analyses of commercial fertilizers were made by Mr. H. E. Curtis, who had entire charge of this branch of the work, assisted by Mr. W. H. Scherffius. The analyses of 150 of the food samples were made by Dr. Chase Palmer of Louisville; the rest were analyzed under the supervision of the writer by Messrs. W. A. Beatty, L. O. Beatty and W. H. Scherffius

Most of the analyses of commercial fertilizers have been published in bulletins numbers 88 and 90, and the analyses of human food will be published later in a separate bulletin. Such of the other analyses as are thought to be of any general interest or worthy of permanent record, are herewith presented.

BUTTER.

The butter analyzed was made at the Station farm in churn tests of some Jersey cows.

Name of Cow.	No. of Sample.	From Milkings of	Fat per cent.	Water per cent.	Salt per cent.	Curd per cent.
Bettie Oldham.	6223	Dec. 28-31, 1899	84.69	11.80	2.39	1.12
	24	Jan. 1-3, 1900	82.54	13.12	2.95	1.39
	45	" 4-6,	82.18	12.51	4.42	0.89
	46	" 7-10,	82.32	12.49	4.35	0.84
	53	" 11-13,	84.45	12.12	2.77	0.66
	56	" 14-17,	80.91	13.82	4.36	0.91
	60	" 18-20,	83.68	12.27	3.31	0.74
	80	" 21-24,	81.22	14.02	3.95	0.81
Bluster's Frances	6252	Jan. 10-13, 1900	82.61	12.67	4.15	0.57
	55	" 14-16,	81.74	13.78	3.89	0.59
	59	" 17-20,	83.35	12.73	3.21	0.71
Dollie's Valentine	6311	Jan. 28-31, 1900	81.01	14.94	2.96	1.09
	12	Feb. 1-3,	83.80	12.63	2.75	0.82
	93	" 13-16,	83.84	11.95	3.27	0.94
	94	" 17-19,	84.52	12.21	2.49	0.78
Tormentor Maid's Daisy.....	6525	April 24-26, 1900	82.47	13.20	3.61	0.72
	35	" 27-30,	82.72	13.26	3.47	0.55
Bluster's Pip.....	6572	May 13-16, 1900	82.41	13.33	3.60	0.66
	77	" 17-19,	83.88	12.39	3.03	0.70
	82	" 20-23,	82.87	13.13	3.45	0.55
	87	" 24-26,	81.75	13.70	4.05	0.50
Oona B.....	6573	May 13-16, 1900	82.01	13.97	3.39	0.63
	78	" 17-19,	82.43	13.50	3.26	0.81
Oonetta..	6579	May 16-19, 1900	84.99	11.65	2.86	0.50
	83	" 20-22,	81.47	13.91	4.00	0.62
	88	" 24-27,	80.25	13.36	3.79	0.60
	94	" 28-30,	81.77	14.26	3.25	0.72
	98	" 31-June 3.	82.16	13.46	3.54	0.84
	6602	June 4-6,	79.29	15.55	4.40	0.76
Amanda	6595	May 28-June 1,	81.58	14.13	3.72	0.57
	99	June 2-4,	82.50	13.25	3.63	0.62
Hattie	7192	Dec. 18-21, 1900	84.82	11.31	2.96	0.91
	93	" 22-24,	83.91	12.29	3.01	0.79
	7416	" 25-28,	83.97	11.88	3.40	0.75
	17	" 29-31,	83.13	12.13	3.86	0.88

SORGHUM CANE JUICE.

Continuing the experiment in the selection of sorghum seed we planted, in 1900, seed from a cane that had yielded 450 c. c. of juice which tested 1.078 specific gravity, equivalent to 18.8 degrees Brix, 1.22 per cent. of reducing sugar, 14.29 per cent. of cane sugar and 76 per cent. purity. (12th Annual Report, p. xiv.) The cane produced was tested at different times and some of the best results are given below.

Number of Sample.	Date. 1900.	Weight of Stalk. Lbs.	Weight of Stalk. Ozs.	Juice Obtained, Per Cent.	Specific Gravity of Juice.	Degrees Brix.	Reducing Sugar, Per Cent.	Cane Sugar, Per Cent.	Coefficient of Purity.
7212	Sept. 18.....	.....	.....	.....	1.090	21.5	1.28	16.83	78.1
22	" "	.....	.....	.....	1.085	20.4	1.19	16.25	79.4
23	" "	.....	.....	.....	1.083	20.0	1.31	15.7	78.5
27	" "	.....	.....	.....	1.084	20.2	1.04	16.2	80.1
28	" "	.....	.....	.....	1.087	20.8	1.85	16.7	80.4
29	" "	.....	.....	.....	1.083	19.7	2.04	15.55	78.9
7230	" "	.....	.....	.....	1.084	20.2	1.67	15.85	78.9
31	" "	.....	.....	.....	1.088	21.1	1.92	16.45	77.9
32	Sept. 20.....	.....	.....	.....	1.083	20.0	1.85	16.05	80.2
33	" "	.....	.....	.....	1.084	20.2	1.77	16.2	80.2
34	" "	.....	.....	.....	1.084	20.2	2.17	16.1	79.2
35	" "	.....	.....	.....	1.088	21.1	1.72	16.85	79.9
38	" "	.....	.....	.....	1.079	19.0	1.54	15.15	79.7
7241	" "	.....	.....	.....	1.085	20.4	1.54	16.4	80.4
7261	Sept. 24 ..	1	14¼	50.	1.080	19.3	1.92	15.44	80.0
62	" "	2	1½	53.	1.077	18.6	1.60	14.85	79.8
64	" "	1	13¾	48.	1.087	20.8	0.90	16.40	78.8
66	" "	2	3¼	53.	1.079	19.0	1.10	15.40	81.0
67	Sept. 25	1	14	45.	1.085	20.4	1.28	16.04	78.4
68	" "	1	8¼	48.	1.086	20.6	0.94	16.23	78.6
69	" "	1	10	49.	1.082	19.7	1.51	15.60	79.2
7270	" " ..	1	9¾	44.	1.091	21.7	1.25	16.85	77.2
71	" "	1	9	44.	1.096	22.8	0.98	17.35	76.1
74	" "	1	7¼	45.	1.091	21.7	0.91	17.20	78.1
7286	Sept, 28	1	6¾	42.	1.098	23.2	1.47	17.90	77.1
87	" "	1	8¼	48.	1.095	22.6	0.86	17.65	78.1
89	" "	1	11½	49.	1.091	21.7	2.27	16.80	77.4
7290	" "	1	13	49.	1.088	21.0	1.39	16.90	80.5
7292	" "	1	13	50.	1.086	20.6	1.35	16.55	80.3
93	" "	1	13¾	50.	1.085	20.4	1.39	16.30	79.9
94	" "	1	14½	49.	1.090	21.5	1.93	16.55	76.9
98	October 1. ..	1	11¾	56.	1.086	20.6	0.86	16.78	81.4
99	" "	1	12½	57.	1.094	22.4	0.69	17.6	78.5
7300	" "	1	12½	59.	1.085	20.4	0.92	16.7	81.8
1	" "	1	11	60.	1.086	20.6	1.19	16.35	79.3
2	" "	1	11¾	59.	1.086	20.6	1.19	16.60	80.6

SORGHUM CANE JUICE—Continued.

Number of Sample.	Date. 1900.	Weight of Stalk. Lbs.	Weight of Stalk. Ozs.	Juice Obtained, Per Cent	Specific Gravity of Juice.	Degrees Brix.	Reducing Sugar, Per Cent.	Cane Sugar, Per Cent.	Coefficient of Purity.
7303	October 1.....	1	10½	60	1.087	20.8	1.14	16.60	79.8
4	" ".....	1	9½	56	.090	21.5	1.25	16.95	78.8
6	" ".....	2	2½	59	1.088	21.1	1.19	16.75	79.4
7	October 2.....	1	9¼	54	1.090	21.5	0.76	17.00	79.0
8	" ".....	1	9	52	1.096	22.8	1.14	17.35	76.1
9	" ".....	1	8½	54	1.094	22.4	0.62	17.20	76.8
7310	" ".....	1	9	53	1.096	22.8	0.50	17.75	77.9
14	" ".....	1	9¼	57	1.088	21.1	0.83	16.50	78.2
16	" ".....	1	9¾	56	1.092	21.9	0.61	17.10	78.1
17	" ".....	1	9¼	50	1.095	22.6	0.83	17.40	76.9
19	October 3.....	1	6	56	1.093	22.2	0.86	17.3	77.9
7321	" ".....	1	7½	56	1.094	22.4	0.96	17.4	77.7
23	" ".....	1	7¾	58	1.090	21.5	0.92	16.95	78.8
24	" ".....	1	5¾	54	1.096	22.8	1.19	17.5	76.7
27	October 4.....	1	9	50	1.091	21.7	1.47	16.55	76.2
29	" ".....	1	12¼	58	1.087	20.8	1.92	16.25	78.1
7331	" ".....	1	7¾	54	1.095	22.6	1.09	17.10	75.7
32	" ".....	1	10	61	1.088	21.1	1.19	16.30	77.3
33	" ".....	1	8¼	52	1.096	22.8	1.31	17.10	75.1
35	" ".....	1	11	55	1.090	21.5	1.31	16.05	74.6
7351	October 8.....	1	6½	52	1.097	23 0	0.71	17.50	76.1
52	" ".....	1	6½	55	1.099	23.5	0.78	17.70	75..3
53	" ".....	1	7¾	54	1.095	22.6	0.64	17.40	77.0
54	" ".....	1	9½	55	1.098	23.3	0.76	17.40	74.6
55	" ".....	1	11½	56	1.094	22.4	1.04	16.85	75.2
56	" ".....	1	8¾	55	1.096	22.8	0.81	17.50	76.7
58	" ".....	1	8¼	52	1.096	22.8	0.92	17.10	75.0
59	" ".....	1	7¾	51	1.096	22.8	1.16	17.45	76.5
7360	" ".....	1	9¾	59	1.086	20.0	0.89	16.10	77.4
63	" ".....	.....	.....	.....	1.088	21.0	0.83	16.85	80.2
64	" ".....	.....	.....	....	1.085	20.4	0.89	16.05	78.6

Samples No. 7363 and 7364 show the result of an experiment made by running a quantity of the juice through a De Laval cream separator. Sample No. 7363 was what ran from the skim milk spout and No. 7364 from the cream spout. The results are interesting as showing a decided gain in purity and per cent of sugar in the juice running from the skim milk spout.

SUGAR BEETS.

Several varieties of sugar beets were raised this year on the Station farm in co-operation with the U. S. Department of Agriculture. The seed was planted April 25th, and sample beets from each plot were tested from time to time during the season, as shown below:

Plot and Variety.	Number of Sample	Date of Sampling, 1900.	Number of beets taken	Av. Weight of 1 Beet.		The Juice Tested.		
				Topped, ozs.	Trimmed, ozs.	Brix	Sugar, per cent.	Purity, per cent.
Plot No. 1. Lichts, from F. R. Boyd, New York.	6807	July 5	2	5	3¾	14.9	11.6	77.8
	6928	Aug. 30	2	15¼	10¼	12.85	9.0	71.6
	7242	Sep. 19	1	8¾	7	10.9	8.35	76.4
	45	Sep. 19	1	9¼	7	12.3	8.65	70.3
	75	Sep. 26	2	10¾	8½	11.4	8.7	76.3
	82	Sep. 27	1	15	10¾	12.1	6.7	55.4
	82(a)	Sep. 27	1			12.4	9.2	74.2
	84	Sep. 27	1	24½	18	10.9	7.8	71.5
	85	Sep. 27	1	.....		11.2	8.0	71.4
	85(a)	Sep. 27	1	11¼	7¼	10.7	8.1	75.7
	85(b)	Sep. 27	1	... ...	... ..	10.9	7.95	72.9
	7337	Oct. 6	1	15	10½	10.	6.65	66.5
	38	Oct.. 6	1	12¾	10	12.1	7.75	64.0
	65	Oct. 12	1	17¾	13	8.5	5.6	64.7
	72	Oct. 16	1	9¾	7¼	12.1	8.6	71.1
	79	Nov. 19	3	9¾	8	11.4	7.55	66.2
Plot No. 2. Kleinwantzlebener Dippe, Germany U. S. D A., No. 3944.	6929	Aug. 30	2	14½	11½	13.9	11.35	81.65
	7243	Sep. 19	1	9½	7¾	11.4	7.9	69.0
	7244	Sep. 19	1	10½	8½	13.3	10.45	78.5
	76	Sep. 26	2	13¾	10	9.7	7.2	74.2
	7339	Oct. 6	1	19¾	17½	11.2	7.55	67.4
	40	Oct. 6	1	13¾	11½	11.6	8.7	75.
	66	Oct. 12	1	12	8¾	10.4	6.7	64.4
	73	Oct. 16	1	10	8½	11.2	6.5	58.
	80	Nov. 19	4	10½	7¾	12.1	8 0	66.1
Plot No. 3. Austrian Special Kleinwantzlebener U. S. D. A.	6930	Aug. 30	2	11½	8	12.7	10.05	79.2
	7246	Sep. 19	1	20¾	15½	11.2	8.4	74.1
	47	Sep. 19	1	13¼	10	10.0	7.0	70.0
	77	Sep. 26	2	8¾	5¾	10.2	6.85	67.2
	7341	Oct. 6	1	14¾	11	13.3	9.9	74.4
	42	Oct. 6	1	9¾	6¾	11.9	8.5	72.2
	67	Oct. 12	1	12½	7¼	10.7	7.35	68.7
	74	Oct. 16	1	10½	8½	11.9	8.05	67.6
	81	Nov, 19	4	10½	8¼	11.0	7.0	63.6

SUGAR BEETS—Continued.

Plot and Variety.	Number of Sample.	Date of Sampling, 1900.	Number of beets taken.	Av. Weight of 1 Beet.		The Juice Tested.		
				Topped, ozs	Trimmed, ozs	Brix.	Sugar, Per cent.	Purity, Per cent.
PLOT No. 4.	6931	Aug. 30	2	11½	8	13.6	10.5	77.2
White Improved	7248	Sep 19	1	15½	13½	13.1	10.25	78.2
Vilmorin.	49	" "	1	10½	8	12.3	9.7	78.8
U. S. D. A.	78	" 26	2	10¼	8¾	11.4	8.5	74.6
No. 3941.	7343	Oct. 6	1	19	17¾	12.8	9.2	71.9
	44	" "	1	9¾	7	11.9	8.75	73.5
	7368	" 12	1	13¾	9¼	11.6	8.75	75.4
	75	" 16	1	10½	8¾	11.6	8.3	71.5
	82	Nov. 19	3	10	7¼	12.1	7.9	65.2
PLOT No. 5.	6932	Aug. 30	2	11¼	8¼	12.7	10.3	81.2
Queen of the North	7250	Sep. 19	1	12½	9¾	12.6	9.65	76.7
U. S. D. A.	51	" "	1	11½	9	13.5	10.5	77.7
	79	" "	2	15¾	12	11.6	8.4	72.4
	7345	Oct. 6	1	10	8¼	12.1	8.8	72.7
	46	" "	1	11	7¼	11.4	8.4	73.7
	7369	" 12	1	10½	7½	10.2	6.25	61.2
	76	" 16	1	10½	8	10.2	7.05	69.1
	83	Nov. 19	4	.....	7	11.2	7.3	65.1
PLOT No. 6.	6933	Aug. 30	2	13	9¼	13.3	10.95	82.3
Zehringen, Strandes,	7252	Sep. 19	1	11	8¾	12.8	10.2	79.6
Germany. U. S. D.	53	" "	1	13¾	11¼	13.4	10.15	75.7
A., No. 3942.	80	" 26	2	12¼	9½	11.2	8.2	73.2
	83	" 27	2	7½	5½	11.4	8.1	71.0
	7347	Oct. 6	1	13	10½	10.9	7.4	67.9
	48	" "	1	11½	8½	12.8	9.0	70.3
	7370	" 12	1	10¾	8¼	11.4	8.45	74.1
	77	" 16	1	14½	10½	11.4	7.25	63.6
	84	Nov. 19	4	.....	7¾	12.1	8.	66.1
PLOT No. 7.	6934	Aug. 30	2	14	10	13.3	10.1	75.9
Mrozinski No. 1,	7254	Sep. 19	1	11½	9¼	13.5	10.1	74.8
Russia. U. S. D. A.	55	" "	1	16¾	12½	12.3	8.9	72.3
No. 3943.	81	" 26	2	11	8¾	11.9	8.4	70.6
	7349	Oct. 6	1	10½	8	11.4	8.4	73.7
	50	" "	1	10½	8¼	12.1	8.45	69.9
	7371	" 12	1	11¾	8¾	10.4	8.4	80.7
	78	" 16	1	15	12¾	10.2	5.9	57.8
	85	Nov. 19	3	.....	8	11.2	7.4	66.1

6616—Sugar beets brought by Prof. H. Garman, June 16th, from some that had been growing in the insectarium during the late winter and spring months. The sample consisted of two well shaped beets with luxuriant tops.

Average weight, trimmed	11 ounces.
Specific gravity of the juice	1.061
Degrees Brix	14.9
Per cent. of sugar in the juice	12.1
Purity	81.2

These beets are of distinctly better quality than those grown in the field.

SILICATE OF POTASH.

Two samples of this material were analyzed, taken from different lots furnished the Station by the German Kali Works, for experimental purposes. The material is said to be mixed with some ground peat. The German analysis was: Moisture, 2.00 per cent.; silica, 68.74; sulphuric acid, 0.53; chlorine, 0.28; potash, 25.41; and soda 0.73 per cent.; total, 97.73.

7036—Sample from one of the earlier shipments. A rather coarse, salt-like material, containing some brown vegetable matter.

7037—Sample from a lot received in the spring of 1900. Finer ground than the other lot and seems to contain a larger proportion of vegetable matter.

ANALYSES.	7036	7037
	Per cent.	
Potash soluble in water, official method	15.12	19.84
Potash soluble in boiling acidulated water	18.4	24.6
Silica soluble in water	21.9	13.5
Total nitrogen	0.08	0.09

The material was strongly alkaline and effervesced when treated with acids.

SUGAR BEETS—Continued.

Plot and Variety.	Number of Sample.	Date of Sampling, 1900.	Number of beets taken.	Av. Weight of 1 Beet. Topped, ozs	Av. Weight of 1 Beet. Trimmed, ozs	The Juice Tested. Brix.	The Juice Tested. Sugar, Per cent.	The Juice Tested. Purity, Per cent.
PLOT No. 4. White Improved Vilmorin. U. S. D. A. No. 3941.	6931	Aug. 30	2	11½	8	13.6	10.5	77.2
	7248	Sep 19	1	15½	13½	13.1	10.25	78.2
	49	" "	1	10½	8	12.3	9.7	78.8
	78	" 26	2	10¼	8¾	11.4	8.5	74.6
	7343	Oct. 6	1	19	17¾	12.8	9.2	71.9
	44	" "	1	9¾	7	11.9	8.75	73.5
	7368	" 12	1	13¾	9¼	11.6	8.75	75.4
	75	" 16	1	10½	8¾	11.6	8.3	71.5
	82	Nov. 19	3	10	7¼	12.1	7.9	65.2
PLOT No. 5. Queen of the North U. S. D. A.	6932	Aug. 30	2	11¼	8¼	12.7	10.3	81.2
	7250	Sep. 19	1	12½	9¾	12.6	9.65	76.7
	51	" "	1	11½	9	13.5	10.5	77.7
	79	" "	2	15¾	12	11.6	8.4	72.4
	7345	Oct. 6	1	10	8¼	12.1	8.8	72.7
	46	" "	1	11	7¼	11.4	8.4	73.7
	7369	" 12	1	10½	7½	10.2	6.25	61.2
	76	" 16	1	10½	8	10.2	7.05	69.1
	83	Nov. 19	4	.....	7	11.2	7.3	65.1
PLOT No. 6. Zehringen, Strandes, Germany. U. S. D. A., No. 3942.	6933	Aug. 30	2	13	9¼	13.3	10.95	82.3
	7252	Sep. 19	1	11	8¾	12.8	10.2	79.6
	53	" "	1	13¾	11¼	13.4	10.15	75.7
	80	" 26	2	12¼	9½	11.2	8.2	73.2
	83	" 27	2	7½	5½	11.4	8.1	71.0
	7347	Oct. 6	1	13	10½	10.9	7.4	67.9
	48	" "	1	11½	8½	12.8	9.0	70.3
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	81	" 26	2	11	8¾	11.9	8.4	70.6
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	50	" "	1	10½	8¼	12.1	8.45	69.9
	7371	" 12	1	11¾	8¾	10.4	8.4	80.7
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ANALYSES.	7036	7037
	Per cent.	
Potash soluble in water, official method	15.12	19.84
Potash soluble in boiling acidulated water	18.4	24.6
Silica soluble in water	21.9	13.5
Total nitrogen	0.08	0.09

The material was strongly alkaline and effervesced when treated with acids.

FEEDING STUFFS.

6494—Dried distillery slop from W. A. Gaines & Co., Frankfort. This consists of the coarser particles strained out of the slop, pressed and dried by artificial heat.

6512—Press cake of the finer particles. Sample in its moist condition just as taken from the press.

ANALYSES.	6494		6512		
	As Received.	Water-free.	As Received.	Room Dry.	Water free.
Water	4.17		63.82	2.06	
Ash	1.79	1.87	0.86	2.22	2.27
Protein	29.03	30.29	9.18	24.88	25.40
Fiber	13.38	13.96	2.65	7.18	7.33
Nitrogen-free extract	40.65	42.42	17.21	46.63	47.61
Fat	10.98	11.46	6.28	17.03	17.39
	100.00	100.00	100.00	100.00	100.00

6590—Belt-pressed corn feed, (dried distillery slop) from W. A. Gaines & Co., Frankfort.

6895—"Columbia Dairy Feed" manufactured by Callahan & Sons, Louisville. A mixed feed, apparently containing yellow corn, bran and some small grain.

ANALYSES.	6590		6895	
	As Received.	Water-free.	As Received.	Water free.
Water	8.33		11.44	
Ash	1.98	2.16	3.46	3.91
Protein	31.13	33.96	13.75	15.53
Fiber	11.42	12.46	5.90	6.66
Nitrogen free extract	36.55	39.87	61.05	68.93
Fat	11.59	11.55	4.40	4.97
	100.00	100.00	100.00	100.00
Phosphoric Acid			1.28	1.45
Nitrogen			2.20	2.48
Potash			0.81	0.91

SOILS.

6094—Soil, sent by H. G. Smith, Lewisport, Hancock County, from a place where the water of a coal mine comes down on the land and nothing will grow.

The soil was moist when received. It was strongly acid, and an aqueous extract of it was found to contain the sulphates of aluminium, iron, manganese, calcium, sodium and lithium and possibly also traces of free sulphuric acid. The following determinations were made, calculated on the air-dried soil:

Matters dissolved by cold water	0.72 per cent.
Acidity, calculated as SO_3	0.04 " "
Potash, dissolved by HCl, 1.115 sp. gr.	0.18 " "
Phosphoric Acid " " " " "	0.21 " "
Total Nitrogen	0.07 " "

If the acid water from the mine could be turned away from this land the soil could no doubt be restored to a fertile condition by liberal application of lime, marl or wood ashes.

Soil and subsoil from the farm of Mr. J. T. Maddox on the Skinnersburg and Stamping Ground pike, one-half mile east of Skinnersburg, Scott County. Collected by Messrs. Peter and Miller, November 30, 1900.

7085—Surface soil from a field some distance to the west of the young orchard. This sample represents a considerable area of poor soil in the northern part of Scott County, locally known as "White Oak" land. Sample taken to depth of about six inches.

7090—Subsoil of the preceeding. Small sample taken from same hole at depth from 6 to 12 inches. This subsoil is yellowish in color.

7087—Surface soil from the north end of the young orchard, taken to depth of about six inches. This also is "White Oak" soil but the subsoil here is reddish in color, unlike that where the preceeding samples were taken.

7089—Subsoil of No. 7087, taken at a depth of 6 to 12 inches, color reddish.

7086—Surface soil from a field next to the south end of the young orchard near a locust grove. This is a better class of land than the "White Oak" land and is locally known as "Limestone" land on account of the presence in it of numerous fragments of limestone. This soil is brown in color and rather clayey in appearance. Several pieces of limestone were removed from the hole where the sample was taken.

7088—Subsoil of No. 7086, taken from same hole at depth of 6 to 12 inches. Color yellowish; contains pieces of limestone.

ANALYSES OF THE AIR-DRIED SOILS—Per Cent.

	White Oak Land.				Limestone Land.	
	Top soil 7085	Sub-soil. 7090	Top soil. 7087	Sub-soil. 7089	Top soil. 7086	Sub-soil. 7088
Moisture	1.55	2.22	2.01	3.66	3.25	3.20
Organic matter and combined water	3.27	3.84	4.34	4.91	7.07	5.20
Sand and insoluble matters	84.63	80.59	82.61	75.48	74.23	69.41
Peroxide of iron	3.68	5.30	4.30	6.07	5.46	6.37
Alumina	5.31	6.46	5.22	7.69	7.44	7.95
Lime	0.20	0.25	0.24	0.36	0.54	3.49
Magnesia	0.21	0.27	0.22	0.30	0.26	0.58
Potash	0.25	0.34	0.29	0.49	0.71	0.85
Phosphoric Acid	0.09	0.10	0.08	0.08	0.15	0.18
Nitrogen	0.08	0.05	0.11	0.06	0.22	0.08
Carbonic acid, undetermined and loss	0.73	0.58	0.58	0.90	0.67	2.69
Total	100.00	100.00	100.00	100.00	100.00	100.00
Available phosphoric acid	0.0004	0.0006	0.0005	0.0006	0.0006	0.0203
Available potash	0.0111	0.0116	0.0138	0.0114	0.0226	0.0074

These soils, especially the "White Oak", are deficient in phosphoric acid and organic matter. It is probable they con-

tain enough potash for wheat, but they could not be expected to produce a fair crop of that grain without the application of phosphates and probably also nitrogenous fertilizers. They could be improved by the growth of some leguminous crop, such as cow peas, with the aid of phosphates.

TOBACCO EXTRACT.

Some samples of tobacco extract used by the Division of Entomology and Botany for experimental purposes were tested as to their content of nicotine. In this work the Lloyd method, as described by B. C. Keiser, was most used, but the Kissling method and the Winton method were also tried for comparison.

6935—"Rose Leaf Tobacco Extract," from a sample can sent to the Station for trial by the Kentucky Tobacco Product Company, Louisville. A thick, dark brown liquid, having a pungent, somewhat smoky but not unpleasant smell and a slightly alkaline reaction.

6990—"Skabcura Sheep Dip," from a sample bottle sent to the Station for trial by the Skabcura Dip Co., Chicago, Ill. The label states that a bottle (about a pint) contains the nicotine from 200 lbs. of stems. It is stated to contain 40 per cent. of nicotine. To make dip, the contents of the bottle is to be mixed with a hundred gallons of water. A dark brown, thin liquid, having a strong smell of ammonia and pyridine bases.

	6935	6990
Nicotine by the Lloyd-Keiser method	1.75	51.4
Nicotine by the Kissling method	1.47	49.3
Nicotine by the Winton method		52.9

Four other samples of the "Rose Leaf" Extract, tested by the Lloyd-Keiser method, gave figures ranging from 1.96 to 2.50 per cent., with a mean of 2.18 per cent. nicotine.

TOBACCO STEMS AND STALKS.

6258—Tobacco stems from Hamilton Scott, Lexington, Ky.

ANALYSES.	Room Dried.	As Received.
Moisture by room drying, per cent		15.5
Potash.....per cent	9.59	8.10
Nitrogen.....per cent	2 97	2.51
Equivalent to ammonia..per cent	3.61	3.05

6591—Ground tobacco stems and 6593, broken tobacco stems, both from Louisville.

ANALYSES.		6591	6593
Moisture	per cent.	10.43	13.72
Potash	per cent.	9.83	10.83
Nitrogen	per cent.	2.55	1.46
Equivalent to ammonia	per cent.	3.10	1.77

6823—Ground stems from Louisville, 6855, same Adairville, 6901, same Louisville.

ANALYSES.		6823	6855	6901
Moisture	per cent.	....	18.16	5.78
Potash	per cent.	9.37	7.31	10.18
Nitrogen	per cent.	2.61	2.39	2.60
Equivalent to ammonia	per cent.	3.17	2.90	3.16
Phosphoric acid	per cent.	....	0.50	....

6299 and 7173—Ground tobacco stalks from Owensboro, Ky.

ANALYSES.		6299	7173
Potash	per cent.	3.08	2.97
Nitrogen	per cent.	2.80	3.27
Equivalent to ammonia	per cent.	3.40	3.97
Phosphoric acid	per cent.	0.69	....
Nicotine	per cent.	....	0.52

POTASSIUM NITRATE.

A considerable amount of crude potassium nitrate is now produced from tobacco stems as a bye-product in the manufacture of tobacco extract, and is used as a fertilizer. Analyses of this material have been published in these reports from time to time. Three additional analyses are here given, samples Nos. 6501 and 7067 being the crude substance and No. 7074 that which has been purified by repeated washing.

ANALYSES.		6501	7067	7074
Moisture	per cent.	8.11	7.60	0 17
Potash	per cent.	33.16	37.44	46.16
Nitrogen	per cent.	6.67	10.65	13.43

CRUDE PETROLEUM.

7169—Petroleum from a well of the Mount Sterling Oil and Gas Co., in Bath County, brought December 14, 1900, by Dr. Elmer Northcutt.

Sample a dark brown oil having little smell.

Specific gravity..0.915 equivalent to 23°B.
Flashing point....111.°F.
Cold test..... 5.°F.
Distillate below 300°F. .....4. per cent by volume.
Distillate between 300 and 500°F. 62.5 " (Spec. grav. 0.817)
Residue, by difference.....33.5 "

100.0

Sulphur..... 0.4 per cent.

Oils of this character have been used with with good results in place of kerosene in making kerosene emulsion.

PHOSPHATIC LIMESTONE.

6893—Sample sent by J. Stoddard Johnson, Louisville, Aug. 1st, 1900. A soft gray limestone, resembling the phosphatic limestone found in Fayette county, Kentucky, and characterized by the presence of the small shell, *cyclora minuta*.

ANALYSIS.

Moisture..... 0.23 per cent.
Carbonic acid..... 20.50 "
Equivalent to carbonate of lime.....46.60 "
Phosphoric acid..... 20.65 "
Equivalent to phosphate of lime .....45.10 "

SUSPECTED POISONING OF STOCK.

Two cases were examined in which cattle or horses were suspected to have been poisoned. In one of these, No. 6600, several steers that had been running in pasture died suddenly with symptoms suggesting arsenical poison. The contents of the stomach and portions of liver from two of the steers, one of which had been the first to die, and one that had lingered several hours, were examined and found to contain both arsenic and copper. In each instance the contents of the stomach appeared to be only grass, but in the first steer it was of an

unusually bright green color, and in this one most arsenic and copper was recovered. Evidently the steers had died from poisoning with Paris green.

It was found upon investigation that a tobacco field adjoined the pasture in which the steers were, that Paris green had been used on this tobacco, and that some of the empty boxes had probably been carelessly thrown over the fence into the pasture, and the poisoning was probably accidental. It is important for those who use this poison as an insecticide to bear in mind that cattle will lick Paris green and chew the pasteboard boxes in which it has been packed.

The other case, No. 6892, was of several horses that had been turned into a field where wheat had been threshed. They were all affected alike, appearing sluggish and unable to move. Later one of them died; the others finally recovered. Part of the contents of the stomach was brought to the laboratory for examination. It was found to contain masticated wheat, with occasional grains of cockle. Examination was made for metallic and alkaloidal poisons with negative results. An examination for saponin also was unsuccessful. As the horses had access to the place where the thresher had stood it is possible that they may have gotten enough cockle from eating the screenings to produce poisoning. The owner reported that his wheat contained an unusually large amount of cockle.

MINERAL WATERS.

6352—Water from a spring recently discovered on the farm of Mrs. Sallie Jackson, near New Haven, Nelson County, Ky., sent by Sam. C. Elliott, New Haven

ANALYSIS.

The water leaves, upon evaporation, 222.4 grains of solid matter to the gallon, composed mainly of the sulphates of magnesia and soda, with some sulphate of potash, chloride of sodium carbonates of lime, magnesia and iron and some organic matter. The water contained also some sulphuretted hydrogen gas and alkaline sulphide.

This is a saline sulphur water, containing purgative salts.

6353—Water from a bored well on the farm of Mr. H. B.

Durham, in Fayette County, about three and a half miles from Lexington, on the Newtown road. The well is 35 feet deep and the water stands in it 5 feet from the surface.

ANALYSIS.

The water leaves, upon evaporation, 114. grains of solid matter to the gallon, composed mainly of the chlorides of sodium, calcium and magnesim, with small quantities of chlorides of potassium, lithium, strontium and iron, some iodide, a little silica, and a very notable amount of organic matter.

This is a weak salt water, such as is often struck by boring in the limestone rocks of this region. Such waters are wholesome and have medicinal value, but the large amount of organic matter in this one suggests local contamination.

6354—Water sent by Mr. R. M. Carroll, Bardwell, Carlisle County.

The water left, upon evaporation, 14.6 grains of solid matter to the gallon, of which more than 6. grains was organic matter. The mineral matter consisted of oxide of iron, silica, small quantities of the chlorides of sodium, potassium calcium and magnesium and traces of iodides and lithium.

The presence of so large a proportion of organic matter is suspicious.

6355—Water from a well on the farm of L. Kevil, Princeton, Caldwell County. Sample received April 25th, 1900.

ANALYSIS.

The water left, upon evaporation, 34.5 grains of solid matter to the gallon, composed mainly of the sulphates of magnesia and soda, with small quantities of the sulphates of lime, potash and lithia, a little chloride of sodium, traces of iodides, borates and nitrates, some carbonate of lime and a little iron and silica.

6474—Water brought by Mr. Robert Moorman, Glendeane, Breckinridge County, April 20th, 1900.

ANALYSIS.

The water left, upon evaporation, 56.2 grains of solid matter to the gallon, composed of carbonates of lime and magnesia, sulphates of lime, magnesia, potash and soda, chloride of

sodium, traces of iron, aluminum and lithium compounds and some organic matter.

This water should be diuretic in its action and may have some medicinal value.

6494—Sulphur water from a bored well 212 feet deep, situated near the Manual Training factory at the State House of Reform, Greendale, Fayette County. Brought by Mr. C. E. Richards, Architect, April 19th, 1900.

The sample was slightly turbid and deposited a slight, blackish sediment on standing. No smell of hydrogen sulphide was perceptible, but the water had a slight smell and taste of petroleum.

ANALYSIS.

The water left, upon evaporation, 41.9 grains of solid matter to the gallon, composed mainly of the carbonates of lime, magnesia and soda and chloride of sodium, with only a small proportion of sulphates, traces of bromides, borates, lithium, iron, silica, nitrates and a trace of zinc.

The water was found to contain a little hydrogen sulphide, and the sediment contained some sulphide of iron and sulphide of zinc.

This is an alkaline-calcic water of a kind that has been found to have considerable medicinal value, especially in certain kidney and bladder troubles, and some cases of dyspepsia and rheumatism.

On account of the alkaline character of this water it was thought that it might be safely used in boilers, and it was accordingly used in the heating system of the institution. It was found, however, that although it did not affect the iron, it rapidly corroded the brass plugs in the boilers, probably on account of the sulphides present. One of these plugs was brought to the laboratory by Superintendent Doak for examination. The threads, where they had been in contact with the iron, had been entirely destroyed and the inside of the plug was coated with a black, crystalline layer of sulphide of copper containing only a trace of zinc. Apparently the zinc

had been dissolved from the brass by the water and the copper converted into sulphide.

6576—Water from a bored well 187 feet deep in the prison yard of the Branch Penitentiary at Eddyville, Lyon County. Sent by Mr. Ed. Fennell, Chairman of the Board of Prison Commissioners. The well is in solid limestone rock and the supply of water is sufficient for all needs of the institution for steam and drinking.

ANALYSIS.

The water left, upon evaporation, 31.7 grains of solid matter to the gallon, consisting mainly of the carbonates of calcium and magnesium, organic matter, and small quantities of chlorides, sulphates and nitrates of sodium, potassium, calcium and magnesium and a trace of lithium.

The following determinations were made:

Lime, 9.7 grains per gallon.

Chlorine, 1.8 grains per gallon.

Magnesia; 2.0 grains per gallon.

Free ammonia, 0.016 part per million.

Albuminoid, 0.124 part per million.

The high albuminoid ammonia and the presence of nitrates and organic matter indicate that the water is impure and should not be used for drinking without boiling.

6646—Water sent by Mr. E. W. Zoeller, Frankfort, Ky. When received the water contained a slight, brownish sediment. It had no smell of hydrogen sulphide.

ANALYSIS.

The water left, upon evaporation, 74.5 grains of solid matter to the gallon, composed mainly of carbonates of lime, magnesia and soda, with some sulphate of soda, sulphate of potash and chloride of sodium and marked traces of the carbonates of iron, strontium and lithium and some organic matter and nitrates.

The sediment contained some oxide of iron and sulphide of zinc.

This is an alkaline, carbonated water, possibly containing a

little hydrogen sulphide when fresh, and no doubt has medicinal value.

6647—Water from Beattyville Springs, Lee County. Sent by Mr. Frank Kearney, of Robertson & Weitzel, Lexington.

ANALYSIS.

The water left, upon evaporation, 168.5 grains of solid matter to the gallon, composed mainly of sulphate of soda and chloride of sodium, with small quantities of the carbonates of lime, magnesia, soda and iron and traces of bromides, strontium and lithium.

This is a saline water, containing a little iron, and should have some medicinal value.

6648—Water from a bored well at the Phoenix Hotel, Lexington. Brought June 26th, 1900, by Prof. F. P. Anderson. This water is now being used in the boilers.

ANALYSIS.	Grains. Per Gallon.	Grams. Per Liter.
Carbonate of lime	13 4	0.230
Carbonate of magnesia	2.1	0.036
Sulphate of magnesia	6.9	0.119
Chloride of sodium	10.0	0.171
Silica	0.5	0.008
Peroxide of iron	0.2	0.004
Organic matter	4.2	0.072
Total solid matter	37.3	0.640

Sodium carbonate, strontium carbonate, nitrates, etc., traces.

A sample of scale from the boilers in which this water was used was found to contain much carbonate of lime, some sulphate of lime, a good deal of sand, silica and oil, and some magnesia and oxide of iron.

6647 a and b—Two samples of Blue Lick Water sent by Mr. F. B. Lindsay, Carlisle, Nicholas County, May 12th, 1900. The samples were marked No. 1 and No. 2, one being from the source from which water is now being shipped; the other from a new source a out three hundred yards distant. Both samples were nearly clear

and yellowish in color. A partial analysis was made, with the results given below, calculated in grams in the liter. An old analysis of the Blue Lick water is given for comparison, taken from the Reports of the Kentucky Geological Survey, Vol. A, part 1, page 415, made in 1877. The results show the two samples to be practically identical, and only a little weaker than the water was twenty-three years ago.

Analyses—grams per liter.	Sample No. 1.	Sample No. 2.	Old Analysis-
Total solid matter	9.026	9.315	10.558
Total after ignition	8.599	8.938	.....
Lime	0.422	0.431	0.422
Magnesia	0.219	0.221	0.220
Alkaline chlorides	7.671	7.932	8.615
Sulphuric anhydride	0.344	0.317	0.324
Chlorine	4.925	5.120	5.567
Total hydrogen sulphide	0.0338	0.0155	0.0279
Alkaline sulphides	Present	Present	Present

6896—Water from a well on the camp grounds of George Catlett, Eddyville, Lyon County. The sample had no marked odor or taste, and did not contain any hydrogen sulphide.

ANALYSIS.

The water left, upon evaporation, 21.8 grains of solid matter to the gallon, containing the carbonates of iron, lime and magnesia, with traces of carbonate manganese, carbonate of soda, chloride of sodium, chloride of potassium, nitrates and organic matter. This is a good chalybeate water.

6989—Water from a well in the town of Bloomfield, Nelson County. Brought by Mr. A. L. Jenkins, September 7th, 1900. This is a bored well, 16 feet deep, situated near the creek.

ANALYSIS.

The water left, upon evaporation, 26. grains of solid matter to the gallon, consisting principally of carbonate of lime, with a little carbonate of magnesia, chloride of sodium and

carbonate of soda, with traces of sulphates, nitrates and organic matter.

The mineral matter present is quite similar in kind and amount to that usually contained in the hard well and spring waters of limestone regions.

7001—Water from a bored well 110 feet deep on the premises of J. W. Waterfill, in the suburbs of Lawrenceburg, Anderson County. Sample taken by Mr. J. C. Clay, September 12th, 1900.

ANALYSIS.

The water left, upon evaporation, 664.5 grains of solid matter to the gallon, consisting mainly of the chlorides of sodium, calcium and magnesium, with a little sulphate of lime, carbonate of lime, chloride of potassium, chloride of lithium, sulphate of strontium, a trace of carbonate of iron and marked traces of iodides, bromides and borates.

The sediment in the bottle contained a trace of sulphide of zinc.

Saline waters of this character are often met with in boring in the limestone strata of Central Kentucky. They are good and wholesome for drinking, and have some medicinal value.

7010—Water from the well of J. J. Tucker, Greensburg, Green County. Sent by Mr. E. R. Van Meter, September 18th, 1900.

ANALYSIS.

The water left, upon evaporation, 161. grains of solid matter to the gallon, composed mainly of the sulphates of lime and magnesia, chloride of sodium and carbonate of lime, with traces of nitrates, borates, iodides, bromides and lithium.

A calcic, saline water, which may possess some medicinal value.

7024—Water sent by Rickman Bros., Hopkinsville, Christian County, September 30, 1900. The well is 112½ feet deep, and is situated fifty feet above the level of the city.

ANALYSIS.

The water left, upon evaporation, 201. grains of solid matter to the gallon, composed mainly of chloride of sodium, with carbonates of calcium, magnesium, strontium, sodium and lithium, sulphide of sodium, marked traces of borates and bromides and small quantities of the sulphates of sodium and potassium. The water contained some free hydrogen sulphide; and the total amount of this substance present, both free and combined, was found to be 4.5 grains to the gallon.

This is a good alkaline-saline sulphur water.

7025—Water sent by William Graddy, Versailles, Woodford County, from a bored well at his house.

ANALYSIS.

This water left, upon evaporation, 213. grains of solid matter to the gallon, composed principally of chloride of sodium, with small quantities of carbonate of calcium and carbonate of magnesium and marked traces of carbonate of lithium, carbonate of strontium, iodide and bromide of sodium and nitrates. The water contained also a notable quantity of hydrogen sulphide, and the slight sediment in the bottle contained a trace of zinc sulphide.

This is a mild alkaline sulphur water and should have some medicinal value.

7046—Water sent by Mr. Charles D. Matthews, Auburn, Ky., from a well bored on his place in Logan County. Sample received October 20th, 1900.

ANALYSIS.

The water left, upon evaporation, 36.8 grains of solid matter to the gallon, composed mainly of the carbonates of calcium, magnesium and sodium, with some sulphate of sodium, sulphate of potassium, sulphide of sodium, chloride of sodium and marked traces of lithium and strontium carbonates and sodium borate. The total amount of hydrogen sulphide present, both free and combined, was found to be 2. grains to the gallon.

This is very good, mild sulphur water.

7075—Water from a bored well, 180 feet deep, at the home of Mr. L. C. Price, Lexington, Fayette County. Brought November 7th, 1900.

ANALYSIS.

The water left, upon evaporation, 609. grains of total solid matter to the gallon, consisting mainly of the chlorides of sodium, calcium and magnesium, carbonate of calcium, a little sulphate of calcium, sulphate of strontium, chloride of potassium, chloride of lithium, borates, iodide and bromides.

The sediment contained a little sulphide of zinc.

This is a saline water, such as is often found by boring into our limestone. It is wholesome and should have some medicinal value.

7078—Residue from boiling down three gallons of water from a well on the property of Mr. J. H. Smith, in Nelson County, four miles north of New Haven. The sample consisted of two and one-half ounces of thick, muddy, brownish liquid of alum-like taste.

ANALYSIS.

The total amount of solid matter in the sample was 384. grains, corresponding to 128. grains to the gallon of the original water. It was composed principally of the sulphates of iron, aluminum, calcium, magnesium and sodium, with some sulphate of manganese and marked traces of the sulphates of potassium and lithium.

This is a chalybeate water belonging to the class commonly known as alum waters, and should have medicinal value.

7175—Water "from a spring at or near the surface of the rock under about eight feet of earth. About two feet of rock has been excavated." Sent by Mr. J. W. Allen, Scottsville, Allen County, December 4th, 1900.

The sample was yellowish, with a slight, blackish sediment.

ANALYSIS.

The water left, upon evaporation, 29.2 grains of solid matter to the gallon, consisting mainly of carbonate of iron, with carbonates of calcium, magnesium and manganese and traces of chlorides and iodides of sodium and potassium.

This seems to be a good chalybeate water.

7176—"Water from a drilled well thirty-one feet deep (ten feet of earth and twenty-one feet of rock). The sample was drawn by a steam jet pump before the recent rains,

when everything was very dry." Sent by J. W. Allen along with the preceding. The sample was yellowish, with a slight, brownish sediment.

ANALYSIS.

The water left, upon evaporation, 40.3 grains of solid matter to the gallon, composed mainly of carbonates of calcium and magnesium, with some carbonate of iron, small quantities of sulphate and chloride of potassium and sodium, and traces of iodides and lithium and strontium compounds.

This is a weak chalybeate water, more calcic than No. 7175, and containing less iron.

7177—Water from the same well as No. 7176, but drawn with a hand bucket after the recent heavy rains. It was quite milky when first drawn. Sent by J. W. Allen with the two preceeding. The sample was only slightly yellowish, but contained a flocculent, gray sediment.

The water left, upon evaporation, 33.5 grains of solid matter to the gallon, of the same character as that found in No. 7176, except, perhaps, containing a little more iron.

7178—Water sent by Dixie Knight, Nealton, Jessamine County, from a well 180 feet deep, bored last summer. Stock will not drink the water. The sample was taken after pumping out a good deal of water from the well. Received December 11th, 1900.

The sample was colorless, but contained some grayish sediment. It smelled of petroleum and tasted slightly brackish.

ANALYSIS.

The water left, upon evaporation, 298.5 grains of solid matter to the gallon, consisting mostly of chloride of sodium, with some chloride of calcium and chloride of magnesium, a little carbonate of calcium, borates and lithium and strontium compounds and a trace of iodide. The sediment contained some sulphide of zinc and a little carbonate of iron.

This is a weak saline water, and should have some medicinal value.

7179—Water sent by J. H. Cole, proprietor of the "New Morgan House," West Liberty, Morgan County, December 12th, 1900. Sample colorless, with a slight, grayish sediment.

ANALYSIS.

The water left, upon evaporation, 25 grains of solid matter to the gallon, composed mainly of the carbonates of calcium, magnesium and sodium, with traces of chlorides and sulphates of sodium and potassium and a trace of carbonate of strontium.

The alkaline character of this water should render it of some value, especially in certain cases of dyspepsia.

ALFRED M. PETER,
Chemist.

REPORT OF THE DIVISION OF ENTOMOLOGY AND BOTANY.

By H. GARMAN.

M. A. SCOVELL, Director.

DEAR SIR:—In the Division of Entomology and Botany attention has been directed during the past year to a study of the insects and fungi injurious to cucumbers and related plants to satisfy requests for information received from growers in the vicinity of Louisville and Cincinnati. A bulletin on the subject has just been published by the Station and contains, besides, the results of our experiments in checking potato scab, and a study of the food of the common toad. A good deal of time has been spent also in getting together material for a bulletin on the insects affecting seeds and stored grains in this section. Studies of tobacco insects have been continued both in the Vivarium and in the field. During the winter work has been continued on lettuce diseases, and it has been shown that most of the troubles to which this plant is subject when grown under glass, can be warded off or checked. We have had no difficulty in keeping our plantings at all times in most excellent condition.

Nursery inspection occupied more than a month in 1900. The number of nurseries calling for inspection being 37. It was not possible to go over them in less time. Their condition proved to be much as in previous years, except for the prevalence of pear blight, which disease was more common on both young and old trees than it has been at any time since the inspection law was enacted. Three small nurseries that have not hitherto been examined were inspected this spring. One of them, in Campbell County, has been started recently. Two in Jessamine County have been in existence for some

time, but have not reported for inspection. Both were found badly infested with crown gall, and certificates could not be granted until the galled trees were bestroyed. This has now been done, and while I am not entirely satisfied with trees grown among those that were diseased, the remaining trees have every appearance of being sound, and I cannot therefore withhold certificates.

At present I have in preparation, and hope to get out during the coming week, a bulletin on nursery pests that have assumed prominence since our Bulletin 80 was issued, and also material for a forage plant bulletin which I hope to have in print in the latter part of the summer, after getting notes on plants now growing in the new grass plots.

Some time was given by me during the winter to institute work with the Commissioner of Agriculture, and a small class in Entomology has been in my charge since the beginning of the second term. I am desirous of improving and extending this work as a means of disseminating information concerning economic entomology, and thus supplementing work being done through Station publications. To this end I wish to recommend that an increase be allowed the Division.

H. GARMAN,

Entomologist and Botanist.

METEOROLOGICAL SUMMARIES.

FOR THE YEAR 1900.

Compiled from the records of the U. S. Weather Bureau Station in the main college building.

PRESSURE.

(Corrected for temperature and instrumental error only.)

ELEVATION OF THE BAROMETER CISTERN ABOVE MEAN SEA-LEVEL, December 31st, 990 ft.

MONTHS.	Monthly	Highest Observed.	Date.	Lowest Observed.	Date.	Absolute range.
	In.	*In.*		*In.*		*In.*
January	29.02	29.41	6	28.56	20	0.85
February	28.94	29.33	27	28.41	22	0.92
March	28.99	29.35	3	28.59	19	0.76
April	28.99	29.45	5	28.79	8	0.66
May	28.96	29.22	10	28.60	19	0.63
June	28.92	29.10	20	28.66	22	0.44
July	29.01	29.11	22	28.78	8	0.33
August	29.06	29.23	8	28.86	23	0.37
September	29.07	29.21	26	28.86	15	0.36
October	29.09	29.29	17	28.89	22	0.40
November	29.04	29.50	16	28.73	13	0.77
December	29.04	29.42	16	28.64	23	0.78
		Highest		Lowest		
Mean	29.01	29.50	Nov. 16	28.41	Feb. 22.	0.61

PRECIPITATION.

(Amount in inches and hundredths).

Elevation of top of gauge above ground December 31, 68 feet.

MONTHS.	Total Amount.	Greatest Am't in any 24 consecutive hours.		No. of days on which 1 in. fell.	No. of days on which no rain except "Trace" fell	Greatest No. of consecutive days without rainfall (Dates inclusive)	Normal rainfall.
		Am't	Date.				
January	2.13	0.84	11	0	20	1 to 10....	3.82
February ..	3.17	0.71	7 & 8	0	17	1 to 3....	3.70
March	1.98	0.45	25 & 26	0	20	7 to 14....	4.90
April	1.23	0.59	16 & 17	0	24	1 to 10...	3.72
May	3.54	1.20	28 & 29	0	18	10 to 17....	3.49
June	2.19	0.86	6	0	17	2 to 5...	4.25
July	2.80	1.52	19	1	20	13 to 16....	5.10
August	5.75	2.19	22 & 23	2	21	4 to 11....	3.52
September...	1.85	0.73	27 & 28	0	23	4 to 11....	2.54
October	0.79	0.56	7 & 8	0	25	13 to 20...	2.22
November .	6.38	3.07	20 & 21	2	21	12 to 19 ...	3.72
December ..	1.86	0.82	30 & 31	0	23	9 to 22...	3.40
Total.....	33.67	.....	.....	.....	242	.....	44.38

CLOUDINESS.

Months.	Mean Cloudiness (0 to 10).		Character of Day.		
	8 a. m.	Monthly.	Clear.	Partly Cloudy.	Cloudy.
January	5.9	6.1	11	5	15
February	6.9	6.5	6	10	12
March	6.1	5.5	14	4	13
April	5.2	3.8	17	7	6
May	4.5	4.2	15	9	7
June	6.8	5.7	4	19	7
July	3.4	4.3	15	13	3
August	2.1	4.6	8	21	2
September	3.9	4.5	11	15	4
October	3.9	3.8	15	11	5
November	5.5	5.0	11	8	11
December	6.3	5.6	9	10	12
Summary			136	132	97
Mean	5.0	5.0			

TEMPERATURE.

Months.	Elevation of the Dry Thermometer Bulb Above Ground Dec. 31st, 75 Feet. From Self-Registering Instruments.										No. of Days.		
	Mean.			High'st	Date.	Lowest	Date,	Range.		Mean daily change.	Max. below 32 degrees.	Max. above 90 degrees.	Min. below 32 degrees.
	Max.	Min.	Monthly.					Absolute.	Mean Daily				
				°									
January	43.9	27.9	35.9	62	15	—1	29	63	16.0	5.9	7	0	14
February	40.1	22.1	31.1	68	8	—4	25	72	18.0	9.3	7	0	23
March	48.1	30.2	39.2	67	11	4	17	63	17.9	8.0	2	0	18
April	64.7	45.2	55.0	79	29	26	10	53	19.5	5.2	0	0	4
May	76.1	55.1	65.6	91	16	36	4	55	20.9	5.2	0	1	0
June	80.9	64.1	72.5	89	29	53	6	36	16.8	3.3	0	0	0
July	86.8	67.2	72.0	93	15	58	9	35	19.6	2.4	0	9	0
August	89.3	69.3	79.3	96	11	62	3	34	20.0	1.7	0	14	0
September	83.1	63.4	73.2	97	10	46	17	51	19.7	3.1	0	7	0
October	74.9	54.9	64.9	87	5	38	17	49	20.0	3.3	0	0	0
November	54.0	36.0	45.0	74	22	20	16	54	18.0	5.6	0	0	14
December	44.4	30.0	37.2	59	18	18.0	19	41	14.4	5.2	1	0	17
Mean	65.5	47.1	56.3	Max. 97	Sep.10	Min. —4	Feb. 25.	50	18.4	4.8	.....	.....	.. ..

WIND.

Elevation of the Anemometer Cups above ground Dec. 31, 102 ft.

MONTHS.	Prevailing Direction.	Maximum hourly velocity during month.			No. of days with gales*	No. of calms.
		Miles	From	Date.		
January	S. W.	37	W.	25	0	0
February	S. E.	48	W.	24	4	0
March	N. W.	38	W.	26	0	0
April	N. E.	40	S.	17	1	0
May	S. W.	31	S. W.	8	0	0
June	S.	27	S.	1	0	0
July	S. W.	31	W.	19	0	0
August	S. W.	42	N. W.	14	2	0
September	S. E.	27	S. W.	11	0	1
October	S. E.	32	S.	22	0	1
November	S. W.	37	N.	25	0	0
December	S. W.	32	S. W.	23	0	0
Summary					7	2
Mean	S.					

*Days with 40 miles per hour and over.

NUMBER OF DAYS.

Months.	Thunder Storms.	Snows.	Hail.	Fog.
January	0	2	0	2
February	2	5	0	0
March	0	3	0	0
April	0	0	0	0
May	4	0	0	0
June	7	0	0	0
July	11	0	0	0
August	14	0	0	0
September	2	0	0	0
October	1	0	0	0
November	3	3	0	0
December	0	0	0	1
Summary	44	12	0	3

WIND.

Elevation of the Anemometer Cups above ground Dec. 31, 102 ft.

MONTHS.	Prevailing Direction.	Maximum hourly velocity during month.			No. of days with gales*	No. of calms.
		Miles	From	Date		
January	S. W.	37	W.	25	0	0
February	S. E.	48	W.	24	4	0
March	N. W.	38	W.	26	0	0
April	N. E.	40	S.	17	1	0
May	S. W.	31	S. W.	8	0	0
June	S.	27	S.	1	0	0
July	S. W.	31	W.	19	0	0
August	S. W.	42	N. W.	14	2	0
September	S. E.	27	S. W.	11	0	1
October	S. E.	32	S.	22	0	1
November	S. W.	37	N.	25	0	0
December	S. W.	32	S. W.	23	0	0
Summary					7	2
Mean	S.					

*Days with 40 miles per hour and over.

NUMBER OF DAYS.

Months.	Thunder Storms.	Snows.	Hail.	Fog.
January	0	2	0	2
February	2	5	0	0
March	0	3	0	0
April	0	0	0	0
May	4	0	0	0
June	7	0	0	0
July	11	0	0	0
August	14	0	0	0
September	2	0	0	0
October	1	0	0	0
November	3	3	0	0
December	0	0	0	1
Summary	44	12	0	3

KENTUCKY

AGRICULTURAL EXPERIMENT STATION

OF THE

STATE COLLEGE OF KENTUCKY.

BULLETIN NO. 86.

INSPECTION AND ANALYSES OF FOODS.

LEXINGTON, KENTUCKY,
Jan. 1, 1900.
1

019248

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Address of the Station,

LEXINGTON, KENTUCKY.

BULLETIN NO. 86.

Inspection and Analyses of Foods.

Chapter 52, "An Act Regulating the Sale and Manufacture of Food," was passed by the General Assembly of the Commonwealth of Kentucky during the session of 1898. This act became operative June 13, 1898, and immediately thereafter this Station issued and sent to all grocers, confectioners, millers, and other dealers in food products in the State, who were rated "K" and above in Dun's Agency, the following circular of information regarding the above act, and enclosed also a copy of the act.

AGRICULTURAL EXPERIMENT STATION OF THE STATE COLLEGE OF KENTUCKY.

Circular of Information Regarding the Kentucky Pure Food Law.

The Legislature of Kentucky at its late session passed an act entitled "An Act Regulating the Manufacture and Sale of Food." The act went into effect June 13, 1898. Under this law, any person manufacturing, or selling, or exposing for sale any article of food, or any article which goes into the composition of food, as pure or unadulterated which is adulterated or misbranded, is subject to a fine not to exceed $500, or not more than one year imprisonment.

The terms "adulterated" and "misbranded" are clearly defined in the law, a copy of which is sent herewith. So many inquiries, however, have been made in regard to labelling different articles of food so as to comply with the law that it has been thought best to present herewith a few provisional definitions of terms for the purpose of illustration.

ANTISEPTICS.

Salicylic acid, benzoic acid, boracic acid, or any of their compounds, or any other antiseptic or objectionable preservative must not be used in catsup, mince meat, canned meats or fish, canned vegetables, or any article of food, unless the presence of such antiseptic is plainly indicated on the label.

BAKING POWDER.

Baking powders are known as cream of tartar, phosphate, alum-phosphate, alum baking powders, etc., depending upon the acid substance used to liberate the carbonic acid in the soda bicarbonate contained in every baking powder. As some of these acid materials are considered more or less injurious to health, and as some are much cheaper than others, it is necessary, in order to comply with the law, to designate the kind of baking powder on the label, as cream of tartar baking powder, phosphate baking powder, phosphate-alum baking powder or alum baking powder.

BUTTER.

Butter should contain at least 80 per cent. of pure milk fats. Butter made by the use of "black pepsin" or other substance, in order to incorporate large quantities of water and casein is adulterated.

Where other fats or oils are substituted, in part or whole, for milk fats in butter, such article can not be sold as "Butter," or "Creamery," or "Dairy Butter," or any combination of words embracing the word "Butter," but must be classed as "Oleomargarine" or "Butterine" and so plainly labelled.

BUTTERINE OR OLEOMARGARINE.

Butterine or oleomargarine, or kindred compounds can only be manufactured and sold in this State when put up in "such package and manner as will advise the customer of its real character, free from coloration or ingredient that causes it to look like butter."

CHEESE.

Cheese not made wholly from milk or cream, salt, and harmless coloring matter, is considered adulterated, and must be sold as "Filled Cheese" or the name and amount of the adulterant must be made part of the label. Cheese made from milk from which part of the cream or fat has been taken, must be so labelled as to indicate the amount of cream or fat taken from the milk of which it was made. Cheese containing less than 10 per cent. of fat must be labelled "Skim milk cheese."

COFFEE.

Any article offered as coffee which contains any substitute for the coffee bean in any proportion is considered adulterated, and can not be offered for sale unless the quantity and kind of such substitute is given as part of the label.

CANDY.

The use of harmful coloring matters or other ingredients, and the admixture of terra alba, kaolin, or other mineral substances to give weight and volume to the mass, are adulterations. Where glucose is substituted in part or whole for cane sugar its presence must be indicated on the label.

CIDER.

Cider is the unfermented juice of the apple. Any substitute for apple juice, or any antiseptic added constitutes an adulteration and such adulterated cider can not be offered for sale, unless the name of the adulterant is made a part of the label.

FLOUR.

Flour is commercially known as the fine and bolted meal of the wheat grain, and for the purpose of this law is so defined. When mixed with the product of any grain except wheat it is adulterated and can not be offered for sale unless the kind and amount of the admixture is made part of the label.

Buckwheat flour or rye flour must be derived wholly from the grains designated in the name, and any admixture of other flours or materials constitutes an adulteration, and can not be offered for sale unless the kind and amount of such admixture is made part of the label.

FRUIT JELLIES, FRUIT BUTTERS, PRESERVES, CANNED FRUITS, FRUIT CONSERVES, CONFECTIONS, FRUIT JUICES AND SYRUPS, ETC.

Fruit jellies, fruit butters, preserves, canned fruits, fruit conserves, confections, fruit juices and syrups, etc., must consist of the fruit specified in the label, preserved only with cane sugar (sucrose), and must not contain artificial flavors, coloring matters or antiseptics. If such articles contain any substitute for the fruit, or any inferior material to make up bulk or weight, any glucose or other substitute for sugar, any artificial flavor or color, any starch or animal gelatine, any salicylic acid or other antiseptic, or any substance not naturally occurring in such fruits, except spices or other wholesome, natural flavoring materials, they are adulterated, and can not be offered for sale unless the presence of all such substances is clearly indicated by the label.

HONEY.

Honey is the nectar of flowers, and other saccharine exudations of plants, gathered by bees. Honey made by feeding bees glucose, sugar, invert sugar, or other saccharine substance, is not pure honey. Adding sugar, invert sugar or glucose to honey constitutes an adulteration, and such adulterated honeys can not be sold, unless the quantity and name of the adulterant is made part of the label.

LARD.

Lard is the fat of swine, the fat being melted and separated from the flesh. Adding beef fat or stearine, cotton seed oil, or other substitute for swine fat constitutes an adulteration, and such adulterated lard can not be sold unless the quantity and name of the adulterant is made part of the label.

MILK.

Milk should contain at least 12 per cent. of total solids and 3 per cent. of fat. Milk containing less than these proportions will be considered adulterated, unless labelled or offered as "skim milk," or milk below standard. The addition of antiseptics or preservatives is an adulteration.

MOLASSES AND SYRUPS.

All molasses and syrups are assumed to be made from the juice of cane, or other sugar producing plant, or the sap of the maple tree, and any syrup or molasses containing starch-sugar, glucose, or corn syrup is considered adulterated unless the label indicates the presence of the same.

OLIVE OIL.

Olive oil is the expressed oil of the olive. The substitution of other oils or fats for olive oil, either in part or whole constitutes an adulteration, and such adulterated oil can not be offered for sale unless amount and kind of the adulterant is shown clearly on the label.

SPICES, MUSTARD, PEPPER, ETC.

Spices, mustard, pepper, etc., must not contain any foreign substances or coloring matter introduced to dilute or cheapen the article, and any such admixture constitutes an adulteration and can not be sold unless its kind and amount are indicated on the label.

TEA.

Tea consists of the dried leaves of the true tea plant, without addition of artificial coloring matter, or filler, or extraction of any essential properties, and any article offered as tea which does not conform to this definition is considered adulterated and can not be offered for sale, unless its true composition is given as part of the label.

VINEGAR.

Standard vinegar is a vinegar made from the juice of the apple. containing not less than 1½ per cent. of apple solids and 4 per cent. acetic acid. All vinegars labelled "apple," "cider," or "orchard" vinegars are assumed under the law to be standard vinegars. Vinegars not made of the juice of the apple must be labelled truly of what

they are made, as "malt vinegar," "distilled vinegar," or "wine vinegar." Otherwise, they are to be considered adulterated. If artificial coloring matter is used, this must be stated on each and every label. Vinegars to which other acids than acetic acid have been added are adulterated.

Vinegars containing less than 4 per cent. absolute acetic acid may be sold, provided the percentage of acetic acid is made part of the label.

M. A. SCOVELL,
Director Kentucky Agricultural Experiment Station,
June 21, 1898. Lexington, Ky.

Number and Kind of Samples Collected and Analyzed, and Where Obtained.

The work of collecting and analyzing samples was not begun until about two months later, in order to let all interested have time to comply with the provisions of the law. During the remainder of 1898 the Station collected and analyzed 239 samples, finding 123 samples to be adulterated under the provisions of the law, and in 116 samples no adulterations were found.

During the year 1899, 488 samples were collected and analyzed, 167 being found adulterated, and in 321 no adulterations were found.

Classing these samples, the Station has collected and analyzed from the time the law went into effect to December 31st, 1899, samples as follows:

Kind and Number of Samples Collected from June 13, 1898 to December 31, 1899.

ARTICLE SAMPLED.	Not Found Adulterated.	Adulterated	Total.
Baking powder	11	45	56
Butter	118	29	147
Canned goods	6	..	6
Catsups, pickles, etc.	12	45	57
Coffee	2	1	3
Corn starch	1	..	1
Flour (wheat)	20	..	20
Jellies, preserves, etc.	5	18	23
Lard	29	11	40
Milk (sweet and buttermilk)	115	35	150
Milk color	1	..	1
Mincemeat	..	7	7
Oleomargarine	2	16	18
Olive oil	1	1	2
Pepper, spices, etc.	3	11	14
Sweet cider and grape juice	..	3	3
Soda (cooking soda)	3	..	3
Syrups, honey and sugar	41	9	50
Vinegar	67	59	126
Total	437	290	727

Dr. A. M. Peter and myself have had general oversight of the chemical analysis of these samples, assisted by W. H. Scherffius, W. A. Beatty and J. V. Reed. Dr. J. H. Kastle analyzed the baking powders and most of the lards and some of the catsups. Dr. Chase Palmer, of Louisville, analyzed most of the samples collected in

Louisville. Prof. H. Garman has had charge of the microscopical work. Mr. W. H. Scherffius collected most of the samples. Mr. T. G. Dunlap collected most of the samples in Louisville.

These samples were collected from the different places in the State as is shown in the following table:

Number of Samples Obtained at Different Places in the State from June 13, 1898 to December 31, 1899.

WHERE OBTAINED.	Not Found Adulterated.	Adulterated.	Total.
Bowling Green	2	3	5
Covington	27	7	34
Danville	7	4	11
Frankfort	11	7	18
Fulton	2	3	5
Georgetown	14	7	21
Guthrie	1	2	3
Harrodsburg	1	..	1
Hopkinsville	4	5	9
Lexington	124	54	178
Louisville	171	140	311
Lynnville	..	2	2
Mayfield	9	5	14
Murray	6	3	9
Newport	9	3	12
Nicholasville	3	2	5
Paducah	8	11	19
Paris	10	5	15
Princeton	1	4	5
Richmond	5	6	11
Russellville	..	4	4
Somerset	4	5	9
South Carrollton	1	..	1
Trenton	..	1	1
Versailles	7	4	11
Winchester	10	3	13
Total	437	290	727

The Station has reported 97 adulterated samples of food to Hon. Frank Parsons, Prosecuting Attorney at Louisville, asking him to bring the same before the grand jury; 37 to Hon. John R. Allen, Prosecuting Attorney at Lexington; 7 to Hon. D. A. Glenn, Prosecuting Attorney at Covington; and 3 to Hon. J. P. Newman, Prosecuting Attorney at Newport.

As no provision is made in the law to pay the traveling expenses of witnesses, both before the grand juries and the courts, and as such fees were not allowed by the State, and, as the provisions of the law now are, it would be necessary for both the inspector, or the party who bought the samples, and the chemist who analyzed the samples to appear as witnesses, both before the grand jury and the trial court, and, as is often the case, the trial might be post-

poned from time to time, it has been deemed impossible to report to the grand juries some cases that would otherwise have been reported. Especially has this been true of samples taken at a distance from Lexington. In some instances the work of sampling and analyzing has been but recently done. These cases are now being reported to the prosecuting attorneys.

Following will be found the analyses of all samples of food collected, grouped in tables under appropriate headings:

ALUM AND ALUM-PHOSPHAT

Station No.	Name Taken from Label	Where Obtained	Date of Collection	From Whom Obtained
4626	Cameo	Bowling Green	Sept. 7, 1898	Robinson & Jones
4639	Mascot	"	"	Jones & Co.
6182	Good Luck	Frankfort	Nov. 28, 1899	Mrs. Jas O'Donnell
6183	Capital City	"	"	M. L. Ellwanger
6184	Sauer's Old Dominion	"	"	Howard & Noonan
6185	Silver Star	"	"	T. Britewell
4628	Delicatesse	Fulton	Aug. 30, 1898	Henry Collins
6177	I. C. (one cent)	Georgetown	Nov. 27, 1899	Wolf & Co.
6179	Calumet	"	"	John S. Gaines & Co.
6181	Old Time	"	"	John S. Gaines & Co.
4630	Eddy	Guthrie	Sept. 25, 1898	Mimms & Martin
4634	Hawkins' Bouquet	Hopkinsville	Sept. 3, 1898	J. R. Hawkins
4635	Jack Frost	"	"	A. M. Wallis
4636	Crystal Pearl	"	"	Diuguid & Wells
4788	Delicatesse	Lexington	Oct. 19, 1898	W. B. Chasteen
4789	Delicatesse	"	Oct. 21, 1898	W. M. Gully
5018	Good Luck	"	Dec. 7, 1898	J. T. Honaker
5680	American Beauty	"	July 20, 1899	Jones & Terry
4640	Cotton Belt	Louisville	Sept. 7, 1898	H. K. Greeley
4641	Cameo	"	"	"
4642	Crescent	"	"	"
4643	Gold Medal	"	"	"
4644	Our Flag	"	Sept. —, 1898	N. Wile & Co.
4645	Bon Bon	"	"	"
4646	American	"	"	"
4647	Ballard's Obelisk	"	"	L. Hugelmeyer
4648	Grom Bros.' Own Make.	"	"	Grom Bros.
4649	Model	"	"	E. H. Jenne
4662	Queen Flake	"	"	"
4669	American	"	"	"
4670	Veteran	"	"	"
4627	Blue Label	Lynnville	Aug. 29, 1898	M. L. Wilson
4562	Big Pound. Big Dime...	Mayfield	Aug. 24, 1898	C. Wallis
4563	Carter Bros.' Lily	"	"	Carter Bros.
4567	Perfect	Paducah	Aug. 22, 1898	J. E. Potter
4568	Forbes' Ten-Cent	"	Aug. 23, 1898	Mrs. J. Seamon
4570	Kenton	"	Aug. 22, 1898	J. E. Potter
6186	Bon Bon	Paris	Nov. 29, 1899	Lavin & Connell
6187	Aunt Jemima's	"	"	"
6188	Pure Food	"	"	J. F. Prather
4637	Rose	Princeton	Sept. 2, 1898	A. Cash & Bros.
4638	Comet	"	"	"
6191	Quick Cream	Richmond	Dec. 9, 1899	E. Deatherage & Co.
6189	Eddy's Reliable	Winchester	Dec. 2, 1899	J. M. Lockmane
6190	Crescent	"	"	"

BAKING POWDERS.

Manufacturer as taken from label or stated by retailer.	Alum or Sulphate of Alumina	Phosphate	Cream of Tartar	Carbonic Acid Gas: Available	Carbonic Acid Gas: Total	Starch Per Cent	Remarks.
Cameo B. Powder Co., Chicago...	Found	Found	None	8.3	10.4	35.9	Phosphoric acid, 5.9 per cent.
	Found	Found	None	6.	9.2	39.2	Phosphoric acid, 5.7 per cent.
Sou. Mfg. Co., Richmond, Va.....	Found	None	None	....	....	....	
M. L. Ellwanger, Frankfort, Ky..	Found	None	None	....	....	....	
E. F. Saurer Co., Richmond, Va..	Found	Found	None	....	....	....	
Canby, Ach & Canby	Found	Found	None	....	....	....	
Cr. Tartar B. Pow. Co., N. Y.....	Found	None	None	8.	10.5	34.1	Label indicates cr. tartar powder.
Jaques Mfg. Co., Chicago	Found	Found	None	....	....	....	
Calumet B. Powder Co., Chicago.	Found	Found	None	....	....	....	
Stewart Henly Co., Cincinnati...	Found	None	None	....	....	....	
Eddy & Eddy, St. Louis	Found	Found	None	7.4	9.	27.2	Phosphoric acid, 5.5 per cent.
J. R. Hawkins, Hopkinsville, Ky.	Found	None	None	8.7	9.6	41.2	
Bain & Chapman Mfg. Co., St. L.	Found	Found	None	7.5	10.7	20.5	Phosphoric Acid, 8.6 per cent.
Evansville Chem. Wks.	Found	Found	None	6.6	10.8	34.4	Phosphoric acid, 6.1 per cent.
Cr. Tartar B. Powder Co., N. Y..	Found	None	None	9.2	11.8	27.6	See 4628.
Cr. Tartar B. Powder Co., N. Y..	Found	None	None	10.	12.3	28.1	See 4628.
Southern Mfg. Co., Richmond, Va.	Found	None	None	14.8	16.2	29.7	
Gt. Southern Mfg. Co., Louisville	Found	None	None	....	....	....	Stamped on label "This powder contains C. T. S. Bic. Soda E.A.+St.
Diamond B. Pow. Co., St. Louis.	Found	Trace	None	10.1	11.	10.8	Terra alba, 27.7 per cent.
Cameo B. Powder Co., Chicago...	Found	Found	None	....	....	....	
A. Holmes, Jeffersonville, Ind. ...	Found	None	None	11.3	12.8	31.7	
H. K. Greeley, Louisville	Found	Found	None	9.6	11.8	30.	Phosphoric acid, 5.4 per cent.
M. Kahn & Co., Louisville	Found	None	None	8.5	8.9	29.3	Ammonia found.
J. C. Grant Chem. Co., Chicago..	Found	None	None	8.7	9.2	43.7	
E. Ottenheimer & Son, Louisville.	Found	None	None	9.1	10.1	33.3	Ammonia found.
Ballard & Ballard Co., Louisville	Found	None	None	10.4	10.8	40.6	Ammonia found.
Grom Bros., Louisville	Found	None	None	10.4	10.7	39.8	
E. Ottenheimer & Son, Louisville.	Found	None	None	9.7	10.7	35.8	Ammonia found.
Northrop, Robertson & Carrier, Lansing, Mich.	Found	Found	None	5.8	8.8	41.1	Phosphoric acid, 4.4 per cent.
E. Ottenheimer & Son, Louisville.	Found	None	None	....	....	....	Ammonia found.
E. Ottenheimer & Son, Louisville.	Found	Found	None	7.9	10.3	32.2	Phosphoric acid, 6.4 per cent.
Paducah Vinegar Works	Found	None	None	7.8	8.2	48.4	
Pure Food Co., St. Louis	Found	None	None	6.2	8.7	20.6	
Carter Bros., Mayfield, Ky.	Found	None	None	8.4	9.6	45.6	
Perfect Baking Powder Co.	Found	Found	None	8.2	9.8	30.1	Phosphoric acid, 6.71 per cent.
Forbes Bros. & Co., St. Louis....	Found	Found	None	3.6	6.2	29.7	Phosphoric acid, 7.6 per cent.
Potter Parlin Co., N. Y.	Found	Found	None	2.6	4.6	32.4	Phosphoric acid, 6.1 per cent.
Grant Chem Co., Chicago	Found	None	None	....	....	....	
Howell Mfg. Co., Cincinnati	Found	Found	None	....	....	....	
Fred Parker, Chicago	Found	Found	None	....	....	....	
Bain & Chapman Mfg. Co., St. L.	Found	None	None	9.6	9.8	39.2	
D. G. Evans & Co., St. Louis ...	Found	None	None	9.2	9.5	39.7	Ammonia found.
T. S. Mfg. Co., Chattanooga	Found	Found	None	....	....	....	
Eddy & Eddy, St. Louis	Found	Found	None	....	....	....	
Royal Ponciana Co. Louisville....	Found	Found	None	....	....	....	

CREAM OF TARTA

Station No.	Name Taken from Label	Where Obtained	Date of Collection	From Whom Obtained
	Royal	Lexington		C. J. Burdell
4629	Powdered Buttermilk	Bowling Green	Sept. 7, 1898	Wolf & Co.
6176	Cleveland's Superior	Georgetown	Nov. 27, 1899	Wolf & Co.
6178	Royal	"	"	John S. Gaines & Co.
6180	Dr. Price's Cream			Mammoth Grocery Co.
4663	Orana	Louisville	Sept. —, 1898	McCulloch & Jenne
4664	Powdered Buttermilk	"	"	E. H. Jenne
4668	E. H. Jenne's			H. H. Lowery
4931	American Beauty Cr. Tr.	Nicholasville	Nov. 12, 1898	J. E. Potter
4632	Dr. Price's Cream	Paducah	Aug. 22, 1898	J. E. Potter
4633	Royal	"	"	
4665	Monarch Pure Cr. Tartar	Somerset	Sept. 24, 1898	Ogden & Son

*A good cream tartar baking powder and should be so labeled. The amount of proteine found shows th
there could not be more than 3½% dried buttermilk present and even so it would be an inert powder, witho
any action on the bread.

ADULTERATE

Station No.	Where Obtained	Date of Collection	From Whom Obtained	Make or Brand marked on packag or stated by retailer
4859	Covington	Oct. 29, 1898	G. Murphy	An Ohio Creamery
4863	"	"	W. J. Drew	Dairy
5228	"	Feb. 25, 1899	F. W. Bellmer	Country
4781	Lexington	Oct. 17, 1898	S. K. Cozine	Sweet Table
4784	"	Oct. 19, 1898	S. K. Cozine	Creamery
4785	"	"	W. W. Gill	"
4786	"	"	W. W. Williamson	"
4787	"	"	J. C. Cravens	"
4790	"	Oct. 21, 1898	W. M. Gulley	"
4870	"	Nov. 3, 1898	A. E. Shields	"
4884	"	Nov. 5, 1898	Bluegrass Grocery Co.	"
5007	"	Dec 14, 1898	Shouse & Looney	"
5206	"	Feb. 4, 1899	Bluegrass Grocery Co.	Country
6095	"	Dec. 6, 1899	J. C. Cravens	Creamery
4701	Louisville	Sept. 9, 1898	Grom Bros.	"
4703	"	"	D. M. Clark	Country
4812	"	Oct. 22, 1898	D. M. Clark	"
4814	"	"	Maraman Bros.	"
4815	"	"	Bessie Bowen	"
4817	"	"	R. G. Wells	Creamery
4819	"	"	Bishop's Creamery	Cooking
4826	"	"	J. Schrodt	Country
4827	"	"	William T. Gaupin	"
4828	"	"	William T. Gaupin	"
4829	"	"	Hall Bros.	Creamery
5532	"	Jan. 27, 1899	H. Niemeier	Pure
5535	"	"	Watkins' Grocery	Country
5537	"	"	Wolf & Sons	"
5539	"	Jan. 28, 1899	T. J. Wathen	Creamery

BAKING POWDERS.

Manufacturer as taken from label or stated by retailer.	Alum or Sulphate of Alumina	Phosphate	Cream of Tartar	Carbonic Acid Gas		Starch Per Cent	Remarks.
				Available	Total		
Royal Baking Powder Co., N. Y.	None	None	Found	11.2	12.1	18.4	Analyzed for comparison.
Powd. B. M. B. P. Co.. Louisville..	None	None	Found	8.3	9.5	15.9	Proteine, 0.9%:* misbranded.
Cleveland Baking Pow. Co., N. Y.	None	None	Found	....	....	....	Properly labeled.
Royal Baking Pow. Co., N. Y.....	None	None	Found	....	....	....	Should be labeled Cr. Tr. B. Pow.
Price Baking Pow. Co., Chicago..	None	None	Found	....	....	....	Should be labeled Cr. Tr. B. Pow.
Mammoth Gro. Co., Louisville ...	None	None	Found	11.1	12.7	10.2	Properly labeled
Powd. B. M. B. P. Co., Louisville..	None	None	Found	....	....	....	*Misbranded.
E. H. Jenne	None	None	Found	11.2	12.6	8.5	Sold in bulk.
E. W. Gilett, London, Chicago....	None	None	Found	8.5	8.6	36.9	Properly labeled.
Price Baking Pow. Co., Chicago..	None	None	Found	10.9	11.5	17.5	Should be labeled Cr. Tr. B. Pow.
Royal Baking Pow. Co., N. Y.....	None	None	Found	8.5	10.9	14.5	Should be labeled Cr. Tr. B. Pow.
Reid Murdoch & Co., Chicago....	None	None	Found	9.2	9.2	15.4	Properly labeled.

BUTTER.

Retail Price per pound	Reichert Number	Valenta Test (Degrees C)	Color	Remarks
$0 18	3.3	90	Annatto	Oleomargarine. Not so marked.
18	3.3	89	Coal-tar dye...	" Stamped on slip of paper.
22	3.1	91	Annatto	" Not so marked.
15	1.5	.....	Azo-dye	" Stamped on sack.
15	3.2	.....	"	" " "
15	.....	92	"	" " "
20	.....	92	"	" " "
20	.....	91	"	" " "
20	.....	92	Coal-tar dye...	" " "
20	.....	89	Azo-dye	" " "
20	.....	91	Annatto	" " "
20	2.7	89	Azo-dye	" Not so marked.
20	4.2	90	"	" " "
20	.....	91	"	" " "
25	9.0	.....	"	About two-thirds oleomargarine.
15	4.5	.....	Trace	Oleomargarine. Not so marked.
20	4.2	87	Coal-tar dye ..	" Stamped on tray.
25	3.3	92	"	" " "
20	3.0	91	Azo-dye	" Not so marked.
20	2.5	94	"	" " "
15	4.0	94	Coal-tar dye ..	" " "
15	3.7	89	Azo-dye	" " "
20	.....	90	Coal-tar dye...	" Stamped on tray.
15	.....	89	Azo-dye	" " "
20	.....	93	"	" " " [No. 215.6.
.....	23.4	68	Coal-tar dye ..	Hehner No. 90.8; Iodine No. 38.3; Koettstorfer.
.....	23.6	76		Hehner No. 93.0.
.....	23.5	47		Hehner No. 91.0.
.....	19.3	72	Azo-dye	Hehner No. 91.7.

BUTTER NOT FOUND TO

Station No.	Where Obtained	Date of Collection	From Whom Obtained	Make or Brand as marked on package or stated by retailer
4857	Covington	Oct. 29, 1898	Geo. C. Goode	Creamery .....
4858	"	"	Geo. C. Goode	Country .....
4860	"	"	R. Hamilton Grocery Co...	"
4861	"	"	J. W. McCool	"
4862	"	"	R. Hartley	"
4864	"	"	Steffen Bros.	"
4865	"	"	Steffen Bros.	Creamery .....
4866	"	"	Chas. Hand	Country .....
4867	"	"	R. Hamilton Grocery Co...	"
4868	"	"	Geo. W. Hill & Co.	"
4869	"	"	Geo. W. Hill & Co.	Creamery .....
5227	"	Feb. 24, 1899	Jno. Dalheim	Country .....
5229	"	Feb. 25, 1899	Chas. Hand	"
5230	"	"	J. H. Voss & Bro.	Elgin Creamery .....
5231	"	Feb. 24, 1899	Bullock & Johnson	Country .....
5232	"	Feb. 25, 1899	Geo. W. Hill & Co.	"
5233	"	"	Hocks & Williams	"
5234	"	Feb. 24, 1899	J. Taylor	"
6109	Danville	Dec. 11, 1899	R. Foley	"
6110	"	"	Durham & Cecil	"
6111	"	"	W. B. Holms	"
6072	Frankfort	Nov. 28, 1899	Mrs. Jas. O'Donnell	Country .....
6073	"	"	M. Ellwanger	"
6074	"	"	Howard & Noonan	"
6075	"	"	N. F. Richardson	"
6076	"	"	Duvall & Rogers	"
6027	"	"	Z. J. Montgomery	Creamery .....
6065	Georgetown .	Nov. 27, 1899	Wolf & Co.	Country .....
6066	"	"	Jno. S. Gaines & Co.	"
6067	"	"	Jas. W. Thacker	"
6068	"	"	K. Stone	"
6069	"	"	Bluegrass Grocery Co. ...	"
6070	"	"	J. J. Thomason	"
6071	"	"	J. J. Caden	"
5504	Harrodsburg .	May 11, 1899	Mrs. E. H. Gaither	"
4574	Lexington ...	Aug. 31, 1898	John Hutchison	Little Buttercup, Elgin Creamery
4811	"	Oct. 22, 1898	Bayless Fruit Co.	Dairy .....
4871	"	Nov. 3, 1898	Shouse & Looney	Country .....
4883	"	Nov. 3, 1898	Mr. Featherston	"
5008	"	Dec. 15, 1898	J. T. Honaker	"
5009	"	"	W. H. May	"
5010	"	"	J. Laughlin	"
5011	"	"	E. Buchignani	"
5012	"	"	H. M. Sousley	"
5040	"	"	Mrs. Duvall	"
5055	"	Dec. 29, 1898	Wm. Shields	"
5056	"	"	Wm. Shields	"
5237	"	.....	.....	"
4546	"	.....	Ky. Agr. Expt. Station ..	Made at the Station .....
....	"	.....	Ky. Agr. Expt. Station ..	" "
....	"	.....	Ky. Agr. Expt. Station ..	" "
5176	"	Feb. 3, 1899	H. M. Griffing	Creamery .....
5202	"	Feb. 4, 1899	W. S. Griffee	Country .....
5203	"	"	Mrs. M. C. Lavery	"
5204	"	"	M. Smith	"
5205	"	"	T. N. Arthur	"
5475	"	April 21, 1899 ...	Geo. Harris	
6087	"	Dec. 4, 1899	John Hutchison	Creamery .....
6093	"	Dec. 6, 1899	Warren Bros.	Country .....
6094	"	"	G. H. Harris	"
4698	Louisville	Sept. 7, 1898	H. K. Greeley	Creamery (Armour) .....
4699	"	Sept. —, 1898 ...	Ragland's Mod. Creamery..	Creamery (Own-make) .....
4700	"	Sept. —, 1898 ...	Straus' Preston st. Market	Creamery, Elgin .....
4702	"	Sept. 8, 1898	A. Button & Son	Fox River Creamery .....
4704	"	Sept. 9, 1898	Swift Bros.	Country .....
4705	"	"	Small Gro., Jefferson & 1st	"
4813	"	Oct. 22, 1898	Carmichael & Moore	Creamery .....
4816	"	"	W. P. Grigsby	"
4818	"	"	Bishop's Creamery	"
4820	"	"	D. H. Ewing & Sons	"
4821	"	"	D. H. Ewing & Sons	"

TO BE ADULTERATED.

Retail Price per pound	Riechert Number	Valenta Test (Degrees C)	Color	Remarks
$0 27	28.4	42	Azo-dye	
20	.....	40	Natural	
22	.....	38	Annatto	
20	.....	35	Coal-tar dye ..	
22	.....	40	"	
25	27.4	50	"	
27	.....	39	"	
20	26.1	47	Natural	
16	.....	35	"	
20	.....	36	"	
25	.....	38	Coal-tar dye ..	
20	.....	42	Natural	
20	.....	40	"	
25	.....	38	Azo-dye	
20	.....	38	Natural	
25	27.1	43	Azo-dye	
25	.....	37	Natural	
25	.....	35	"	
20	.....	36	Annatto	
20	.....	47	Natural	
20	.....	44	"	
20	.....	48	Natural	
20	.....	42	"	
.....	.....	37	"	
20	.....	46	"	
15	.....	48	"	
.....	.....	35	Azo-dye	
20	.....	40	Annatto	
20	26.6	36	"	
20	.....	35	Natural	
15	.....	34	"	
12½	24.2	52	None	
15	.....	40	Annatto	
20	.....	42	"	
.....	.....	40	.....	
.....	28.3	.....	Azo-dye	
.....	29.5	37	Coal-tar dye ..	
25	.....	37	Annatto	
.....	31.3	30	Azo-dye	
20	.....	37	Natural	
25	.....	33	"	
25	.....	39	"	
25	.....	43	"	
23	.....	37	"	
.....	.....	41	"	
.....	.....	43	"	
.....	.....	32	"	
.....	.....	40	"	
25	29.7	.....	"	Genuine Jersey butter, for comparison.
25	.....	38	"	" " " " "
25	30.4	37	"	" " " " "
25	.....	41	Annatto	
25	.....	37	"	
15	27.5	44	Natural	
15	.....	41	"	
20	.....	41	"	
.....	.....	39	"	
.....	.....	39	Annatto	
25	.....	39	Coal-tar dye ..	
25	.....	41	Annatto	
20	26.3	.....	Azo-dye	
25	27.6	.....	"	
25	26.5	.....	"	
25	28.5	.....	"	
17½	28.7	.....	Natural	
.....	28.6	.....	"	
30	28.0	40	Coal-tar dye ..	
25	28.0	40	"	
25	30.0	39	"	
25	29.1	45	Azo-dye	
25	26.4	49	"	

BUTTER NOT FOUND TO

Station No.	Where Obtained	Date of Collection	From Whom Obtained	Make or Brand as marked on package or stated by retailer	Retail per
4822	Louisville ...	Oct. 22, 1898	W. A. Hardin	Country	
4823	"	"	W. A. Hardin	"	
4824	"	"	H. K. Greeley	"	
4825	"	"	S. Lucas		
5521	"	Jan. 25, 1899	Atlantic & Pacific Tea Co.	Elgin Creamery	
5522	"	"	E. W. James	"	
5523	"	"	McCulloch & Jenne	Creamery	
5524	"	Jan. 25, 1899	C W. Jefferson	Creamery	
5525	"	Jan. 26, 1899	A. Bohlsen	Fox River Creamery	
5526	"	"	C. W. Watkins & Co.	Creamery	
5527	"	"	T. J. Tierney	Elgin Creamery	
5528	"	"	A. J. Ross & Son	" "	
5529	"	"	C. W. Jefferson	" "	
5530	"	Jan. 27, 1899	Moses & Nicholls	Creamery	
5531	"	"	Hikes & Hess	"	
5533	"	"	McCulloch & Butler	"	
5534	"	"	The Model Grocery	Country	
5536	"	"	N. Wile & Co.	"	
5538	"	"	Jas. Shaw	Diamond Creamery	
5540	"	Jan. 28, 1899	D. H. Ewing & Son	Creamery, Own Make	
5541	"	Feb. 3, 1899	Theo. J. Fike	Creamery	
5542	"	"	Ross & McCall	Elgin Creamery	
5543	"	"	T. J. Tierney & Co.	" "	
5544	"	"	Phil. Steinacker	Creamery, A. C. Bowen & Co.	
5545	"	"	Ben. Saltenbrock	Spring Brook Creamery	
4850	Newport	Oct. 29, 1898	Otto Delpenbrock	Creamery	
4851	"	"	Geo. Hesinger	Country	
4852	"	"	Otto Delpenbrock	"	
4853	"	"	Walter Bennett	"	
4854	"	"	R. S. Pyle	"	
4855	"	"	R. S. Pyle	Creamery	
4856	"	"	B. H. Kroger	"	
4930	Nicholasville .	Nov. 12, 1898	Bluegrass Grocery Co.	Country	
4547	Paducah	Aug. 23, 1898	J. L. Brown	Elgin Creamery	
4548	"	"	J. T. Bishop	Swanwick Creamery	
6078	Paris	Nov. 29, 1899	Lavin & Connell	Country	
6079	"	"	A. C. Cook	"	
6080	"	"	L. Solashin & Co.	"	
6081	"	"	V. K. Shipp	Creamery	
6082	"	"	Geo. N. Paris	Country	
6096	Versailles	Dec. 7, 1899	J. E. Neet	"	
6097	"	"	Bluegrass Grocery Co. ...	"	
6098	"	"	J. M. Wasson	"	
6083	Winchester ..	Dec. 2, 1899	J. M. Lackmane	"	
6084	"	"	Mrs. C. T. Haggard	"	
6085	"	"	New Enterprise Gro. Co...	"	
6086	"	"	B. T. Busch	"	
6105	Richmond	Dec. 9, 1899	E. Deatherage	"	
6106	"	"	Higgins & Ellis	"	
6107	"	"	Bluegrass Grocery Co.	"	
6108	"	"	Hurst Bros.	"	

T FOUND TO BE ADULTERATED.

arked on pac retailer	Retail Price per pound	Riechert Number	Valenta Test (Degrees C)	Color	Remarks
.....	25	28.0	40	Coal-tar dye ..	
	20	28.8	42	Annatto	
	25	25.2	46	Natural	
	15	24.5	45	"	Very questionable.
	21	27.9	38	Azo-dye	Iodine No. 30.6.
.....	.....	29.5	54	"	Iodine No. 33.8.
.....	.....	29.4	65	"	Iodine No. 33.5.
.....	$0 25	26.7	32	Coal-tar dye ..	
y	.....	27.5	32	"	
.....	.....	25.6	41	.....	
.....	.....	27.8	37	Azo-dye	
	.....	26.2	34	Coal-tar dye ..	
	17½	27.6	39	Azo-dye	
.....	.....	29.3	28	"	Iodine No. 31.3.
	.....	25.7	34	Coal-tar dye ..	
	.....	29.7	32	Azo-dye	
	.....	29.0	38	.....	
	.....	25.9	27	.....	
	.....	25.5	34	Azo-dye	
ke	30	27.3	33	Coal-tar dye ..	
	.....	28.2	40	Azo-dye	Iodine No. 31.5; Koettstorfer No. 226.
	.....	27.4	34	"	
	15	25.7	29	"	
wen & Co.	.....	27.3	39	"	Koettstorfer No. 220.5.
nery	.....	27.8	33	"	Koettstorfer No. 220.4.
	22	29.6	32	Coal-tar dye ..	
	20	.....	38	Natural	
	17	31.8	32	"	
	20	29.0	34	"	
	12½	.....	39	Annatto	
	20	27.0	43	Natural	
	.....	29.4	41	Azo-dye	
	12½	27.2	45	Annatto	
	.....	26.1	.....	"	
y	.....	28.1	.....	Azo-dye	
	20	.....	45	Natural	
	20	26.8	21	"	
	20	.....	39	"	
	35	.....	44	Azo-dye	
	20	.....	44	Natural	
	20	.....	37	"	
	20	.....	36	"	
	20	.....	44	"	
	20	.....	46	"	
	20	.....	42	"	
	20	.....	49	"	
	15	.....	52	"	
	20	.....	46	"	
	20	.....	43	"	
	20	.....	49	"	
	15	.....	41	"	

CANNED GOODS.

Six samples of canned goods were examined for antiseptics, including formaldehyde, salicylic acid, benzoic acid and boric acid, none being found in any of the samples. The samples examined are described as follows:

5631—"Victory Fancy Grated Pineapple," packed by the John Boyle Co., Baltimore, Md. Bought of Bluegrass Grocery Co., Lexington, Ky., June 29, 1899.

5632—"Winter's Luxury Corn," H. F. Webb Co. Portland, Me. Bought same as 5631.

5633—"National Brand, Standard Quality, Lemon Cling Peaches," Lincoln Fruit Packing Co., Lincoln, Cal. Bought same as 5631.

5634—"Royal Brand Sugar Corn," Rumford Canning Co., Rumford, Me. Bought same as 5631.

5635—"Concentrated Clear Consomme," Armour Packing Co. Bought same as 5631.

5640—"Hitz Brand, White Pie Peaches," Madison Packing Co., Madison, Ind. Bought of Bacher Bros., Lexington, Ky., June 30, 1899.

FLOUR.

Twenty samples of wheat flour were examined by means of the microscope for adulteration with corn starch or "flourine," and for alum by the logwood test. No sample was found to be adulterated, though in two or three there was a very small amount of corn starch probably accidental. The samples examined are described as follows:

5021—Sample of the flour in daily use in the Kentucky Penitentiary, sent by the Warden, Mr. E. T. Lillard, Frankfort, Dec. 19, 1898. Moisture, 7.61 per cent.; ash, 0.63 per cent.; protein, 11.44 per cent.

5167—Same, sent Jan. 18, 1899. Moisture, 8.12 per cent. ash, 0.78 per cent.; protein, 11.56 per cent.

4585—Silver Star, Guthrie Mill Co., Guthrie, Ky. Bought of T. T. Russell, Guthrie, Ky., Sept. 5, 1898.

4595—"Acme," Acme Mills Co., Hopkinsville. Bought of A. M. Wallis, Hopkinsville, Sept. 3d, 1898.

4596—"Orient," Crescent Milling Co., Hopkinsville. Bought same as 4595.

4623—"Eagle," Acme Mills Co., Hopkinsville, Ky. Sent by Wm. Grau, Hopkinsville, Ky., Aug. 8, 1898.

5548—Sample obtained from Luther McMillan, Lexington, May 25, 1899, out of a lot bought by him in Crittenden, Ky. Moisture, 12.38 per cent.; protein, 9.72 per cent.; ash, 0.75 per cent.; silica, .006 per cent.; alumina, .001 per cent.

4597—"Obelisk," Ballard & Ballard Co. Louisville, Ky. Bought of Jacob Gast, Louisville, Ky., Sept. 6, 1898.

4598—Same. Bought of H. K. Greeley, Louisville, Sept. 7, 1898.

4599—"Golden Rule," Meloy & Robinson, Scottsburg, Ind. Bought same as 4598.

4600—"Gold Dust," R. O. Gathright & Co., Louisville, Ky. Bought same as 4598.

4601—"Acme," Eberts Bros., Jeffersonville, Ind. Bought same as 4598.

4602—"White Dove," same make. Bought same as 4598. A small amount of corn starch was noted in this sample, probably not more than one-half of one per cent.

4603—"Gold Medal," Washburn & Crosby, Minneapolis, Minn. Bought same as 4598.

4604—"Standard Roller Mill O. K.," E. B. McCormick, Charlestown, Ind. Bought same as 4598.

4605—"Old Gold," Evans & Henthorn, Otisco, Ind. Bought same as 4598.

4606—"Sea Foam," E. B. McCormick, Charlestown, Ind. Bought same as 4598.

4593—"Triumph, Extra Fancy," Wilford Stinston & Co., Mayfield, Ky. Bought of J. B. Wrather & Son, Mayfield, Aug. 24, 1898.

4594—"Jersey Cream," Wilford Stinston & Co., Mayfield, Ky. Bought of T. B. McNeely, Mayfield, Aug. 24, 1898.

4624—Sample sent by Walcott Bros., South Carrollton, Ky., Aug 14, 1898.

JELLIES, PRESERVES,

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
5084	Currant Jelly	Louisville	Sept. —, 1898	Mammoth Grocery Co.
5869	Raspberry Jelly	"	July 3, 1899	M. Kaltenbach
5870	Blackberry Jam	"	"	"
5871	Currant Jelly	"	"	H. Wilken & Son
5872	Currant Jelly	"	"	Moses & Nicholls
5873	Cherry Preserves	"	"	"
5874	Currant Jam	"	"	Mammoth Grocery Co.
5876	Plum Jam	"	July 4, 1899	A. Button & Son
5877	Raspberry Preserves	"	"	"
5878	Currant Jelly	"	"	"
5879	Currant Preserves	"	July 5, 1899	M. Wolf & Sons
5880	Raspberry Jam	"	"	McCulloch & Jenne
5881	Cherry Jam	"	"	"
5883	Raspberry Preserves	"	July 6, 1899	E. A. King
5641	Quince Jelly	Lexington	June 30, 1899	Bacher Bros.
5642	Raspberry Jelly	"	"	"
5643	Raspberry Jelly	"	"	W. F. Burke
4569	Currant Jelly	"	.....	Vogt & Foley
5082	Orange Marmelade	Louisville	Sept. 5, 1898	.....
5085	Grape Jelly	"	Sept. 7, 1898	.....
5086	Grape Jelly	"	"	.....
5087	Blackberry Jelly	"	Sept. 2, 1898	.....
5660	Quince Jam	"	.....	.....
5657	Peach Pres., Diamond	"	.....	.....
5658	Raspberry Pres., Highl'd	"	.....	.....
5659	Fig Preserves, Cloverdale	"	.....	.....
	Flavored Apple Jelly	Lexington	.....	.....

JELLIES, PRESERVES, ETC.

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
5673	Strawberry Jelly	Lexington	July 11, 1899	J. B. Rogers & Co.
5083	Currant Jelly	Louisville	Sept. —, 1898	.....
5088	Shredded Pineapple	"	"	McCulloch & Jenne
5875	Blackberry Jelly	"	July 3, 1899	Mammoth Grocery Co.
5882	Currant Jelly	"	July 5, 1899	W. H. Norwood
	Strawberry Preserves	Lexington	.....	.....
	Wild Plum Jelly	"	.....	.....
	Strawberry Preserves	"	.....	.....
	Raspberry Jam	"	.....	.....

MINCE MEA

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
6129	Condensed Mince Meat	Danville	Dec. 11, 1899	Durham & Cecil
6123	Mince Meat	Georgetown	Nov. 27, 1899	Wolf & Co.
6124	Mince Meat	"	"	J. S. Gaines & Co.
6131	Condensed Mince Meat	"	"	Gus. Margolen
6125	Condensed Mince Meat	Paris	Nov. 29, 1899	A. C. Cook
6126	Fig Mince	Versailles	Dec. 7, 1899	Blue Grass Grocery Co.
6127	Mince Meat	"	"	O'Neill & Bro.

ETC., ADULTERATED.

Manufacturer or Wholesaler	Polarization Direct	Polarization Inv'rt	Sugar Per Cent	Antiseptics	Remarks
Cruikshanks Bros.	32.8	—23.	43.1	Benzoic acid..	
Louisville Preserving Co.	132.	127.8	.....	" "	Contains glucose.
Empire Preserving Co.	93.2	84.5	.....	" "	" "
H. J. Heinz & Co.	75.	72.6	.....	" "	" "
J. D. Stilz Preserving Co.	—2.4	—19.4	13.	" "	Contains some starch.
J. D. Stilz Preserving Co.	26.6	—16.9	33.2	Salicylic acid.	Reducing sugar, 38.8.
Curtice Bros.	35.8	20.9	11.3	" "	Reducing sugar, 48.5.
Hoosier Packing Co.	128.8	128.	.....	" "	Contains glucose.
Sprague, Warner & Co.	11.2	—10.1	16.3	" "	Reducing sugar, 30.2.
Sprague, Warner & Co.	101.	99.4	.....	Benzoic acid .	Contains glucose.
Sprague, Warner & Co.	102.4	97.	.....	" "	" "
Melrose Packing Co.	73.2	67.4	.....	Salicylic acid .	" "
Melrose Packing Co.	78.2	73.3	.....	" "	" "
Williams Bros. & Charbonneau .	78.2	77.4	.....	Benzoic acid .	" "
J. Weller Co.	116.4	116.8	None.	None	" "
J. Weller Co.	104.	104.4	None.	None	" "
Louisville Preserving Co.	126.6	126.4	None.	Salicylic acid .	" "
Geo. K. McMechen & Son	—12.8	—19.4	5.1	" "	No glucose or starch.
Geo. K. McMechen & Son	84.4	77.5	5.3	None	Contains glucose.
E. Ottenheimer & Son	128.	125.6	1.9	None	" "
M. Kahn	133.6	131.	2.	None	" "
J. D. Stilz Preserving Co.	—11.1	—20.5	7.3	Salicylic acid.	Starch present.
J. D. Stilz Preserving Co.	96.6	92.4	2.7	None	Contains Glucose; labeled adult.
Sprague, Warner & Co.	51.7	37.5	10.9	Trace Borate..	Contains glucose.
Williams Bros. & Charbonneau .	80.5	79.6	.7	None	Contains glucose; starch found.
Sprague, Warner & Co.	110.4	110.	None.	Borate	" " " "
E. G. Dailey & Co.	113.6	111.6	1.5	None	" " " "

NOT FOUND ADULTERATED.

Manufacturer or Wholesaler	Polarization Direct	Polarization Inv'rt	Sugar Per Cent	Antiseptics	Remarks
Austin, Nicholls & Co.	9.6	—21.6	22.4	None	Traces of starch.
J. D. Stilz Preserving Co.	.5	—19.8	15.7	"	
Githens, Rexamer & Co.	—2.6	— 6.5	3.0	"	
Geo. K. McMechen & Son	41.8	— 3.5	34.6	"	Reducing sugar, 34.4. Glucose.
Shaker Preserving Co.	3.6	—19.1	17.3	"	Reducing sugar, 41.7.
Home-Made	—14.8	—20.	3.9	None	
"	— 8.6	—21.6	9.8	"	Home-made, genuine preserves for comparison.
"	8.	—14.8	17.4	"	
"	1.8	—15.2	12.3	"	

ADULTERATED.

Manufacturer or Wholesaler	Polarization Direct	Polarization Invert	Sugar Per Cent	Antiseptics	Remarks
Sprague, Warner & Co.	33.	— 9.7	32.3	Borate	
The J. Weller Co.	25.6	24.6	.....	Salicylic acid .	Contains glucose.
The J. Weller Co.	55.2	54.1	.....	" "	" "
Murrell, Soule Co.	—12.8	—25.5	9.6	Borate	
Emery Provision Co.	13.	—15.4	21.5	"	
Sherman Fig Co.	—14.8	—17.6	2.1	"	
American Grocery Co.	15.2	14.5	.....	Salicylic acid .	Contains glucose.

TOMATO CATSUPS, PICKLES, ETC.,

Station Number	Name Taken from Label	Where Obtained	Date of Collection	From Whom Obtained
6169	Tip Top Tomato Ketchup	Danville	Dec. 11, 1899	W. B. Holmes
5080	Choice Family Pickles	Guthrie	Sept. 5, 1898	Mimms & Martin
4654	Maple Leaf Tomato Catsup	Lexington	Sept. 26, 1898	W. W. Williamson
4655	Snider's Home Made Tomato Catsup	"	"	J. T. Honaker
4989	Maple Leaf Tomato Catsup	"	Nov. 29, 1898	W. W. Williamson
4990	" " " "	"	Nov. 30, 1898	J. C. Woolfolk
5273	" " " "	"	Jan. 3, 1899	Blue Grass Gro. Co.
5349	" " " "	"	Mar. 24, 1899	
5637	Hyman's Tomato Catsup	"	June 29, 1899	G. H. Harris
5645	Tomato Catsup	"	June 17, 1899	W. B. Chasteen
5662	Royal Tomato Ketchup	"	July 11, 1899	Vogt & Foley
5664	Maple Leaf Tomato Catsup	"	"	J. W. Parish
5665	Sunny Side Ketchup	"	"	H. M. Sousley
5668	Heinz Tomato Ketchup	"	"	W. S. Griffee
5669	Tomato Catsup	"	"	W. H. Watts
5671	" "	"	"	J. B. Rogers & Co.
5907	" "	"	Oct. 3, 1899	J. B. Rogers & Co.
5672	Flaccus' Chilmato	"	"	J. B. Rogers & Co.
5674	Queen City Tomato Catsup	"	"	Chas. O'Lee
5683	Tomato Catsup	"	Oct. 20, 1899	J. E. Duncan
5908	High Grade Tomato Catsup	"	Oct. 3, 1899	J. B. Rogers & Co.
4650	Tomato Catsup	Louisville	Sept. —, 1898	E. W. James
4651	Triumph Tomato Catsup	"	Sept. 9, 1898	J. B. Wurach
4652	Our Best Tomato Catsup	"	Sept. —, 1898	N. Wile & Co.
4653	Tomato Catsup	"	"	N. Wile & Co.
6046	Snider's Home Made Tomato Catsup	"	July 3, 1899	H. Wilken & Son
6048	Columbia Catsup	"	"	Mammoth Gro. Co.
6049	Ontario Tomato Catsup	"	July 4, 1899	A. Button & Son
6050	Champion Catsup	"	"	A. Button & Son
6051	Tomato Catsup	"	July 5, 1899	M. Wolf & Sons
6052	" "	"	"	McCulloch & Jenne
6053	Acme Home Made Tomato Catsup	"	"	W. H. Norwood
6054	Van Camp's Pure Catsup	"	"	W. H. Norwood
6055	Blue Label Ketchup	"	July 6, 1899	Ross & McCall
6056	High Grade Tomato Catsup	"	"	Frank Otte
6057	Tomato Catsup	"	Aug. 14, 1899	A. Button & Son
6059	Snider's Home Made Tomato Catsup	"	"	H. Wilken & Son
6060	Tomato Catsup	"	"	W. O'Connell
6062	Green Label Sauce and Ketchup	"	Aug. 17, 1899	Atl. & Pac. Tea Co.
6063	High Grade Tomato Catsup	"	"	Frank Otte
6064	Crescent Tomato Ketchup	"	"	Frank Otte
4557	Ohio Valley Ketchup	Mayfield	Aug. 27, 1898	Carter Bros.
6163	United States Catsup	Richmond	Dec. 9, 1899	E. Deatherage
6164	Queen City Tomato Catsup	"	"	T. B. Collins
6165	Cruikshank Tomato Ketchup	"	"	R. A. Baxter
6166	New England Catsup	"	"	Hirsch Bros.
6167	The Colter Catsup	"	"	Hirsch Bros.
5348	Mrs. Jones' Home Made Catsup	Lexington	Mar. 23, 1899	
5350	Chili Sauce	"	Mar. 29, 1899	

ETC., FOUND ADULTERATED.

Manufacturer or Wholesaler as taken from label or stated by retailer	Antiseptic Found	Remarks
Tip Top Ketchup Co., Cincinnati	Benzoic Acid	
Hyman Pickle Co., Louisville	Salicylic Acid	No copper found.
Maple Leaf Packing Co., Brookville, Ind.	" "	
T. A. Snider Preserve Co., Cincinnati	Benzoic Acid	
Maple Leaf Packing Co., Brookville, Ind.	" "	
" " " " "	" "	
" " " " "	" "	
" " " " "	" "	Artificial color.
Hyman Pickle Co., Louisville	" "	
Great Southern Mfg. Co., Louisville	Salicylic Acid	Contains eosin.
The Horton Cato. Mfg. Co., Detroit	" "	
Maple Leaf Packing Co., Brookville, Ind.	Benzoic Acid	Contains eosin.
Tip Top Ketchup Co., Cincinnati	" "	
H. J. Heinz & Co., Pittsburgh	" "	
Lutz & Schramm Co., Allegheny, Pa.	" "	Contains eosin.
Flaccus Bros., Wheeling, W. Va.	" "	
" " " "	" "	Duplicate of 5671.
The E. C. Flaccus Co., Wheeling, W. Va.	" "	
The J. Weller Co., Cincinnati	Salicylic Acid	
H. J. Heinz & Co., Pittsburgh	Benzoic Acid	
Ohio Valley Preserving Co., Wheeling	" "	
Crescent Preserving Co., Camden, N. J.	" "	
Meyer-Bain Mfg. Co., St. Louis	Salicylic Acid	
M. Kahn & Co., Louisville	" "	
E. Ottenheimer & Son, Louisville	" "	
T. A. Snider Preserve Co., Cincinnati	Benzoic Acid	
The Mullen Blackledge Co.	Salicylic Acid	
Standard Preserving Co., New Jersey	Benzoic Acid	Artificially colored.
Champion Syrup Refining Co.	Salicylic Acid	
Pickling and Preserving Co., Indianapolis.	" "	
R. J. Ritter Preserve Co., Philadelphia	" "	
The J. Weller Co., Cincinnati	" "	
Van Camp Packing Co., Indianapolis	" "	
Curtice Bros., Rochester, New York	" "	
M. Kahn & Co., Louisville	" "	
Ontario Preserving Co., Middleport, N. Y.	Benzoic Acid	Artificially colored.
T. A. Snider Preserve Co., Cincinnati	" "	
Great Southern Mfg. Co., Louisville	Salicylic Acid	
Little Silver Sauce Co., Little Silver, N. J.	Benzoic Acid	
M. Kahn & Co., Louisville	Salicylic Acid	
Crescent Preserving Co., Camden, N. J.	Benzoic Acid	
Covington Bros., Paducah, Ky.	Salicylic Acid	
Standard Pkg. Co., Indianapolis	" "	
The J. Weller Co., Cincinnati	Benzoic Acid	
Cruikshank Bros. & Co., Allegheny, Pa.	Salicylic Acid	
Eddy & Eddy, St. Louis	Benzoic Acid	
A. W. Colter Canning Co., Mt. Wash., O.	" "	Artificially colored.
Williams Bros. & Charbonneau, Detroit	" "	Artificially colored.
Jos. Campbell Preserve Co., Camden, N. J.		

LARD AND OLIVE OIL, A

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
4910	Supreme Brand Pure Leaf Lard	Bowling Green	Sept. 7, 1898	P. J. Morphew
4900	Kettle-Rendered Lard	Fulton	Aug. 30, 1898	Reed & Sellers
4907	Pure Country-Kettle Rend. Leaf Lard.	Hopkinsville	Sept. 3, 1898	Vanhoover & Myers
4908	Silver Leaf Lard	"	Sept. 4, 1898	C. E. Olliver
4914	Leaf Lard	Louisville	Sept. 7, 1898	H. K. Greeley
4899	Pure Leaf Lard	Paducah	Aug. 23, 1898	J. L. Brown
4904	Snowflake Pure Kettle Rendered Lard.	Princeton	Sept. 2, 1898	T. J. Johnson
4905	White Frost Pure Kettle Leaf Lard...	"	"	T. J. Johnson
4909	P. D. X. Leaf Lard	Russellville	Sept. 6, 1898	Gaines Cooksey
5039	Olive Oil	"	"	Harris & Bros.
4921	Pure Leaf Lard	Somerset	Sept. 24, 1898	Sears & Owens
4920	White Label Pure Leaf Lard	Trenton	Sept. 9, 1898	S. P. Smith & Co.
5305	Pure Butchers' Lard (Compound)	Lexington	March 16, 1899	
5312	Rex Kettle Rendered Leaf Lard	"	March 17, 1899	
4918	Compound Lard	Louisville	Sept. 8, 1898	A. Button & Son

CATSUP, PICKLES, ETC. NOT F

Station No.	Name Taken from Label.	Where Obtained	Date of Collection	From Whom Obtained
6168	Van Camp Tomato Catsup	Danville	Dec. 11, 1899	Durham & Cecil.
4656	Tomato Catsup	Lexington	Sept. 27, 1898	J. T. Honaker
4657	Climax Tomato Catsup	"	"	" "
5636	Snider's Homemade Tomato Catsup	"	June 29, 1899	G. H. Harris
5663	Grated Horse Radish	"	July 11, 1899	Vogt & Foley
5670	W. Virginia Tomato Catsup	"	"	S. K. Cozine
5675	Star Home-made Catsup	"	July 12, 1899	P. J. Furlong
6045	Heinz Tomato Ketchup	Louisville	July 3, 1899	M. Kaltenbach
6047	Shrewsbury Tomato Ketchup	"	"	Mammoth Gro. C
6058	Heinz Tomato Ketchup	"	Aug. 14, 1899	M. Kaltenbach
6061	Shrewsbury Tomato Ketchup	"	Aug. 15, 1899	Mammoth Gro. Co.
5081	Tri-State Brand Pickles	Mayfield	Aug. 27, 1898	Carter Bros.

OIL, ADULTERATED.

Manufacturer or Wholesaler as taken from label or stated by retailer	Iodine Number	Bechi Test	Nitric Acid Test	Sulphuric Acid Test	Remarks
Nelson Morris & Co.	42.7	Black			Contains Cotton Seed Oil.
J. K. Bondurant & Son	62.4	Great Reduction	Light Brown		" " "
Armour & Co.	58	Black	Dark Brown		" " "
Swift & Co.	51.2	"	"		" " "
Louis P. Bornwasser	67	Great Reduction	Brown	Dark Brown	" " "
Cudahy Packing Co.	55.9	Black	Dark Brown		" " "
Louisville Packing Co.	68.1	Brown			" " "
.....	59.5	Brownish Black	Dark Brown		" " "
Querbacker, Gilmore Co.	57.1	Black	"		" " "
E. Lubon, Nice (G. K. & Co.).	106.1	Brown			Cotton Seed Oil.
Cudahy Packing Co.	82	Much Reduction	Dark Brown	Dark Brown	Contains Cotton Seed Oil.
Armour & Co.	60.5	Black	"		" " "
Steel-Wedeles Co.	88.4	Dark Brown	"	Dark Brown	Analyzed for comparison.
Cudahy Packing Co.	58.8	Consid'ble Reduction	Pink	"	" " "
Louisville Packing Co.	81.8	Brown			Contains Cotton Seed Oil.

NOT FOUND ADULTERATED.

Manufacturer or Wholesaler as taken from label or stated by retailer	Antiseptics Found	Remarks
Van Camp Packing Co., Indianapolis	.....	No antiseptics found.
National Pure Food Co., Cincinnati	.....	" " "
Climax Packing Co., Cincinnati	.....	" " "
T. A. Snider Preserve Co.	.....	" " "
Wm. Spencer & Sons, Cincinnati	.....	
.....		
The J. Weller Co., Cincinnati	.....	" " "
H. J. Heinz & Co., Pittsburgh, Pa.	.....	" " "
E. C. Hazzard & Co., New York	.....	" " "
H. J. Heinz & Co., Pittsburgh, Pa.	.....	" " "
E. C. Hazzard & Co., New York	.....	" " "
Keokuk Canning Co., Keokuk, Iowa	.....	No copper found.

LARD AND OLIVE OIL

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
4901	C. & G. Lard	Fulton	Aug. 30, 1898	Reed & Sellers
		"	"	J. H. Cayce
4902	Robin Pure Kettle Rendered Lard	Hopkinsville	Sept. 3, 1898	Mrs. A. M. Wallace
4906	Shield Brand Lard	Lexington	Dec. 22, 1898	W. W. Williamson
5027	Pure Kettle Rendered Lard	"	"	John Hutchison
5028	Kettle Rendered Lard	"	"	J. T. Honaker
5029	Maple Leaf Choice Kettle Rend. Lard.	"	Dec. 21, 1898	W. B. Chasteen
5030	Superior Compound Lard	"	Dec. 22, 1898	N. Self
5031	Country Lard	"	"	J. D. See
5032	Shield Brand Pure Leaf Lard	"	"	T. Norris
5033	Country Lard	"	"	John O'Neill
5038	Maple Leaf Kettle Rend. Leaf Lard...	"	Oct. —, 1898	E. Buchignani
5041	Pure Lucca Oil	"	Dec. —, 1898	W. B. Chasteen
5099	Price's Lard	"	"	Market House
5100	Choice Kettle Rendered Leaf Lard	"	"	P. D. Foster
5101	Pure Kettle Rendered Lard	"	"	Lankart
5102	Pure Leaf Lard	"	"	S. K. Cozine
5103	Pure Kettle Rendered Lard	"	March 17, 1899...	John Hutchison
5311	Lard	"	"	Curry, Tunis & Nor[wood]
5313	Climax Leaf Lard	Louisville	Sept. 3, 1898	E. H. Jenne
4911	Lard	"	Sept. 6, 1898	Jacob Gast
4912	Lard	"	Sept. 7, 1898	Jeffersont'n Creamery
4913	Lard	"	"	Geo. Weppler
4915	Lard	"	Sept. 8, 1898	A. Button & Son
4916	Shield Brand Pure Leaf Lard	"	"	A. Button & Son
4917	Leaf Lard	"	"	A. Button & Son
4919	Best Lard			
4903	Pure Country Leaf Lard	Princeton	Sept. 2, 1898	Arch. Cash & Bro.
4922	Choice Leaf Lard	Somerset	Sept. 24, 1898	Ogden & Son
4923	Leaf Lard	"	"	G. C. Cundiff

NOT FOUND ADULTERATED.

Manufacturer or Wholesaler as taken from label or stated by retailer	Iodine Number	Bechi Test	Nitric Acid Test	Sulphuric Acid Test	Remarks
Cox & Gordon	62.1	Brown	Slight Coloration		Doubtful.
Meeks-West Grocery Co.	62.9	"	"		"
Armour & Co.	63.7	No Color			
John F. Price	55.6	"	Slight Color		
Vogel & Son	61.5	Dark Brown	Light Pink		Doubtful.
Jacob Vogel & Son	58.4	No Color			
Swift & Co.	84.9	Brown			
Miss B. Murphy	56.7	No Color			
Armour & Co.	61.9	"			
George Ott	60.2	"			
Jacob Vogel & Son	60	Black	Light Pink		Doubtful.
.....	82.1	Slight Coloration			
.....	52.4	No Color	Slightly Pink		
Ott & Martin	60	"	"		
P. D. Foster	55.4	"	"		
Geo. W. Lankart	57.8	"	"		
The Ruttle Schlickman Pkg Co.	58.9	"	"		
Jacob Vogel & Son	64.2	Slight Reduction	Pinkish Color	Slight Brown	Acetic acid test, 87 degrees.
Curry, Tunis & Norwood	59.3	No Color	"	No Color	Acetic acid test, 88 degrees.
C. F. Vissman & Co.	66.7	"			
Pfaffinger & Co.	67.5	Slight Reduction			
Braun & Fitts	57.8	Slight Brown			
Armour & Co.	68.6	Slight Reduction			
Armour & Co.	57.6	Slight Color			
Vissman & Co.	77	No Color			
Conrad Provision Co.	65.7	Slight Color			
Armour & Co.	60	"			
The Ruttle Schlickman Pkg Co.	60.4	No Color			
Torbitt & Castleman	56.5	Slight Reduction			

ADULTERATED

Station No.	Where Obtained	Date of Collection	Seller or Producer
5763	Lexington	July 5, 1899	J. T. Adams
5764	"	"	Henry Kriegel
5769	"	"	J. E. Lilly
5793	"	July 18, 1899	J. E. Lilly
5324	Louisville	March 20, 1899	A. Fienburg
5326	"	"	J. P. Gray
5430	"	April 1, 1899	Jno. C. Straut
5431	"	"	P. A. Ackerman
5434	"	"	W. Thielmeier
5451	"	"	B. Pater
5453	"	"	G. W. Cuseaden
5454	"	"	Carmichael & Moore
5459	"	April 11, 1899	A. Fienburg
5460	"	"	A. Fienburg
5477	"	April 20, 1899	Theo. Brumleve
5478	"	"	J. M. Schoenbaechler
5479	"	"	J. Strohmeier
5481	"	"	Redin & Crawford
5482	"	"	Andy Kaelin
5806	"	Aug. 14, 1899	A. J. Philips
5807	"	"	Centennial Creamery
5808	"	"	B. Reichmuth
5810	"	"	Schange Bros.
5812	"	Aug. 15, 1899	Fred. Meyer
5813	"	"	Fred. Meyer
5816	"	"	J. Stein
5817	"	"	Wm. Kunker
5818	"	"	Mrs. Mary Siegurst
5826	"	Aug. 18, 1899	S. Lucas
5828	"	"	Orr's Creamery
5829	"	"	H. Gus Emery
5832	"	Aug. 21, 1899	Tip Top Dairy
5845	"	Aug. 23, 1899	Frank & Keller
5846	"	"	D. Zehnder
5850	"	"	Kentucky Dairy

MILK.

Specific Gravity	Fat Per Cent.	Solids not Fat Per Cent	Total Solids Per Cent	Antiseptics	Milk Color	Remarks
1.031	2.65	8.28	10.93	None	None	Watered or partly skimmed.
1.034	4.30	9.38	13.68	Formaldehyde ...	"	Contains antiseptic.
1.034	4.20	9.36	13.56	"	"	" "
1.030	4.40	8.39	12.79	"	"	" "
.....	4.20	.....	.....	.....	Annatto..	Artificially colored.
.....	1.85	.....	.....	.....	"	Skimmed and colored.
1.0259	3.35	7.18	10.53	None	"	Watered and colored.
1.0323	3.50	8.71	12.21	None	"	Artificially colored.
1.0287	3.30	7.92	11.22	"	"	Colored and watered.
1.0323	7.60	.....	.....	Borate	None	Contains antiseptic.
1.0323	3.40	8.80	12.20	Formaldehyde ...	"	" "
1.0323	4.10	8.90	13.00	Borate	"	" "
.....	3.65	.....	.....	None	Annatto..	Artificially colored.
.....	3.02	.....	.....	"	"	" "
1.0313	4.20	8.68	12.88	"	"	" "
.....	3.40	.....	.....	Borate	None	Contains antiseptic.
1.0267	3.40	7.34	10.74	Formaldehyde ...	"	" " Watered.
1.0313	2.40	8.31	10.71	None	"	Partly skimmed.
1.0265	3.60	7.35	10.95	"	"	Watered.
1.0295	2.60	8.04	10.64	Formaldehyde ...	"	Contains antiseptic.
1.0320	3.20	8.78	11.98	Borate	"	" "
1.0300	2.70	8.18	10.88	None	"	Watered or skimmed.
1.0310	2.60	8.41	11.01	Borate	"	Contains antiseptic.
1.0260	5.40	7.72	13.12	"	"	" "
1.0285	4.20	8.11	12.31	"	"	" "
1.0315	3.60	8.70	12.33	"	"	" "
1.031	3.80	8.65	12.45	"	"	" "
1.030	4.20	8.48	12.68	"	"	" "
1.0315	3.80	8.77	12.57	"	"	" "
1.0295	2.10	7.94	10.04	Formaldehyde ...	"	" "
1.032	3.20	8.78	11.98	Borate	"	" "
1.028	3.10	7.76	10.88	None	"	Watered.
1.0315	3.70	8.75	12.45	Borate	"	Contains antiseptic.
1.0295	3.40	8.19	11.59	"	"	" "
1.032	3.80	8.90	12.70	Formaldehyde ...	"	" "

MILK NOT FOUND

Station No.	Where Obtained	Date of Collection	Seller or Producer
4727	Lexington	Oct. 6, 1898	Mrs. A. R. Bergen
4728	"	"	Mrs. M. Vandever
4729	"	"	Mrs. W. C. Lyne
4730	"	"	Mrs. W. C. Lyne
4731	"	"	Mrs. G. J. Downing
5759	"	July 5, 1899	J. M. Downing
5760	"	"	M. R. Perkins
5761	"	"	R. L. Sweeney
5762	"	"	G. W. Jett
5765	"	"	Lexington Bluegrass Creamery
5766	"	"	M. L. Sayre
5767	"	"	David Cahill
5768	"	"	Mrs. C. Porter
5770	"	"	O. N. Featherston
5771	"	"	C. A Mahin
5772	"	"	N. B. Haggard
5773	"	"	W. B. Taylor
5774	"	"	C. B. Lair
5775	"	"	B. R. McClure
5776	"	"	A. Schuler
5777	"	"	J. W. Clark
5778	"	"	D. A. Trapp
5779	"	July 18, 1899	Lear Bros.
5780	"	"	M. G. Featherston
5781	"	"	G. R. Ballard
5782	"	"	Mrs. D. A. Thompson
5783	"	"	J. H. Parker
5784	"	"	" "
5785	"	"	" "
5786	"	"	" "
5787	"	"	H. Kriegel
5788	"	"	Krahenbuehl Bros.
5789	"	"	Berry Bros.
5790	"	"	W. B. Hawkins
5791	"	"	H. E. McGovern
5792	"	"	J. B. Beautikofer
5794	"	Aug. 11, 1899	Frank Wheatly
5795	"	"	Mrs. D. C. Young
5796	"	"	W. B. Taylor
5797	"	"	H. S. Sheridan
5798	"	"	Odd Fellows' W. & O. Home Dairy.
5922	"	Oct. 9, 1899	Dr. W. O. Sweeney
5945	"	Oct. 13, 1899	Dr. W. O. Sweeney
5321	Louisville	Mar. 21, 1899	M. Gye
5322	"	"	Sherley Beadle
5323	"	"	E. W. Sewell
5325	"	"	A. Zehnder
5327	"	"	B. Fisher
5328	"	"	F. Bauer
5432	"	April 1, 1899	F. Schurch
5433	"	"	Less Hafft
5435	"	"	B. M. Leinert
5436	"	"	N. T. Ragland & Son
5437	"	"	H. E. Lewman
5438	"	"	" "
5439	"	"	" "
5440	"	"	" "
5441	"	"	" "

ADULTERATED.

Specific Gravity	Fat per cent	Solids Not Fat per cent	Total Solids per cent	Anti-septics	Milk Color	Remarks
.....	.....	.....	.....	None	None.....	Buttermilk.
.....	.....	.....	.....	"	"	"
.....	.....	.....	.....	"	"	"
.....	.....	.....	.....	"	"	"
.....	.....	.....	.....	"	"	"
1.035	4.15	9.60	13 75	"	"	
1.033	4.30	9.13	13.43	"	"	
1.033	4.10	9.09	13.19	"	"	
1.033	4.10	9.09	13.19	"	"	
1.033	3.85	9.03	12 88	"	"	
1.031	4.25	8.61	12.86	"	"	
1.033	3.70	9.00	12.70	"	"	
1.032	.....	.....	.....	"	"	
1.033	4.35	9.14	13.49	"	"	
1.033	4.60	9.19	13.79	"	"	
1.035	4.45	9.67	14.12	"	"	
1.036	3.60	9.74	13.34	"	"	
.....	3.50	.....	.....	"	"	
1.033	3.15	8.89	12.04	"	"	
1.033	3.30	8.92	12.22	"	"	
1.032	4.25	8.86	13.11	"	"	
1.033	4.05	9.07	13.12	"	"	
1.032	4.05	8.82	12.87	"	"	
.....	1.00	.....	.....	"	"	Buttermilk.
1.035	3.80	9.53	13.33	"	"	
1.033	4.10	9.09	13.19	"	"	
1.030	4.45	8.40	12.85	"	"	From A. M. Black.
1.031	3.80	8 52	12.32	"	"	From Walter Dingle.
1.033	3.60	8.98	12.58	"	"	From E. Downing.
1.031	4.30	8.62	12.92	"	"	From S. L. VanMeter.
.....	0.10	.....	.....	"	"	Buttermilk.
1.031	4 60	8.68	13.28	"	"	
.....	0.30	.....	.....	"	"	Buttermilk.
1.031	3.85	8.53	12.38	"	"	
1.036	3 60	9.74	13.34	"	"	
1.030	4.80	8.47	13.27	"	"	
1.031	3.70	8.50	12.30	"	"	
1.035	5.45	9.87	15.32	"	"	
1.030	3.65	8.24	11.89	"	"	
1.032	3.75	8.76	12.51	"	"	
1.035	3.95	9.56	13.51	"	"	
1.0312	5.35	8.89	14.24	"	"	
1.0352	2.60	9.30	11.90	"	"	
.....	3.60	.....	.....	"	"	
.....	4.25	.....	.....	"	"	
.....	4.75	.....	.....	"	"	
.....	4.55	.....	.....	"	"	
.....	3.80	.....	.....	"	"	
.....	4.00	.....	.....	"	"	
1.0323	4.35	8.90	13.25	"	"	
1.0323	3.10	8 63	11.73	"	"	
1.0296	3.40	8.19	11.59	"	"	
1.021	12 00	.....	.....	"	"	
1.0296	3.45	8.19	11.64	"	"	From W. B. Cox, Indiana.
1.0287	3.70	8.00	11.70	"	"	From Chas. Schwartz, Indiana.
1.0305	4.45	8.64	13.09	"	"	From W. M. Simmons, Indiana.
1.0287	5.10	8 28	13 38	"		From E. M. Lutz, Indiana.
1.0305	4.20	8.60	12.80	"	"	From Mrs. Morris, Indiana.

MILK NOT FOUND

Station No.	Where Obtained	Date of Collection	Seller or Producer
5442	Louisville	April 1, 1899	H. E. Lewman
43	"	"	" "
44	"	"	" "
45	"	"	O. F. Shaftlein
46	"	"	T. J. Wathen
47	"	"	A. C. Cole
48	"	"	Fred. Sanders
49	"	"	W. F. Sheets
5450	"	"	Wilson Clare
52	"	April 10, 1899	J. P. Gray
55	"	"	G. W. Cuscaden
56	"	"	" "
57	"	"	B. Pater
58	"	April 12, 1899	J. P. Gray
5461	"	April 20, 1899	B. Grieve
5480	"	May 19, 1899	J. Theis
5514	"	"	E. W. Sewell
15	"	"	J. Reinert
16	"	"	F. F. Gilmore
17	"	"	E. Smithers
18	"	Aug. 14, 1899	J. Strohemeier
5802	"	"	" "
3	"	"	A. Schoenbaechler
4	"	"	J. C. Straut
5	"	"	B. Pater
9	"	Aug. 15, 1899	Fred. Meyer
5811	"	"	F. Von Allen
5814	"	"	T. Schuler
15	"	"	David Otto
19	"	"	George Bouse
20	"	Aug. 18, 1899	C. Bisig
21	"	"	J. Bischler
22	"	"	Von Grunigen Bros.
23	"	"	S. Lucas
24	"	"	" "
25	"	"	The Elite
27	"	"	M. F. Blanton
5830	"	Aug. 21, 1899	Tip Top Dairy
31	"	"	" "
33	"	"	" "
34	"	"	" "
35	"	"	" "
36	"	"	" "
37	"	"	" "
38	"	Aug. 23, 1899	Kentucky Dairy
39	"	"	Tip Top Dairy
40	"	"	" "
41	"	"	Sollberger & Schmidt
42	"	"	Gauman & Bro.
43	"	"	L. Liebert
44	"	"	Kentucky Dairy
47	"	"	J. L. Simcoe
48	"	"	G. W. Cuscaden
49	"	"	Kentucky Dairy
5851	"	"	" "
52	"	"	C. Bodenbonder
53	"		

ADULTERATED.

Specific Gravity	Fat per cent	Solids Not Fat per cent	Total Solids per cent	Anti-septics	Milk Color	Remarks
1.0305	4.60	8.68	13.28	None	None.....	F. S. James, Indiana.
1.0296	4.90	8.49	13.39	"	"	J. W. Ashton, Indiana.
1.0287	4.20	8.10	12.30	"	"	Mrs. N. Zink, Indiana.
1.0278	4.60	7.93	12.53	"	"	N. G. Adair, Indiana.
1,0305	5.65	8.89	14.54	"	"	
1.0314	3.60	8.55	12.15	"	"	
1.0259	8.80	.....	.....	"	"	
1,0305	4.70	8.57	13.27	"	"	
1.0340	3.70	9.26	12.96	"	"	
1.0305	4.90	8.62	13.52	"	"	
.....	3.18	.....	.....	"	"	
.....	2.91	.....	.....	"	"	From W. H. Bell.
.....	2.70	.....	.....	"	"	From Scott Bell.
.....	2.96	.....	.....	"	"	
.....	3.22	.....	.....	"	"	
1.0303	4.60	8.51	13 11	"	"	
1.0287	3.85	7.96	11.81	"	"	
1.0318	4.50	8.87	13.37	"	"	
1,0329	2.80	8.80	11.60	"	"	
1.0344	3.60	9.34	12.94	"	"	
1.0329	3.35	8.90	12.25	"	"	
1.0330	3.00	8.99	11.99	"	"	
1.0330	3.20	9.03	12.23	"	"	
1.0335	3.00	9.12	12.12	"	"	
1.0335	3.10	9.14	12.24	"	"	
1.0290	3.90	8.17	12.07	"	"	
1.0280	4.20	7.98	12.18	"	"	
1.034	3.20	9.28	12.48	"	"	
1.0335	3.00	9.12	12.12	"	"	
1.033	3.00	8.99	11.99	"	"	
1.0298	4.20	8.43	12.63	"	"	
1.0295	3.00	8.11	11.11	"	"	
1.0283	3.40	7.95	11.35	"	"	
1.0325	4.50	9.17	13.67	"	"	
1.0300	4.40	8.52	12.92	"	"	From J. H. Sagaser.
1.0305	4.70	8.71	13.41	"	"	" S. E. Cooper.
1.0320	4.50	9.04	13.54	"	"	
1.0305	4.60	8.69	13.29	"	"	" Wm. Fields.
1.0280	4.20	7.98	12 18	"	"	" T. Z. Sherley.
1.0340	2.80	9.20	12.00	"	"	" E. A. Dunn.
1.0295	4.20	8.36	12.56	"	"	" Ellis Potter.
1.0250	4.20	7.22	11.42	"	"	" W. D. Clare.
1.0310	3.80	8.65	12.45	"	"	" W. H. Snider.
1.0305	4.00	8.57	12.57	"	"	" S. A. Prather.
1,0250	4.00	7.19	11.19	"	"	" Chas. Litzler.
1.0285	4.10	8.09	12.19	"	"	" N. R. Blankenbaker.
1.0300	3.00	8.24	11.24	"	"	" Lewman & Graves.
1.0305	4.00	8.57	12.57	"	"	" S. P. Lewman.
1.0310	4.00	8.69	12.69	"	"	
1.0290	3.50	8.09	11.59	"	"	
1.0240	8.80	.....	.....	"	"	
1.0315	3.60	8.73	12.33	"	"	
1.0320	3.80	8.90	12.70	"	"	
1.0300	4.00	8.44	12.44	"	"	From Scott Bell.
1.0310	3.70	8.60	12.33	"	"	" J. T. Cowherd.
1.0315	4.20	8.86	13.06	"	"	" G. F. Collins.
1.0305	3.00	8.37	11.37	"		

OLEOMARGARINE

Station No.	Where Obtained	Date of Collection	From Whom Obtained
6077	Frankfort	Nov. 28, 1899	Bee Hive Grocery Co.
4575	Lexington	Aug. 31, 1898	W. W. Gill & Son
4576	"	"	W. M. Gulley
4579	"	Sept. 3, 1898	J .B. Rogers & Co.
4780	"	Oct. 17, 1898	Blue Grass Grocery Co.
5175	"	Feb. 7, 1899	
5184	"	Feb. 11, 1899	
4687	Louisville	Sept. 9, 1898	Grom Bros.
4688	"	Sept. —, 1898	S. Lucas
4689	"	Sept. 8, 1898	A. Button & Son
4690	"	"	A. Button & Son
4691	"	Sept. —, 1898	J. S. Spinner
4692	"	"	Mammoth Grocery Co.
4693	"	Sept. 9, 1898	Swift Bros.
4694	"	Sept. 6, 1898	Jacob Gast
4695	"	Sept. 9, 1898	Swift Bros
4696	"	Sept. 3, 1898	E. H. Jenne
4697	"	Sept. —, 1898	Binder Bros.

OLEOMARGARINE NOT

Station No.	Where Obtained	Date of Collection	From Whom Obtained
4779	Lexington	Oct. 7, 1898	W. W. Gill & Son
5013	"	Dec. 15, 1898	" " "

SYRUP, HONEY AND

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
5063	Strained Honey	Covington	Oct. 29, 1898	Wm. J. Drew
4587	White Clover Honey	Fulton	Aug. 30, 1898	S. Lovelace
5862	Honey	Louisville	Feb. 4, 1899	Moses & Nicholls
5864	"	"	"	McCulloch & Jenne
5865	"	"	"	Mammoth Grocery Co.
4560	Virginia Sorghum	Mayfield	Aug. 24, 1898	T. A. Slaughter
4586	Royal Sugar Syrup	Murray	Aug. 27, 1898	McElrath & Sexton
5089	Country Sorghum	"	"	T. Shipley
4564	Sugar Syrup	Paducah	Aug. 22, 1898	J. E. Potter
5093	Honey	Louisville	Sept. 9, 1898	
5094	"	"	"	

ADULTERATED.

Make or Brand as marked on package or stated by retailer	Retail price per pound	Reichert Number	Valenta Test (Degs. C)	Color	Remarks
Braun & Fitts' Holstein.....	$0 20	.....	96	Azo-dye ...	Colored to look like butter.
Friedman's Oak Grove	.....	1.3	.....	" ...	" " "
Capital City Dairy Co.	.....	2.5	.....	Annatto ...	" " "
Braun & Fitts' Holstein.....	20	.....	.....	Azo-dye ...	" " "
Capital City Dairy Co.'s Elgin	20	1.3	.....	Annatto ...	" " "
Braun & Fitts' Holstein	.....	3.2	91	Azo-dye ...	Duplicates for comparison.
" " "	.....	3 4	91	" ...	" " "
Wm. Moxley, Chicago	.....	2.5	.....	" ...	Colored to look like butter.
Wm. Moxley, Fancy D.	.....	.....	.....	" ...	" " "
Swift & Co.	12½	.....	.....	" ...	" " "
Braun & Fitts' Elgin	.....	.....	.....	" ...	" " "
" " "	.....	.....	.....	Coal-tar dye	" " "
Factory No. 4, 1st Dist., Ill...	.....	.....	.....	Azo-dye ...	" " "
Capital City Dairy Co.	20	.....	.....	Annatto ...	" " "
" " "	20	.....	.....	" ...	" " "
Kingman & Co.	15	.....	.....	Azo-dye ...	" " "
Kingman & Co., Bluebell	15	.....	.....	Coal-tar dye	" " "
.....	20	.....	.....	Azo-dye ..	" " "

FOUND ADULTERATED.

Make or Brand as marked on package or stated by retailer	Retail price per pound	Reichert Number	Valenta Test (Degs. C)	Color	Remarks
Friedmann Mfg. Co.	.....	.....	86	None	No cotton seed oil found.
" "	.....	.....	84	"	Trace cotton seed oil found

SUGAR, ADULTERATED.

Manufacturer or Wholesaler	Polarization		Sugar Per Cent	Remarks
	Direct	Invert		
Kenwood Mfg. Co.	69.	55.	10.5	Contains glucose.
Dodson & Brown	81.4	77.	3.3	" "
Geo. McMechen & Co.	22.	20.	.....	" "
Dodson & Brown Mfg. Co.	78.6	77.	.....	" "
Geo. McMechen & Co.	20.	18.	.....	
Noble, Overby & Co.	144.	139.5	3.50	Glucose syrup. Contains salicylic [acid.
Covington Bros.	157.4	157.4	None	Glucose syrup.
Weaks Bros.	129.6	126.5	2.4	" "
M. Livingston & Co.	145.2	137.8	5.5	Contains glucose.
W. Va. Preserving Co.	149.	146.5	1.9	" "
" "	79.2	77.5	2.1	" "

SYRUP, HONEY AND SUG NOT FO

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained	Manufa
5062	Maple Syrup	Covington	Oct. 29, 1898	J. B. Purk	L. G. Yoe
5064	Strained Honey	"	"	R. Hamilton Grocery Co.	
5238	Maple Syrup	"	Feb. 24, 1899	John Evans	Hudson P
6152	" "	Danville	Dec. 11, 1899	Durham & Cecil	Ontario P
6155	White Clover Honey	"	"	" "	"
6144	Maple Syrup	Frankfort	Nov. 28, 1899	Howard Noonan	Scudder S
6142	" "	Georgetown	Nov. 27, 1899	J. J. Thomason	Theo. Sar
6143	H. S. Syrup	"	"	" "	H. S. Co.
4988	Maple Syrup	Lexington	Nov. 29, 1898	W. W. Williamson	L. G. Yoe
5067	Maple Sugar	"	Dec. 17, 1898	J. D. McGuire	Manierre
5246	Comb Honey	"	Jan. 3, 1899	A. E. Shields	
5293	Maple Syrup	"	Feb. 4, 1899	H. M. Sousley	Sprague,
5294	" "	"	"	Simmons & Co.	Williams
5295	" "	"	"	J. T. Honaker	Wm. R.
5296	" "	"	"	J. E. Butler	Welch Br
5297	" "	"	"	W. F. Burke	E. G. Dai
5298	Strained Honey	"	"	Vogt & Foley	
5299	Maple Syrup	"	Jan. 7, 1899	John Hutchison	Wm. R. M
5300	Strained Honey	"	Feb. 4, 1899	Geo. Harris	Mr. Down
5333	Maple Syrup	"	March 24, 1899	Curry, Tunis & Norwood	
5654	" "	"	"	Shouse & Looney	J. C. Can
5655	" "	"	April 29, 1899	J. W. Nelson	J. W. Nel
5682	Honey	"	July 20, 1899	Fred. W. Sauer	Country H
5860	Maple Syrup	Louisville	Feb. 4, 1899	Moses & Nicholls	Scudder,
5861	" "	"	"	E. W. James	J. D. Stil
5863	Comb Honey	"	"	E. W. James	
5866	" "	"	"	C. W. Jefferson	Reid & M
4556	Maple Syrup	Mayfield	Aug. 24, 1898	Carter Bros.	Columbia
4559	Rose Drip	"	"	T. A. Slaughter	R. G. Te
5092	Royal Sugar Drips	"	"	C. Wallis	Covington
5091	Table Syrup	Murray	Aug. 26, 1898	Slaughter & Son	John H. H
5065	Strained Honey	Newport	Oct. 29, 1898	A. Dames	Chas. F.
5066	" "	"	"	J. H. Voss & Co.	"
5090	Maple Syrup	Nicholasville	Nov. 12, 1898	H. H. Lowry	L. G. Yo
6145	" "	Paris	Nov. 29, 1899	A. C. Cook	H. E. La
6146	" "	"	"	L. Solashin & Co.	Schnull &
6153	Honey	"	"	Lavin & Connell	Chas. F.
6156	"	Richmond	Dec. 9, 1899	Arnold Bros.	Country
6150	Maple Syrup	Versailles	Dec. 7, 1899	Berryman Bros.	Francis H
6147	" "	Winchester	Dec. 2, 1899	Lee Evans & Bro.	Sprague,
6161	Granulated Sugar	"	"	Blue Grass Grocery Co.	H. E. La
6102	Confectioners' Glucose	Lexington	.....	.....	.....
6103	41 Degree Glucose	Louisville	.....	.....	.....

NOT FOUND ADULTERATED.

Manufacturer or Wholesaler	Polarization		Sugar Per Cent	Remarks
	Direct	Invert		
L. G. Yoe & Co.	54.	—22.	57.9	
	—21.	—21.6	.....	
Hudson Packing Co.	66.6	—23.	66.8	
Ontario Preserving Co.	56.4	—21.7	59.1	
" " "	—60.8	—21.1	3.2	
Scudder Syrup Co.	64.6	—21.4	65.4	Contains much invert sugar.
Theo. Sarlls Maple Syrup Co.	8.6	—19.2	21.1	" " " "
H. S. Co., Cleveland, Ohio	35.2	—18.	40.4	
L. G. Yoe & Co.	58.2	—21.6	59.8	Water, 6.4. Ash, .26.
Manierre Yoe Syrup Co.	91.5	—30.4	91.	
	—14.8	—17.5	2.	
Sprague, Warner & Co.	52.5	—20.5	54.9	
Williams Bros. & Charbonneau	60.6	—20.6	61.	
Wm. R. Manierre	60.1	—21.6	61.2	
Welch Bros. Maple Co.	59.6	—21.3	60.6	
E. G. Dailey Co.	59.9	—21.2	60.8	
	— 7.8	—14.1	4.7	
Wm. R. Manierre	60.2	—21.5	61.2	
Mr. Downing	—10.1	—17.2	5.3	Ash, .51.
	56.5	—19.3	54.8	" .87.
J. C. Cantrill	57.4	—19.1	57.8	" .98.
J. W. Nelson	51.8	—19.5	54.6	
Country Honey	—10.2	—14.2	3.	Reducing sugar, 2.7.
Scudder, Conn & Brown	64.4	—21.	64.9	" " 43.6.
J. D. Stilz Preserving Co.	11.	—19.4	23.1	" " 66.6.
	— 3.4	— 5.5	.....	" " 72.9.
Reid & Murdock	—10.3	—18.	.....	
Columbia Preserving Co.	63.8	—18.6	61.5	
R. G. Terrell	160.	159.3	.....	Glucose syrup colored with cochineal.
Covington Bros.	153.8	145.6	6.3	
John H. Bradshaw	149.6	146.1	2.7	Glucose syrup.
Chas. F. Muth & Co.	—15.8	—18.2	1.8	
" " "	— 9.8	—17.8	6.	
L. G. Yoe & Co.	57.6	—19.4	59.2	Ash, .25.
H. E. Langdon & Co.	62.	—19.7	62.1	
Schnull & Co.	62.	—20.6	62.8	
Chas. F. Muth & Son	—14.5	—16.9	1.8	
Country Honey	—17.	—18.6	1.2	
Francis H. Leggett & Co.	60.8	—20.8	61.8	
Sprague, Warner & Co.	62.2	—20.1	62.6	
H. E. Langdon & Co.	99.8	.....	99.8	
	180.6	179.	.....	Used in candy, preserves, etc.
	165.8	165.	.....	Analyzed for comparison.

PEPPER, SPICES, COFFEE, ETC.

Seventeen samples of these articles were examined by means of the microscope, twelve of them being found adulterated by admixture with foreign material.

Adulterated.

4675—Ground Cayenne, Newton & Frank, Cincinnati, O. Bought of E. W. James, Louisville, September, 1898; contains corn starch.

4677—Ground Mace, same, bought same; contains starch.

4678—Ground Cloves, same, bought same; contains starch.

4679—Ground Allspice, same, bought same; contains foreign starch.

4680—Ground White Pepper, same, bought same; contains foreign starch.

4681—Ground Black Pepper, same, bought same; contains Demerara pepper and much foreign starch.

4682—Ground Mustard, same, bought same; contains starch.

4683—Ground Cinnamon, same, bought same; contains starch.

4561—"Pure Ground Pepper," Nash Smith Tea & Coffee Co., St. Louis, Mo. Bought of C. A. Payne, Mayfield, Aug. 24, 1898; contains foreign starch.

4676—Ground Ginger, Weeks Bros., Paducah, Ky. Bought of Tilghen Shipley, Murray, Ky., Aug. 26, 1898; contains wheat starch.

4566—"Primrose Strictly Pure Pepper," R. G. Terrell, Paducah. Bought of J. L. Brown, Paducah; contains foreign starch.

4667—Ground Coffee, "Evans' Star Best." Bought of M. F. Simmons, Russellville; contains chicory and cereal starch.

Not Found Adulterated.

5003—"Madja" coffee, roasted, James Heekin & Co., Cincinnati, O. Bought of J. B. Rogers & Co., Lexington, Ky.

4558—"Morning Joy," ground coffee, New Orleans Coffee Co., New Orleans and Atlanta. Bought of R. D. Robertson & Co., Mayfield, Aug. 24, 1898.

4565—Ground Black Pepper, E. R. Durkee & Co., New York, Gauntlet brand. Bought of Jo. T. Bishop, Paducah, Aug. 22, 1898.

4666—Ground Pepper, Thompson & Taylor Spice Co., Chicago, Ill. Bought of Robertson Bros., Murray, Ky., Aug. 26, 1898.

4674—"Strictly Pure Cayenne Pepper," Weeks Bros. & Co., Paducah, Ky. Bought of Tilghen Shipley, Murray, Aug. 26, 1898.

CORN STARCH—NOT FOUND ADULTERATED.

One sample was examined, no adulteration being found.

5098—"Oxford High Grade Corn Starch." Bought of Ryan Furgeson, Murray, Ky. Moisture, 12.13 per cent.; protein, 0.37 per cent.; ash, 0.12 per cent.; starch, by difference, 87.38 per cent.

COOKING SODA—NOT FOUND ADULTERATED.

Three samples were analyzed, none being found to contain anything unwholesome or that would cause the article to be pronounced adulterated. There was some difference in quality, however, the "Arm and Hammer" brand being the purest and DeLand's "Cap Sheaf" being the lowest grade.

5096—"Cow Brand Soda," John Dwight & Co., New York. Bought of R. D. Robertson & Co., Mayfield, Ky.; bicarbonate of soda, 98.7 per cent.; chloride of sodium, 0.3 per cent.; carbonate and sulphate of soda, moisture, etc., 1.0 per cent.

5097—"Cap Sheaf Soda," DeLand & Co., Fairport, N. Y. Bought of Ryan & Furgeson, Murray, Ky.; bicarbonate of soda, 95.1 per cent.; chloride of sodium, 0.5 per cent.; carbonate and sulphate of soda, moisture, etc., 4.1 per cent.

4595—"Arm and Hammer Soda," Church & Co., New York. Bought of J. E. Potter, Paducah, Ky.; bicarbonate of soda, 99.2 per cent.; carbonate of soda, traces of insoluble matter and moisture, 0.8 per cent.

SWEET CIDER AND GRAPE JUICE—ADULTERATED.

Three samples were examined for antiseptics, all of them being found to contain salicylic acid.

4607—"Welch's Grape Juice," The Welch Grape Juice Co., Westfield, N. Y. Bought of T. P. Taylor & Co., Louisville, Sept. 9, 1898; contains salicylic acid.

4706—"Pure Cherry Wine Cider," M. Livingston & Co., Paducah, Ky. Bought of M. L. Wilson, Lynnville, Aug. 29, 1898; contains salicylic acid.

4707—"Blackberry Cider," Price & Lucas Cider & Vinegar Co., Louisville, Sample obtained in Lexington for comparison; contains salicylic acid.

4573—"Sparkling Sweet Cider," Hirsch Bros. & Co., Louisville, Ky. Bought of G. N. Leisner, Paducah, Ky., Aug. 22, 1898; contains salicylic acid. (Messrs. Hirsch Bros. state that they have this bottled for them in New York State, and did not know it contained antiseptic. They will hereafter have it to comply with the law.)

MILK COLOR.

5462—"The Ideal Milk and Cream Color," "made from the best annatto," The Creamery Package Manufacturing Co., Chicago. Bought of J. H. Parker, Lexington, Ky. Chemical tests agree with those of annatto.

ADULTERATED

Station No.	Represented to be	Where Obtained.	Date of Collection	From Whom Obtained
5240	Cider Vinegar.	Covington	Feb. 24, 1899	J. E. Stephens .....
5241	" "	"	"	B. H. Kroger .....
5243	" "	"	Feb. 25, 1899 ...	B. H. Brames .....
6214	Apple "	Danville	Dec. 11, 1899	A. B. Gadberry .....
6215	" "	"	"	Blue Grass Grocery Co. ...
6199	" "	Frankfort	Nov. 28, 1899	N. F. Richardson .....
6200	" "	"	"	Duvall & Rogers .....
6194	Cider "	Georgetown	Nov. 27, 1899	Gus Margolen .....
4885	Apple "	Lexington	Nov. 2, 1898	B. F. White .....
4889	" "	"	Nov. 4, 1898	W. S. Bradley .....
5024	Cider "	"	Dec. 20, 1898	" " .....
5025	Apple "	"	Dec. 23, 1898	B. F. White .....
5245	" "	"	Dec. 21, 1898	D. P. Sallee .....
5639	Cider "	"	June 30, 1899	H. M. Griffing .....
5636	Apple "	"	July 11, 1899	Wm. Shields .....
5667	Cider "	"	"	M. Smith .....
5676	Apple "	"	July 12, 1899	Mitchell & Waller .....
5679	" "	"	July 20, 1899	Jo. Dinelli .....
5074	Cider "	Louisville	Sept. 7, 1898	.....
5391	" "	"	June 24, 1898	R. J. Fitzgerald .....
5393	" "	"	"	Joseph Riley & Sons .....
5394	Apple "	"	"	Henry Kerler .....
5397	" "	"	"	Wm. Norton & Son .....
5398	" "	"	"	R. B. Boyd .....
5399	" "	"	"	Frank Waters .....
5400	Crab "	"	"	Hikes & Hess .....
5401	Cider "	"	"	Ben Saltenbrock .....
5403	Apple "	"	Jan. 25, 1899	A. J. Ross & Son .....
5406	Cider "	"	"	E. H. Jenne .....
5407	" "	"	"	Theo. Evers .....
5409	" "	"	"	L. Zook .....
5411	" "	"	Jan. 30, 1899 ...	R. M. Hughes & Co. .....
5417	" "	"	Feb. 1, 1899	Hubert Haas .....
5419	" "	"	"	Phil. Steinacker .....
5423	" "	"	"	Schlange Bros. .....
5427	" "	"	Feb. 2, 1899	L. G. Stoke .....
5429	" "	"	Feb. 3, 1899	Frank Brown .....
5558	" "	"	May 19, 1899	Ross & McCall .....
5559	" "	"	"	" " .....
5560	" "	"	"	J. F. Bader .....
5561	" "	"	"	Leo Klarer .....
5867	" "	"	Aug. 22, 1899	J. Wm. Miller .....
5059	" "	Newport	Oct. 29, 1898	Walter Bennett .....
5060	" "	"	"	B. H. Kroger .....
5061	" "	"	"	Albert Dames .....
5078	" "	Nicholasville ...	Nov. 12, 1898	J. R. Miller .....
5079	Apple "	"	"	Martin & Greene .....
4549	" "	Paducah	June 6, 1898	Gus Beyer .....
4550	" "	"	Aug. 23, 1898	J. Biederman Grocery Co.
4551	" "	"	Aug. 22, 1898	Jo. Bishop .....
4553	" "	"	Aug. 23, 1898 ...	Wes. Flowers .....
6202	Cider "	Paris	Nov. 29, 1899	C. D. Mitchell .....
4887	Apple "	Russellville	Sept. 6, 1898	Mary F. Simmons .....
4618	" "	Somerset	Sept. 16, 1898 ...	Ogden & Son .....
4619	Malt "	"	"	" " .....
4886	Apple "	"	Sept. 24, 1898 ...	" " .....
5076	" "	"	"	" " .....
6209	" "	Versailles	Dec. 9, 1899	J. E. Harris .....
6213	" "	"	"	J. R. Prentiss .....
6206	" "	Winchester	Dec. 2, 1899	J. M. Lockman .....

*Hirsch Bros. state they have not sold Theo. Evers any vinegar for several years, except 1 bbl. white distilled vinegar on August 1, 1898.

†Hirsch Bros. state they sold Hubert Haas 2 bbls. of white distilled vinegar and 1 bbl. of pickling vinegar, all properly stamped on the bbl.

‡Barrel stenciled "Jones & Bros., white wine vinegar."

VINEGAR.

Manufacturer or Wholesaler	Specific Gravity	Acetic Acid Per Cent	Total Solids Per Cent	Ash Per Cent	Kind of Color
The Ahlers Co.	1.0055	2.64	.23	.02	
.....	1.0095	3.84	1.00	.20	Natural.
.....	1.0065	3.72	.18	.02	
.....	1.007	3.84	.37	.....	Caramel.
H. E. Langdon	1.006	4.08	.15	.....	"
R. M. Hughes & Co.	1.008	3.00	.29	.06	"
Price & Lucas	1.008	3.48	.28	.07	"
.....	1.008	3.96	.36	.04	"
R. M. Hughes & Co.	1.007	3.73	.31	.04	
" " "	1.030	3.42	.34	.04	
Price & Lucas	1.0085	4.86	.33	.05	
R. M. Hughes & Co.	1.0085	4.32	.34	.03	
Price & Lucas	1.007	3.69	.26	.06	
Wallace & Gregory Bros	1.010	5.04	.61	.13	Caramel.
" " "	1.010	4.48	.29	.02	"
" " "	1.010	4.60	.48	.11	"
Price & Lucas	1.010	4.84	1.22	.18	"
Wallace & Gregory Bros.	1.008	4.12	.39	.03	"
Acme Vinegar Co.	1.009	3.87	.73	.05	"
R. M. Hughes & Co.	1.0092	5.17	.33	.04	
Price & Lucas	1.0068	4.12	.42	.06	
" "	1.0063	4.75	.30	.04	
Country made	1.0013	3.50	.24	.04	
Ouerbacker, Gilmore Co.	1.0038	3.56	.28	.03	
Louisville Cider & Vinegar Co...	1.004	4.42	.27	.04	
Price & Lucas	1.0028	3.00	.73	.09	
Louisville Cider & Vinegar Co...	1.0022	3.31	.73	.08	
.....	1.0067	4.42	.49	.05	
Country made	1.0033	3.54	.76	.19	
*Hirsch Bros. & Co.	1.0067	4.36	.40	.10	
Louisville Cider & Vinegar Co...	1.0026	3.96	.48	.09	
R. M. Hughes & Co.	1.0129	7.12	.90	.16	
†Hirsch Bros. & Co.	1.0053	4.05	.26	.03	
Country made	1.0062	3.19	.78	.20	
" "	1.0019	3.62	.36	.03	
" "	1 0065	4.24	.69	.09	
.....	1.008	4.85	.49	.05	
‡Jones Bros.	1.010	4.68	.39	.04	Caramel.
" "	1.008	4.80	.31	.04	"
Louisville Cider & Vinegar Co...	1.009	5.28	.41	.09	"
John Heeb (Jobber)	1.009	4.32	.43	.08	"
R. M. Hughes & Co.	1.0075	4.20	.30	.03	
.....	1.010	4.56	1.09	.20	
.....	1.0115	4.05	1.18	.24	
The Ahlers Co.	1.004	3.87	.31	.03	
.....	1.007	1.50	.90	.18	Caramel.
Wallace & Gregory Bros.	1.009	4.02	.32	.02	"
J. Friedman & Co.	1.006	3.78	.25	.05	
Paducah Vinegar Works	1.008	3.06	.76	.24	
Wallace & Gregory Bros.	1.008	4.38	.93	.21	
Diamond Vinegar Co.	1.011	3.54	1.97	.11	
The Power Vinegar Co.	1.007	3.42	.38	.03	Caramel.
R. M. Hughes & Co.	1.0065	4.29	.40	.04	
" " "	.....	4.60	.38	.04	
" " "	.....	3.60	.20	.03	
" " "	1.0055	4.59	.34	.04	
.....	1.006	3.72	.20	.03	Caramel.
Howard Black	1.006	2.40	1.06	.21	Natural.
Wallace & Gregory Bros.	1.0125	4.68	1.15	.07	Caramel.
R. M. Hughes & Co.	1.005	3.18	.35	.05	"

VINEGAR NOT

Station No.	Represented to be	Where Obtained	Date of Collection	From Whom Obtained
5069	Cider vinegar	Bowling Green .	Sept. 7, 1898	Massey & Rabold .....
5057	" "	Covington	Oct. 29, 1898	Chas. Hand .....
5058	" "	"	"	George C. Goode .....
5239	" "	"	Feb. 24, 1899	J. E. Stephens .....
5242	" "	"	Feb. 25, 1899	The R. Hamilton Grocery Co.
5244	" "	"	"	The Great China Tea Co. ...
5215	Pickling vinegar .	"	Feb. 18, 1899	D. G. McVean .....
6216	Apple vinegar	Danville	Dec. 11, 1899	W. O. Alexander .....
*6195	Cider vinegar	Georgetown	Nov. 27, 1899	K. Stone .....
6196	" "	"	"	Blue Grass Grocery Co. .....
6197	Apple vinegar.....	Frankfort	Nov. 28, 1899	Mrs. Jas. O'Donnell .....
6198	Vinegar	"	"	M. Ellwanger .....
*4999	Apple vinegar	Lexington	Dec. 12, 1898	W. W. Patterson .....
5306	Family vinegar....	"	March 17, 1899 ..	Dr. E. M. Wiley .....
5332	" "	"	March 23, 1899 ..	" " .....
5599	Apple vinegar	"	June 19, 1899	Alex Oaks .....
5638	Cider vinegar	"	June 29, 1899	G. H. Harris .....
5644	" "	"	June 30, 1899	Jno. Hutchison .....
*5661	Apple vinegar	"	July 11, 1899 ...	Scully & Gorham .....
5681	" "	"	July 20, 1899	Fred W. Sauer .....
5720	Cider vinegar	"	Aug. 11, 1899 ...	W. B. Chasteen .....
5721	" "	"	"	Mitchell & Waller .....
5906	Apple vinegar	"	Oct. 3, 1899	A. McKenna .....
5070	" "	Louisville	Sept. 2, 1898	John Kiefer .....
4888	Family vinegar....	"	Sept. 6, 1898	Jacob Gast .....
4871	Pickling vinegar ..	"	"	John Kiefer .....
4872	Family vinegar ...	"	"	A. Button & Son .....
*4873	Cider vinegar	"	"	J. B. Wurach .....
4875	Tarragon vinegar..	"	Sept. —, 1898 ...	C. W. Jefferson & Co. .....
5392	Apple vinegar	"	Jan. 24, 1899	J. W. M. Miller .....
*5395	Cider vinegar	"	"	A. Marcus .....
5396	Apple vinegar	"	"	M. M. O'Connell .....
5402	Cider vinegar	"	"	M. Kaltenbach .....
5404	Apple vinegar	"	Jan. 25, 1899	Moses & Nicholls .....
5405	" "	"	"	Mammoth Grocery Co. .....
5408	Cider vinegar	"	"	Fred Brinke .....
5410	" "	"	Jan. 30, 1899	H. J. Heinz & Co. .....
*5412	" "	"	Jan. 31, 1899	Eclipse Vinegar Works ....
*5413	" "	"	"	Hirsch Bros. & Co. .....
*5414	" "	"	"	Jacob F. Bader .....
*5415	" "	"	"	Strosler & Co .....
*5416	" "	"	"	Jones Bros. & Co. .....
5418	" "	"	Feb. 1, 1899	J. L. Hopf .....
5420	" "	"	"	G. J. Schmidt .....
5421	" "	"	"	Geo. Mayer & Son .....
5422	" "	"	"	W. P. Grigsby .....
*5424	" "	"	Feb. 2, 1899	C. K. Sprowl & Son .....
*5425	" "	"	"	H. G. Eggers .....
*5426	" "	"	"	Philip Guetig .....
5428	" "	"	"	Chas. Deckel .....
5520	" "	"	May 24, 1899	Louis Zapp & Co. .....
5562	" "	"	May 19, 1899	P. C. Clapper .....
5868	" "	"	Aug. 22, 1899	W. H. Norwood .....
4555	Pickling vinegar ..	Mayfield	Aug, 24, 1898	John N. Counts & Co. .....
5068	" " ..	Murray	Aug, 26, 1898	Ryan Ferguson .....
4552	" "	Paducah	Aug, 22, 1898	G. N. Leisner .....
4554	Apple vinegar	"	"	J. E. Potter .....
6201	" "	Paris	Nov. 29, 1899	V. K. Shipp .....
6203	" "	"	"	Chas. Stephens .....
5077	Vinegar	Somerset	Sept. 24, 1898 ...	Sears & Owens .....
6210	Apple Vinegar	Versailles	Dec. 7, 1899	Berryman Bros. .....
*6211	" "	"	"	O'Neill Bro. & Co. .....
6212	" "	"	"	J. M. Wasson .....
6204	" "	Winchester	Dec. 2, 1899	W. T. Gilbert .....
6205	" "	"	"	J. W. Holler .....
*6207	" "	"	"	Tanner & Shipp .....
6208	" "	"	"	Blue Grass Grocery Co. ....

*Apparently genuine but not completely soured.

FOUND ADULTERATED.

Manufacturer or Wholesaler	Specific Gravity	Acetic Acid Per Cent	Total Solids Per Cent	Ash Per Cent	Kind of Color
.....	1.026	4.44	4.29	.47	Natural.
.....	1.0175	5.79	2.45	.31	
.....	1.0155	4.44	2.53	.22	
H. J. Heinz & Co.	1.019	5.07	2.59	.24	
Williams Bros. & Charbonneau.	1.016	3.72	2.60	.29	
.....	1.016	5.94	1.90	.40	
The Ahlers Co.	1.0055	2.46	.20	.03	None.
Lutz & Schramm	1.017	4.02	2.78	.31	
Country made	1.0015	1.86	2.29	.30	Natural.
E. H. Langdon & Co.	1.0175	4.08	2.58	.27	"
H. J. Heinz & Co.	1.018	4.74	2.98	.33	"
Hirsch Bros. & Co.	1.013	3.72	1.60	.24	"
Country made	1.002	1.08	1.37	.27	"
Bayless Fruit Co.	1.012	4.77	.78	.19	Caramel.
" " "	1.0055	3.84	.35	.07	"
H. J. Heinz & Co.	1.020	4.80	2.98	.36	Natural.
Hirsch Bros. & Co.	1.016	3.96	2.19	.30	
" " "	1.021	4.80	3.46	.27	
Country made	1.007	3.34	1.41	.46	Natural.
Hirsch Bros. & Co.	1.016	4.00	2.16	.31	"
Wallace & Gregory Bros.	1.016	4.06	1.89	.33	Caramel.
" " "	1.016	4.12	1.90	.36	"
Price & Lucas	1.014	4.26	2.29	.41	
Country made	1.022	6.90	2.68	.41	Natural.
R. M. Hughes & Co.	1.0065	5.70	.33	.04	
H. J. Heinz & Co.	1.009	5.40	.22	.02	None.
Hirsch Bros. & Co.	1.007	5.08	.24	.03	Caramel.
Country made	1.012	3.18	1.49	.28	Natural.
.....	1.010	5.46	.30	.02	Caramel.
.....	1.0176	4.16	2.50	.14	
.....	.9996	.92	2.18	.19	
Hirsch Bros. & Co.	1.0156	4.17	2.14	.14	
H. J. Heinz & Co.	1.0205	8.41	1.92	.48	
John Mott	1.0121	4.18	1.60	.47	
" "	1.0152	4.85	2.50	.23	
H. J. Heinz & Co.	1.0177	4.72	2.72	.31	
" " "	1.0169	4.79	2.53	.27	
Eclipse Vinegar Works	1.0115	2.60	2.02	.39	
John Mott	1.0195	4.73	3.27	.20	
Jacob F. Bader	1.049	2.95	1.22	.24	
.....	1.00 9	1.90	2.41	.30	
Jones Bros. & Co.	1.017	6.44	2.14	.35	
J. L. Hopf	1.0115	4.66	2.35	.41	
.....	1.0137	3.99	1.95	.33	
Country made	1.0188	5.40	3.17	.20	
" "	1.0103	4.79	1.06	.22	
C. K. Sprowl & Son	1.0108	3.68	2.23	.34	
Country made	1.004	3.38	2.00	.33	
.....	1.0046	3.16	1.89	.37	
.....	1.0125	4.79	2.12	.31	
.....	1.0013	4.14	1.75	.28	
Country made	1.012	4.44	1.25	.24	
H. J. Heinz & Co.	1.0185	4.56	3.02	.31	
Louisville Cider & Vinegar Wks.	1.006	4.23	.44	.11	
H. J. Heinz & Co.	1.010	5.46	.19	.02	Caramel.
Hirsch Bros. & Co.	1.005	3.48	.31	.05	
.....	1.016	4.56	2.51	.31	
Hirsch Bros. & Co.	1.015	4.44	1.68	.26	Natural.
Lutz & Schramm	1.0185	3.96	2.88	.28	
Red Cross Vinegar Co.	1.005	3.54	.22	.03	Caramel.
Country made	1.0195	4.80	4.67	.54	Natural.
" "	1.005	2.64	1.63	.32	"
Hirsch Bros. & Co.	1.0165	3.90	2.35	.30	"
Wallace & Gregory Bros.	1.0135	4.08	1.38	.15	
Knadler & Lucas	1.016	3.96	2.29	.31	Natural.
Country made	1.050	1.86	12.31	.32	"
F. M. Miller	1.0185	4.14	2.68	.33	

BAKING POWDERS.

It will be seen from these tables that 56 baking powders were analyzed, 45 of which were found to be alum—or alum-phosphate powders, and eleven cream of tartar powders.

Baking powders are a mixture of sodium bicarbonate and some form of acid salt, together with from one-fifth to one-half of their weight of starch or flour.

Baking powders may be classed under four kinds, depending upon the acid salt used, viz.: First, cream of tartar baking powders; second, alum baking powders; third, alum-phosphate baking powders; and fourth, phosphate baking powders.

So far as their efficiency in bread-making is concerned, they are about of equal value; that is to say they all liberate about the same amount of carbonic acid gas when fresh. It is the liberation of this carbonic acid gas in the dough in the process of baking that causes the bread to rise and to be porous.

When baking powders are used in bread-making, a chemical change takes place, caused by the water used in mixing the dough and the heat in baking the bread resulting in the evolution of carbonic acid gas, and a fixed residue remains in the bread. This fixed residue in the case of cream of tartar baking powder is potassium sodium tratrate, usually called "Rochelle Salts." In the case of alum baking powders or alum-phosphate baking powders, this residue, if the reaction is complete, is sodium sulphate and alumina hydrate or phosphate. In the case of phosphate baking powders, the residue is calcium and sodium phosphates.

In the case of alum baking powders, or alum-phosphate baking powders, there seems to be a difference of opinion as to whether they are injurious to health or not. It often happens that the reaction is not complete in the process of bread-making. In all such cases alum is left in the bread. This is known to be an astringent and irritant to the mucous membranes. Even when the reaction in bread-making is complete, the alumina hydrate is undoubtedly soluble to some extent in the juices of the stomach and albuminous substances, thus irritating weak stomachs, and is undoubtedly injurious in such cases.

I do not believe that by the use of alum baking powders injury to health has been sufficiently proven to prohibit the sale or manufacture of such baking powders. I am strongly of the opinion, however, that baking powders should be named and plainly labeled according to the acid salt which they contain; and I believe a pure food law should compel all manufacturers of cream of tartar baking powders to label their goods "Cream of Tartar Baking Powder"—not "Pure Baking Powder," or "Baking Powder;" all manufacturers

of alum baking powders should be compelled to label their goods "Alum Baking Powder;" all manufacturers of alum-phosphate baking powders should be compelled to label their goods "Alum-Phosphate Baking Powder;" and all manufacturers of phosphate baking powders, "Phosphate Baking Powder." Such labeling would inform the purchaser of the kind of baking powder he was buying.

As one of the objects of the present law is to inform the purchaser or consumer of what he is buying or consuming, I have ruled that baking powders should be labeled as above. All of the samples described in the table of adulterated baking powder were without any mark to show their true character. One of them bore on the label the legend "This powder contains C. T. S., Bic. Soda, E. A. & S. T." which leaves the reader uninformed as to whether the contents of the can was alum baking powder or not.

I think it would be better if this ruling could be incorporated as a part of the law.

BUTTER.

Of 147 samples of butter analyzed, 29 were found to be adulterated with oleomargarine, or kindred compounds. These 29 adulterated samples covered only those which were purchased as butter. A number of samples were purchased as butter, and when closely examined were found to be marked "oleomargarine." If the rulings of this station in regard to butter are within the scope of the law, or, if otherwise, the law could be made so as to contain these rulings, I am of the opinion that oleomargarine would have to be sold on its merits. Now it is put up mostly in pound packages and colored the same as butter and marked "Holstein," "Elgin," etc., to deceive the purchaser; grocers often advertise it and bill it as creamery butter, and when butter is called for, sell it as butter, putting it in a package, most generally in a paper sack, the bottom of which has previously been stamped "oleomargarine," in order to comply with the Federal law. Oleomargarine should not be advertised as butter. The law prohibits its sale as butter, and when consumers call for butter substitutes should not be offered them as butter. Oleomargarine, or any substitute for butter, when put up in pound packages, should be stamped plainly "oleomargarine" on the package before being wrapped, and the tissue paper which is wrapped around it should be stamped in bold letters "oleomargarine," and no other markings whatever, such as "Elgin," or "Holstein," etc., should be allowed on packages of oleomargarine or other butter substitute.

FLOUR.

A number of samples of flour were analyzed with the expectation

that corn starch might be found as an adulterant, but since the Government requires the stamping of all such flour, we have found no such adulterant.

JELLIES, PRESERVES, ETC.,

With the limited number of examinations of jellies, preserves, etc., which we have made, it becomes at once apparent that most of such are adulterated. Currant jellies in reality are apple jellies, colored like currant jellies, and phosphoric acid and glucose, etc., are put in as adulterants. Preserves contain in most instances salicylic acid, or other antiseptic, which should not be used except such statement is printed on the label. In cheap jellies glue or starch paste are often used; in fact, pure jellies and preserves are rare. In the height of fruit seasons the manufacturers of preserves, jellies, etc., buy up large quantities of fruit, and often times, no doubt, when it is unfit for consumption, because it has commenced decaying, and in order to preserve it from further decomposition, add salicylic acid, or other antiseptic, heat it, store it in large cans, and when the busy season is over this stock is worked up at leisure into preserves, jellies, etc., etc.

TOMATO CATSUPS.

Tomato catsups almost invariably contain salicylic acid, or other antiseptic. It is claimed by some of the manufacturers that this is essential to the preservation of them, but it is a well-known fact that if properly prepared at first, they can be put up without danger of fermentation; and I believe the law should be enforced requiring that all manufacturers of preserves, jellies, catsups, etc., should note plainly on the label if any antiseptic is used.

LARD.

Only a few samples of lard (40), were analyzed. Eleven were adulterated, mostly with cotton seed oil.

MILK.

One hundred and fifty samples of milk were examined. Thirty-five of these were found to be adulterated. Twenty-two contained preservatives; eight were artificially colored to make them look richer; and nine contained skim milk, or were watered. It is clearly a violation of the law to add preservatives to milk for the purpose of keeping it from souring, as such preservatives, at least, retard digestion when the milk is taken into the stomach, if they do not have a direct injurious effect on the system. When we re-

member that such milk is often sold to be fed to small children and infants, their use becomes criminal.

In several instances, milk was found to contain artificial coloring matter to make it look like rich milk or cream. In one instance this milk contained only 1.85 per cent. of fat, showing it to have been mixed with skim milk. This is clearly a deception, and a deception that will be practiced by the unscrupulous unless the law is strictly enforced.

Milk is a great absorber of impurities of all kinds. Germs of the various diseases grow and multiply in it at an enormous rate. It is the richest food for all bacteria. It becomes important, therefore, that dairy cattle should be kept in quarters free from filth and disease, and that they should be fed only wholesome food. Milk from cows quartered in close, unventilated barns, unkept and filthy, and which are fed on distillery slops, should be condemned as unfit for human consumption.

SPICES.

From our brief work on spices, we find them almost invariably adulterated, showing conclusively the necessity of the law.

VINEGAR.

Of the 126 samples of vinegar analyzed, we found fifty-nine adulterated. Most of these adulterated vinegars are vinegars made from low wines, called distilled vinegars, and colored with burnt sugar and labeled "Apple" or "Cider" vinegars. They are sold at wholesale anywhere at from 8 to 18 cents and retailed at from 20 to 40 cents per gallon. It costs the manufacturer very little to make these vinegars, and it is a deception and a fraud to sell them as cider or apple vinegars.

I believe the rulings in regard to vinegars should be incorporated as a part of the law.

CONCLUSION.

From the results obtained under the operation of the pure food law in so short a time, the necessity of the law is clearly shown. Fully 40 per cent. of all samples of food taken have been found adulterated. Some of the adulterants used are injurious to health; others have been put in to cheapen articles of food. From the investigations of the United States Senate Committee on Pure Foods, it is shown that nearly 90 per cent. of all food products are being adulterated in this country. Says Mr. H. B. Mason, in summing up the work before the Senatorial Committee:

"Dr. Wiley, who has been chief chemist of the Agricultural Department at Washington for many years, asserted that nearly every kind of food upon the market is, to a greater or lesser extent, adul-

terated, misbranded, or otherwise rendered harmful or fraudulent. More Vermont maple sugar is made every year in Davenport, Iowa, from cheap yellow sugar, flavored with vegetable extracts, than can be produced from all the maple trees in the whole State of Vermont! Currant jelly is manufactured from the cores and parings of apples utilized after they have been evaporated; glucose, sugar, a vegetable acid, and some coloring and flavoring matter complete the delicacy! Nearly all of the 'pure olive oil' imported to this country is cotton-seed oil made in the Southern States, sent abroad and there refined and returned to us as the pure product of the Mediterranean olive!

"Dr. Wiley, Professor Mitchell, of the Wisconsin Dairy and Food Commission, and others told how the public purse is defrauded and the public health damaged by butter from which the milk fats have been taken and vegetable and animal fats added; how coffee has often been found to consist mainly of molasses and flour molded into berries; how fully 70 per cent. of beer is made without malt; how the color of tea leaves, pickles, and of certain vegetables and canned goods is made with copper salts and the like; how condensed milk is made from milk which has been skimmed and effectually ridden of nearly all of its nutritious material; how spices are not spices; how sardines are not sardines; how fifteen-year- old whisky can be made in fifteen minutes; and how communion wine is usually nothing but a weak solution of salicylic acid flavored with unfermented grape juice.* * * Antiseptics and preservatives of various kinds are used indiscriminately to defraud and to deceive.' and that these are nearly always harmful and sometimes positively dangerous.' Butchers use preserving fluids on choice scraps of meat which they lay aside for transformation into the delicacy known as 'Hamburger steak.' Milk and butter are preserved with 'freezine,' which is nothing more than a solution of formaldehyde. Fruits and fruit products are preserved with salicylic acid; bacon, sausage, and other animal products with boracic acid.

"It was disclosed also that this country had long been a 'dumping-ground, for all sorts of adulterated and inferior food products sent here from abroad."

"This neglect of the public health has enabled manufacturers of foods and drinks to go to almost unlimited lengths in the adulterations and cheapening of their products, regardless alike of the public purse and the public health. Their greed has had no check; their dishonesty has received no punishment. They have flourished and grown fat at the expense of the people who have consumed their inferior, counterfeited, and harmful products. This is no indifferent matter; it is further reaching in its effects than a cursory thought indicates. Reflection must convince any thoughtful man that the prevalent consumption of inferior and harmful foods by a people

must result in the physical and moral deterioration of that people."

In endeavoring to carry into effect the law, we have found as striking examples in our own State. Kentucky has been the "dumping-ground" for inferior food products that could not be sold in other States. I am told by a manufacturer of preserves that a carload of certain preserves were condemned as unfit for use in Ohio. Instructions were given to ship to Indianapolis, and add salicylic acid, boil and ship to Kentucky.

A grocer bought a carload of jelly at a very low price in tubs. After keeping a short time, it separated into glue and liquid and was worthless. One of the preserving companies in Louisville told me that runners were offering a cheap grade of glue for jellies, and certain preservatives, which they guaranteed chemists could not detect.

We have found salicylic acid, sometimes in large quantities, in tomato catsups, preserves, and other food products which were sold as pure. We have found formaldehyde and other preservatives in milk, which perhaps in some cases was fed to infants. The most striking example of all is in the case of essence of peppermint and essence of cinnamon sent to us from the county attorney of Pike county. These extracts both contained "wood alcohol," a poisonous substance, as one of the ingredients, and the county attorney stated that death had been caused by their use. In the preparation of these essences a mixture of wood alcohol and common alcohol was used in place of common alcohol, presumably to avoid the Government tax on alcohol.

KENTUCKY

AGRICULTURAL EXPERIMENT STATION

OF THE

State College of Kentucky.

BULLETIN NO. 87.

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1. Kentucky Forage Plants—The Grasses.
2. Analyses of Some Kentucky Grasses.

LEXINGTON, KENTUCKY,

May, 1900.

KENTUCKY

Agricultural Experiment Station.

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KENTUCKY AGRICULTURAL EXPERIMENT STATION,

LEXINGTON, KY.

BULLETIN No. 87.

I. Kentucky Forage Plants—The Grasses.

By H. GARMAN, Entomologist and Botanist.

The State produces her fair proportion of the forage product of the United States. She is just within the wheat belt, and while this is not her characteristic crop, some regions of the State are largely occupied with wheat growing and produce a winter wheat of very good quality. Oats do not thrive as generally here as in some other states, yet the crop is not a small one (1,725,596 bushels in 1898), and at times the quality is first-class. Barley and rye do well in the State. Most of our soils produce excellent corn, which is the leading forage crop. It is grown in every one of the 119 counties, the lowest yield, in 1898, according to our State Commissioner of Agriculture, being 32,380 bushels, while five counties produced more than a million bushels each. Sorghum grows well everywhere, and is employed both for green forage and for making syrup. Timothy, clover and orchard grass are extensively grown for meadow, 361,696 tons of hay, mostly of these grasses, being produced by Kentucky in 1898, and in addition 142,875 bushels of grass and clover seeds were harvested.

The fame of Kentucky does not rest on any of these products especially. It is her blue-grass pastures that give her standing in the world, and their charm that gives the State its peculiar hold on the affections of those born and reared upon her soil. The phrase "Down in Old Kentucky" conveys to the wandering Kentuckian a picture in which are sunny slopes of soft green grass; grazing horses and cattle, sleek and beau-

tiful beyond the belief of those who have not seen them; together with memories of humming bee, and piping lark, and smell of clover and locust blossoms. Blue-grass Kentucky is a delightful bit of the world in May and June; and all that her children say and believe of her, and more, is then true. And it is largely the result of the profusion with which the little plant, blue-grass, grows in her limestone soil. If it grew everywhere in the State as it grows here about Lexington we should have little occasion to discuss forage plants in these bulletins. But Blue-grass Kentucky includes only about one-fifth of the area of the State, and outside this section we have yet much to hope and labor for in the matter of forage for stock.

NATURAL FORAGE REGIONS.

Years ago, when the old Transylvania University was at the zenith of its fame and influence, a man, dark of feature and with something in expression and carriage that marked him a foreigner, might often have been encountered trudging along country roads about Lexington or threading his way through forests and along streams searching for plants and shells and fossils. Breaking off a fragment from a rocky ledge here, turning over a stone yonder, to expose the lurking salamander or lizard, he went his way absorbed in study of the nature about him, unmindful of self, unmindful of scoffing neighbor and wondering country folk, bent solely on learning the truth and proclaiming it. This was the naturalist Rafinesque, at one time Professor of Botany and Natural History at the University, a man whose great misfortune it was to have been half a century ahead of his associates, and who suffered for it later by dying unattended and in poverty in a garret in Philadelphia. But Rafinesque is still an influence in the world, and the scoffer who gorged himself while the naturalist toiled, and lolled in his chair and smiled at the thought of his importance, has disappeared and left no trace —the natural end of self-sufficiency in all times.

These and similar reflections have been suggested to me from time to time as I have encountered traces of this man while studying the zoology and botany of Kentucky. For he

is remembered very well by people yet living in this vicinity. There is probably not a nook or corner of interest within ten miles of Lexington which he did not visit, always, I am told, traveling afoot and carrying a pack for rocks and plants at his back. His acquaintance with Kentucky plants seems to have been particularly good, and the natural botanical regions* into which he divided the State are based upon real knowledge, which could only have been acquired by arduous out of door work such as he is known to have done. The regions he proposed are the following, and are presented in this connection because of their bearing on the distribution of forage in Kentucky.

1. The Fluviatile or River Region, characterized by such species as the sycamore, catalpa and cottonwood.

2. The Central or Limestone Region, characterized by the buckeye (*Æsculus glabra*), pennyroyal (*Isanthus*), boneset (*Eupatorium*), etc. Of this region Rafinesque says it is poor in species. Until reading his statement I had been accustomed to regard this relative scarcity of species as the result of close cultivation and grazing, but in his time doubtless there was much virgin land that showed what the flora had been before the advent of the white man

3. The Hilly Region—a series of knobs that starts at the Ohio river in Lewis and Mason counties, encircles the Central Region, reaching the river again in Jefferson county near Louisville. This is still one of the best collecting grounds in the State, and is characterized by the small hill iris (*Iris cristata*), by the red cedar, and by the pines.

4. The Barren Region—The open section of the western and southern parts of Kentucky, with a flora like that of the northern prairies, including such genera as Rudbeckia, Silphium and Ruellia.

A consideration of the whole flora of Kentucky would perhaps require some modification of the boundaries of Rafinesque's regions, but as laid down by him they serve in a general way to indicate characteristic forage regions of the State.

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* See the Western Review and Literary Magazine, published at Lexington by W. G. Hunt in 1819-20, Vol. I, p. 97.

The hill region I would extend to include the mountains of Eastern Kentucky. Some trace of it may be detected to the westward of the central region even in Edmonson, Grayson and Hardin counties, indicated by the presence there of the great-leaved magnolia (*Magnolia macrophylla*), the umbrella tree (*M. tripetala*), holly (*Ilex opaca*), and mountain laurel (*Kalmia latifolia*). At present it is characterized by its deficiency in cultivated forage, and marked by the abundance of forest trees and native leguminous plants.

While the central region produces most of the commonly cultivated forage crops, its blue-grass is what gives it distinction at the present time.

The fluviatile region, of course, follows the rivers. It is marked by extensive bottom-land corn fields. The establishment of permanent meadow and pasture is made difficult over much of it by spring overflows.

The name barren region does not imply sterile soil, but was applied in early days to a portion of the State that was largely free from forest growth. As here used it includes our best wheat and corn counties, Christian county producing more of both of these crops than any other county in Kentucky. It is characterized, besides, by orchard grass and red-top meadows. Some portions of it are adapted to southern forage crops, such as Bermuda grass, which seems to be worthy of more extended trial than it has yet been given. I have extended this region to include all of the State lying west of the Tennessee river, which seems not to have been visited by Rafinesque, although the bottom lands, especially, show so many species characteristic of the far South, that it might well form a separate botanical division. I need only refer to the presence of Mississippi hackberry (*Celtis mississippiensis*), the pecan (*Hicoria pecan*), the red buckeye (*Æsculus pavia*), bald cypress (*Taxodium distichum*), the red iris (*Iris fulva*) and the water locust (*Gleditschia monosperma*), in illustration.

KINDS OF FORAGE PLANTS.

Our forage plants may for convenience be separated into three groups: (1) The grasses (Gramineæ), including blue-grass, crab-grass, timothy, Johnson grass, wheat, corn, rice

and a large number of other species; (2) the clovers (Leguminosæ) and their allies, such as alfalfa, cow peas, soy beans, and the like; (3) a small number of plants of other families, of value for some kinds of stock, or adapted to special situations, such as dwarf essex rape and the Australian salt bush. In this bulletin only the true grasses, native and introduced, are included, the observations both in the text and in the tables following coming largely from grasses grown in plots on the Experiment Farm. These plots have numbered about thirty-two during the past eight years, and have given us a means of estimating the value of the species for this region, which could not have been obtained in any other way. But it must be added that the soil on which the plots were situated is rather poor, on which account I do not feel disposed to pass final judgment on some of the species. New plots on better soil have already been started, and will serve to correct and extend the observations now presented.

The clovers and other forage plants, of which we have had about twenty plots growing on the Farm for some years, will be treated in a bulletin to be printed later. It is hoped that it will be possible to give native species special attention in a final account of Kentucky forage, and with this in view I take advantage of the opportunity to request correspondents of the Station to call our attention, as occasion may arise in the future, to any native grass or other forage plant of which stock appear to be specially fond, sending us at the same time if possible specimens of the plant in flower. Wherever bluegrass, timothy and red clover grow well the question of forage for stock is in a way solved. But in sections of both eastern and western Kentucky they do not thrive, and, whatever the cause, the fact must be faced. Some of our native grasses and clovers may on trial prove adapted to cultivation in these sections. The hairy bush-clover (*Lespedeza hirta*) has already been pointed out to me by Col. Jay H. Northup, of Louisa, as relished by stock and otherwise adapted for forage in the mountains. A careful study of this and related genera would perhaps reveal others even more promising. What is wanted for the rather sterile mountain sections is a perennial that will

stand our uneven winters and our very hot summer sun. It is not unreasonable to hope to find among the native species growing in this region plants that after cultivation and improvement will meet these requirements as well or better than any to be found in foreign countries.

THE GRASSES.

Grasses may be known by their jointed stems, bearing very small flowers which are generally more or less green in color, and either form a loose head or panicle (as in blue-grass) or else are closely placed so as to produce a cylindrical spike or spike-like panicle, as in timothy. The flowers are often complete, that is, with both stamens and ovary in one flower, but occasionally the staminate flowers are separate from the pistillate and on a separate part of the panicle, as in wild rice, or even on a different part of the plant, as is true of Indian corn (maize). As the flowers are not brightly colored and do not produce nectar, they are not much visited by insects, the wind being the important agent in carrying pollen from one flower to another. Besides well-known plants employed for pasturage and hay, the family includes others that provide the most valuable vegetable food of man, so that it can be said that the grasses furnish us with both meat and bread. In corn, wheat, oats, rye, barley, rice, blue-grass and timothy we have a group that has no equal in its importance to us elsewhere in the vegetable kingdom.

Agropyron cristatum (Crested wheat-grass). This grass, which is about 30 inches high, produces a short spike-like head resembling that of wheat. It has been observed but once, July 5, 1895, when a specimen was collected among grass plots on the Experiment Farm. No doubt it was introduced among grass seeds bought of an eastern seedsman. It is a native of Northern Asia, and is reported to have been observed in Scotland.

Agrostis alba (Red-top). Where the soil holds water well red-top thrives in Kentucky and has a value for meadow. It is not commonly grown in the limestone soils of Eastern Kentucky, but may be seen here growing spontaneously along

water courses. In porous soils and on high ground it suffers in August and September from drought. On the Experiment Farm at Lexington, on rather poor soil for this region, it reaches a height of two feet about June 20, when its panicle is fully expanded. On wet ground along ponds and streams it has been noted at times as about three feet in height. The head or panicle is contracted and green at first, but expands and assumes the characteristic purple (not red) color later. When fully expanded, heads measure from six to eight inches long and are about three inches in expanse. The blades are rather short and flat, those of the stem (culm) measuring from about three to five inches long and one-fourth inch in greatest width. A plot started in the spring of 1893 and left to itself very largely after the first season, lasted only until 1896, when but few tufts remained, the rest of the ground having been occupied by weeds. The grass of this plot became perfectly brown in winter, and would not then have furnished any grazing. In the latter part of March the green blades began to appear and by the last of April a very nice growth six inches high was generally visible, when it would have furnished very good grazing. In the latter part of July the growth stopped, and the grass remained stationery until September, when green blades began to appear and during October the plot was again in a condition to furnish some grazing. The first cold weather, however, turned all parts of the plants above ground brown. The portion of the State beginning with Jefferson and Nelson counties and extending westward to the Tennessee River seems to be better adapted to red-top than eastern Kentucky, and I have seen some very good crops of hay cut from fields in that region.

It is a very nutritious grass, ranking in this regard with timothy and blue-grass, but is said not to be relished by stock in some localities.

It has been observed from time to time growing spontaneously at the following places: Crab Orchard, Junction City, Brooklyn Bridge, Lexington, Clay's Ferry, Maysville, Dickey's Mills.

Agrostis canina (Rhode Island bent-grass). This grass,

planted side by side with red-top, has proved a more hardy and durable species. It soon forms a close-knit turf from which during most of the season cattle could get some grazing. But its blades are short and rather slight, and hence the amount of forage produced by it is relatively small. Because of the close turf formed it stands drought on dry ground better than red-top, though both grasses do best in damp soil. It can only prove of value for grazing. Produces rather small panicles, with a general resemblance to those of red-top, in late June, and then averages about twenty inches in height.

Agrostis elata. A native grass observed in Harlan and Bell counties by T. H. Kearney in 1893. A late-blooming species which, according to Scribner, reaches a height of about two feet.

Agrostis elliottiana. A very slender, insignificant native grass about 12 inches high. Stems thread-like. Blades very short. Not worth considering as forage. Observed at Nortonville, May 12, 1898; at Central City May 15, 1899; and at Auburn May 17, 1898.

Agrostis hyemalis (Rough hair-grass). A widely distributed native species, of slight habit such that it is not calculated for forage. Panicle very long with slender thread-like branches. A specimen in the Station collection measures twenty inches in height. Localities: Junction City, June 19, 1892; Nortonville, August 8, 1892; Aden Springs, October 22, 1892; Cave City, May 19, 1898; Central City, May 15, 1899; Prentiss, Ohio Co., May 1?, 1900 (from Mr. E. G. Austin).

Agrostis intermedia. Grows in the mountains of Southeastern Kentucky, where it was collected by Kearney. The original description is in the Bulletin of the Torrey Botanical Club, Vol. 20, p. 476.

Agrostis perennans (Thin-grass). A slender grass inclined to be prostrate. Panicle scant, the branches very slender. Attains a height of twenty inches or more, but is so very slight as not to promise well for cultivation. Localities: Clay's Ferry, August 22, 1893; Hawesville, August 16, 1898.

Agrostis stolonifera (Creeping red-top). Regarded as a variety of red-top, but differs in producing a dense turf and in being more persistent in some situations as a consequence. It is not so well adapted for meadow as for pasture.

Alopecurus agrestis (Slender foxtail). Of European origin. The seeds are sometimes offered for sale by American seedsmen. In general the plant resembles timothy, having flat blades sometimes one-fourth inch in diameter and 5 inches or more long, with at flowering time a cylindrical head 3 to 4 inches long and three-sixteenths inch in diameter. In a plot on the Experiment Farm the heads appeared from May 12 to May 21, and the grass then averaged about two feet in height. In England it is known as black grass and is said to have the character of a weed in some soils. It showed but poor staying qualities on the Farm and when left to itself soon disappeared.

Alopecurus geniculatus (Marsh foxtail). A low growing grass 10 inches or less in height, observed growing in tufts in wet places at Clinton, Ky., May 12, 1898. The heads are from one to one and a half inch long with a diameter of rather less than three-sixteenths inch. The plant is too slight to be of value on the farm. It has probably been introduced from Europe with seeds of other plants.

Alopecurus pratensis (Meadow foxtail). This is a handsome introduced species that we have grown for some years on the Experiment Farm, where at times it has presented a very fine appearance. The head resembles that of timothy, but is shorter, ranging from about 2 to 2½ inches in height and having a diameter of ¼ inch, or a trifle more. The seeds at the tip ripen and fall first, the central axis becoming gradually bare from the tip. It grows in large tufts, with numerous, rather large, green blades at the base, the stems with heads measuring from 2 ft. 5 inches to 3 ft. 5 inches high. The blades themselves are often 8 to 9 inches long and ¼ inch in diameter. Growth starts very early in spring, often as early as March 6, and by the last of March the dense tufts of blades would make excellent grazing. It is ready to cut by the first

of May and would doubtless make a moderate yield of good hay, though it strikes me as better adapted to pasture. While it is one of the most attractive species we have grown, it lacks the spreading habit that goes to make our best pasture and meadow grasses. In England it is highly valued for pasture, and is said to do best on clay soils, and I judge on rather low ground.

Andropogon halepensis (Johnson grass). A coarse grass adapted to damp situations and rich soil. It spreads by thick underground stems, which remain in soil over winter and send up a new growth late the following spring, the time at which it appears varying with the season, but ranging from about the last of April until the middle of May. By the middle of June it is two feet high, with blades 22 inches long and as much as 1¼ inch wide, with the panicles just appearing. About July 20 it is at its best, the panicles being fully developed, sometimes with a length of 18 inches and an expanse of 8 inches, the plants themselves averaging 5½ to 6 feet in height. On the Experiment Farm in 1894 some plants measured 75 inches in height. The panicles soon assume a purple hue, and later become dark brown. The grass presents a thrifty appearance throughout the fall months, until frost comes, when it is killed to the ground at once, and nothing but dead remnants is seen until the following spring. Sometimes, as in 1895, it is cut down also by late spring frosts. It is a near relative of the common sorghum, and furnishes nutritious food which seems to be greatly liked by all browsing animals. The amount of forage it yields is not as great as would be expected, this being the result of the large space occupied by individual plants. The most serious objection to it is the fact than once established it is rather difficult to eradicate, but this objection has not the same force in Kentucky as farther south, because it can be killed here by plowing at such time as to expose the underground roots to the frost.

Johnson grass is not as hardy in Eastern Kentucky as it is in the western counties. It grows spontaneously throughout the State, however, though nowhere very common. Specimens have been collected by me at Lexington, Bowling Green

and Clinton. It was received at the Station July, 1894, from Mr. O. E. Bowles, of Pikeville, in the extreme southeastern end of the State.

Andropogon nutans, var. *avenaceus* (Indian grass). A coarse native grass, with long blades and rather close spike-like panicle. A specimen in the collection from Livingston, Ky., measures about 40 inches in height, with the panicle 9 inches and blades about 12 inches long. It is said to reach a height of 8 feet. Observed only in Southeastern Kentucky.

Andropogon provincialis (Forked beard-grass). A prairie grass of the Middle States, where it is sometimes cut for hay. Native throughout most or all of Kentucky and not uncommon. Possibly worth cultivating in sections where timothy does not thrive. Height in good soil about five feet, the slender spikes resembling small heads of rye, 1½ to 2½ inches long, in pairs at intervals along the stem, or sometimes three at the summit. Blades broad, and 12 inches or more long.

Andropogon scoparius (Broom beard-grass). This is related to the preceding, but is more slender, with narrower blades and slight short heads, the spikelets of which are covered with silky hairs. Blades about 10 inches long. Heads 1 inch, or a trifle more. Clay's Ferry, Ky. R., Aug. 22, 1893; Kearney records it from Southeastern Kentucky.

Andropogon sorghum (Sorghum, Broom-corn, Kafir corn). This well-known species is cultivated everywhere in the State as sorghum and broom-corn. Kafir corn has not been seen in cultivation, excepting in a small plot on the Experiment Farm. Sorghum stands drought better than corn, but on the whole cannot be considered the equal of the latter as green forage. When cut before it becomes too tough, it makes very fair silage. Kafir corn is a dwarf variety, and has not proved with us in any way remarkable. Common sorghum appears to have all its good qualities with some additions.

Andropogon virginicus (Broom-sedge). No plant occurring in our fields is better known than this. In blue-grass Kentucky it is not as common as elsewhere, yet can be found close to the edge of Lexington on bits of particularly poor ground. In western Kentucky it often occupies meadow and pasture land to the exclusion of most other grasses. Late in fall and in winter its tough stems are to be seen over large tracts of land, attracting attention because of their peculiar reddish brown color. When young they are eaten by stock to some slight extent, but later become so tough and dry that they are untouched even when forage is scarcest and everything else is grazed close to the ground. Occurs throughout Kentucky. Aden Springs, Lexington, Bardwell.

Anthoxanthum odoratum (Sweet scented vernal-grass). An attractive little grass worth cultivating among more productive meadow grasses because of the pleasant fragrance it imparts to hay. It grows in dense clumps six or seven inches across finally, but this is about the extent to which it spreads after becoming established. The dropped seeds do not germinate as a rule, and hence if one fails to get a stand at the start, vacant ground is not likely to be occupied by it. It is only moderately hardy. Our plot was badly injured by freezing during the winter of 1895-96, but revived in great part later, though it did not produce heads in 1896, and is still alive. Excepting this sensitiveness to cold it is quite persistent, standing drought splendidly, and throughout the season presenting a growth of rather short, light green blades that would make good grazing. When cut it sends up a fresh growth promptly, but does not grow tall enough to make it profitable for meadow. The heads develop from about May 1 to May 15, are rather thick and about 1½ to 2½ inches long. It has not been observed growing spontaneously anywhere in the State.

Aristida gracilis (Slender aristida). A very slight native grass observed to be common on poor land in the vicinity of Bremen, Muhlenberg County, Sept., 12, 1899. The species

was collected in the mountains of Southeastern Kentucky by Kearney. Of no possible value for stock.

Aristida oligantha (Few-flowered aristida). Collected in Muhlenberg county with the preceeding, on dry, clayey soil along country roads ; a thin wiry growth, with a poor hold on the soil, of no value for stock.

Aristida purpurascens (Purplish aristida). Collected in the mountains of southeastern Kentucky by Kearney.

Aristida ramosissima (Branched aristida). Credited to the State by Dr. Asa Gray, by Britton and Brown, and by Kearney.

Arrhenatherum elatius (Tall oats-grass). Among from forty to fifty forage plants kept growing on the Kentucky Experiment Farm for a number of years, this has always, winter and summer, been one of the finest in appearance. In the matter of hardiness snd productiveness it has had no equal on the Farm. It stands drought better than timothy. It has not been affected by the severest cold weather we have had during the past six years. It grows rapidly on poor soil.

When fully grown about the middle of June it is often five feet in height, with a panicle somewhat like that of oats, and inclined to droop a little, but not so course. After flowering it soon becomes rather woody and should on this account be cut promptly before the panicles mature. After cutting, a new growth of blades appears, that might furnish either pasture or hay.

The experience of American farmers who have tried this grass is in its favor, but British farmers say it is bitter and unfit for either hay or pasture. It is at least worthy of trial in Kentucky As showing more fully the character of the grass, the following is quoted from notes made on the plot grown on the Experiment Farm,

June 13, 1893. Recently replanted. A regular growth of a bright green color.

Aug. 8, 1893. A fair growth. About 8-10 inches long. Coarse ; grayish green, like timothy.

Jan. 20, 1894. A very good green growth in dense tufts.

June 16, 1894. Averages five feet high. Some stalks five feet four inches. Heads 7-14 inches long, a little inclined to droop. Chiefly past its flowering season. Not a very good mat of blades at base, but those well up the stems are of considerable size and sufficiently abundant to make good fodder. Growth still confined to lines in which seed was drilled. Blades 5¾ to 7 inches long and ⅜ inch wide, resembling those of oats and with a gray bloom. Panicles green at first, but finally becoming whitish with a purplish cast.

July 10, 1894. Had this cut yesterday. Weight at present, 40 pounds.

July 26, 1896. Since cutting, this has sent up a good growth of fresh green blades, in places six inches long.

Aug. 23, 1894. A splendid growth of blades. Fresh and green. Would make good pasture. Blades 6-12 inches long.

Nov. 6, 1894. Very good. Uniform. Would make fine grazing. 8-12 inches high. A very slight trace of injury from recent frost.

Dec. 4, 1894. Good, but some brown.

March 6, 1895. Very fair. Generally brown, but with a good appearance of green mixed with it. A dense growth in drills. Does not spread much.

March 30, 1895. Very good. Would make excellent pasture.

April 29, 1895. A fine growth, 12-18 inches high. Growth green, like timothy. No trace of stems yet. The tallest and rankest among the grasses planted.

May 24, 1895. A fine growth just heading out, stems with heads often 44 inches high. Leafy to the top. Would make fine hay. Nodes (joints) dark purple. Heads with a silvery sheen and purple cast, 9¾ inches long in some cases. Longer blades 7¼ inches by ⅜ inch.

June 29, 1895. Cut this on the 27th. Weight, 42 pounds.

July 25, 1895. A splendid growth, 8–10 inches high. A very fine grass.

March 26, 1896. Splendid. Green growth looks well. Several inches long. Best-looking plot of all.

April 17, 1896. Very good. Growing rapidly.

April 27, 1896. A fine stand of green blades 10 inches high. Has not spread from lines in which seed was drilled, but persists in a most vigorous fashion.

July 6, 1896. A very good growth, but not as good as it was last year. Stems 36 inches high. A good growth of blades at base of stems, this growth forming a dense mass about 18 inches high. Stems brown and dry.

July 28, 1896. 18–20 inches high, mostly blades. Few heads this season. Looks well for the season, but is not as good as last year.

June 20, 1897. Seeds ripe for some time.

May 23, 1899. Averages 34 inches high. Headed out. Still shows lines in which it was drilled, but a fine growth notwithstanding, and I cannot see that it has deteriorated in the slightest degree since the first year it was grown here.

August 23, 1899. This old plot still in splendid condition. Now fresh and green and looks like fine grazing.

Arundinaria macrosperma (Cane). The larger growth of this plant furnishes the fishing rods often seen for sale in stores. The small variety from 4 to 8 feet in height is most commonly seen growing in this State, generally in swamp land or along rivers. It is likely to be encountered anywhere within our borders. It has been observed and collected at Bryan Station, Clay's Ferry, High Bridge, Greensburg, and elsewhere. Kearney reports it from the mountains in southeastern Kentucky. The tall variety occurs chiefly in the southern counties. The blades are eaten by stock to some extent.

Bouteloua curtipendula (Racemed bouteloua). A native grass credited to Kentucky by Britton and Brown in their Illustrated Flora.

Brachyelytrum erectum (Brachyelytrum). A slender-stemmed grass with numerous rather short, broad and rough leaves. Grows in rocky woods. Brooklyn Bridge, July 22, 1892; Nortonville, Aug. 7, 1892; also reported from the mountains by Kearney.

Bromus ciliatus (Wood chess). A native grass reaching a height of five feet, with a drooping panicle somewhat like that of English blue-grass, but coarser. Blades numerous, 10 inches long or more, and ½ inch wide. In woods in spring; common. Banks of Kentucky River, Clay's Ferry, May 30, 1892; Tyrone, June 9, 1892; mountains of eastern Kentucky (Kearney).

Bromus erectus (Hairy brome-grass). A tall grass with downy blades and rather coarse panicles, somewhat resembling those of cheat. Encountered in cultivated ground, where it is commonly introduced with seeds of other plants. It is of European origin. Specimens in the herbarium of this Division were collected on the Experiment Farm, May 2 and May 21, 1890.

Bromus inermis (Smooth brome-grass). An introduced perennial of fine appearance, reaching on the Experiment Farm a height of 44 inches, with numerous long blades and an open panicle, slightly inclined to droop, 7½ to 9 inches long and with an expanse of 6 inches. Blades 8-11 inches long and ½ inch wide. It remains green until late in the fall, and starts promptly again in spring, a decided new growth being apparent by the last of March. After cutting it comes up promptly and would furnish grazing during the latter part of summer and in fall. It spreads to some extent by underground stems, and on the Farm the dropped seeds germinated and grew in fall in large numbers. The grass has received extravagant praise, and undoubtedly has some very desirable qualities. Three plantings have been tried on the Experiment Farm. The first one, started in 1892, did remarkably well and lasted until 1897. The second lot was started in 1895 and is still alive, but has never done well, though it generally stands during most of the summer months with a good growth of blades. The third lot of seed was received from the U. S. Department of Agriculture and was sown in the spring of 1898. None of it germinated.

While it seems to be a promising grass, my experience with it is not such as to warrant recommending it without reservation

to Kentucky farmers as a substitute for timothy. It is well worth trying however, especially in sections where timothy does not grow well, for, once started, it seems to be the more persistent and vigorous of the two grasses. The yield per acre, calculating from the product of our plot, is from 1½ to 2 tons. A yield of three tons per acre has been reported by others. It should be cut as soon as the panicles are fully developed and before the seeds have ripened. The seed may be sown either in spring or fall, but from the uncertainty of seed sown in spring, and the fact that the dropped seeds germinate spontaneously in the fall, I am disposed to regard fall as the proper time to plant. It is sometimes planted with winter wheat. About forty pounds of seed to the acre should be sown. Contrary to what has sometimes been asserted, it has not with us shown a disposition to assume the character of a weed.

Bromus racemosus (Upright chess). An introduced grass resembling cheat, sometimes found growing about cultivated ground. Lexington, May 19 to June 5; Cave City, May 19.

Bromus secalinus (Cheat). This notorious grass is the subject of strange beliefs among farmers in the United States. It is held that under some circumstances good clean wheat seed produces nothing but cheat. It is even asserted that after wheat comes up as such, certain kinds of weather will cause it to produce stems bearing cheat instead of wheat. Timothy seed, it is said, sometimes produces cheat. One variation of this transmutation theory has not thus far been encountered in Kentucky, namely that clean cheat seed will under some circumstances produce a crop of wheat. The writer cannot hope to say anything that will kill beliefs that have persisted so long. They are simply curiosities to be classed with the imagined snake that takes its tail in its mouth and pursues a man by rolling like a hoop; with the notion that the number 13 is unlucky; or that a horse shoe placed above the door brings good luck.

Cheat was at one time recommended under various names as a forage plant. Its nutritive value is low, and when fed with almost any other forage plant cultivated in this country

it will be rejected by stock. It is said, however, to be preferred to straw. Lexington, May 22; Pineville, June 16.

Bromus squarrosus (Corn brome)? This is another cheat-like grass, sometimes found growing in Kentucky fields. Introduced with European seeds. Of no value for forage.

Bromus unioloides (Rescue-grass, Schrader's brome-grass). An introduced perennial grass with the general character of smooth brome-grass, but with the panicle coarser, heavier and more inclined to droop, the weight finally becoming so great that it is liable to be prostrated by wind. A plot from seed sown in the spring of 1892 lasted only until 1896, when the last plants were observed, the others having been gradually crowded out by crab-grass and other weeds. Its flowering season was about June 1, and by the 12th the panicles were brown and the seeds ripe. When cut, a very nice growth of new blades appeared before fall that would have afforded good grazing. It would not have furnished winter forage, but started very early in spring, and on January 20, 1894, had produced a fine growth of blades in the path alongside the plot where the seeds had dropped during the preceding season. Fully matured plants taken from the plot June 19, 1894, measured 40 inches in height, the panicle constituting 7½ inches of this. The blades are of a dark sea-green color, with a yellow cross band at the base, are 7–10 inches long, ½ inch wide, the ensheathing portion and the under side of the blade itself, when young, finely pubescent.

It did not stand drought well, and this, I believe, explains its failure to keep possession of the ground. On less porous soils than ours it might do better in this regard. When in bloom it presents a fine appearance. Thirty pounds of seed are sown to the acre. In Georgia it does well when sown in November and December. Here it is best perhaps to sow either in fall or early spring.

Capriola dactylon (Bermuda-grass). Farther south this grass is valued both as a hay-producer and for grazing. It resembles in a general way our crab-grass, so troublesome in

cultivated ground, and has the same habit of spreading by runners which send out roots at the joints (nodes). Seed sown on the Experiment Farm has never germinated, and the only plants I have seen here were grown from material kindly furnished some years ago by Col. J. Stoddard Johnston, of Louisville. These plants lasted only one season and were killed by frost the following winter. When introduced in soil in Western Kentucky, Bermuda grass persists, the climate there being more nearly that of the southern states. I have seen on the lawn of the late J. M. Samuels, of Clinton, Hickman county, a tolerably dense growth of the grass, in flower, and about one foot high. For most of Kentucky it cannot be considered a rival of blue-grass. Its capacity to withstand summer heat and thus furnish green forage when blue-grass is at its worst, would render it useful were it not for the fact that it must be grown by chopping up the stems or roots and sowing them in drills, for it appears not to produce perfect seeds at this latitude.

Prof. Tracy, of Mississippi, says that Bermuda-grass is to the South what blue-grass is to the North, and rates it the best hay and pasture-grass for that section, excepting for wet land. The product is, he says, from two to four tons to the acre. To start a meadow he advises cutting the sod formed by the grass into small pieces about an inch square, and dropping these about two feet apart each way, pressing them into the soil with the foot. When the ground is too hard for this procedure a hoe is made use of to dig small holes, a second man dropping the pieces and covering them. The seed is sown in March, six pounds per acre being used.

Cinna arundinacea (Wood reed-grass). A coarse grass reaching a height of 4 feet, with rough broad blades and a panicle about 7 inches long, resembling somewhat that of red-top, but not spreading, the branches bearing the small flowers extending close along the axis of the panicle. A native species perhaps worthy of trial for forage. Clay's Ferry, Aug. 22, 1893; Nortonville, Aug. 7, 1892.

Dactylis glomerata (Orchard-grass). This well-known grass

has qualities that should commend it to Kentucky farmers who fail with other forage. It is persistent, enduring heat and cold better than timothy. It grows rapidly, is moderately productive, and will thrive either in sun or shade. I have observed some indications that stock in this region do not like it very well, having more than once seen inviting-looking tufts of blades left untouched in pasture where everything else was cropped close to the ground. Yet I am familiar with published statements to the effect that all kinds of stock are fond of it, sheep being said to prefer it to all other grasses. It is nutritious, judged by the chemist's test, ranking in this respect higher than timothy. Sown thickly it will make very good meadow by itself, though the yield is apt to be disappointing because of the few stems and heads produced. It is often planted in mixtures for meadow. It requires a good soil. Grown in a plot on the Station Farm the quality that has especially attracted my attention is the large number of long blades it produces throughout the growing season. From January 20 until October these would furnish grazing. 3–4 bushels of seed are sown to the acre.

A plot of this grass started in the spring of 1892 is still in good condition. Some notes made on the growth from time to time will show among other things its time of flowering and its hardiness compared with timothy, a plot of which lies by its side.

May 13, 1893. A good growth, 7–8 inches high.

June 13, 1893. A fine growth. Blades with a tendency to turn brown at tips, otherwise not very different in appearance from timothy. Along paths especially fine and of a deeper green color than elsewhere. Heads in midst of plot rather scattering. Tallest stems, with panicles, 4 feet 3 inches. Others measure as little as 3 feet 3 inches. Panicles 4 to 6 inches long. Blades at base of plants from 1 foot 4 inches to 1 foot 10 inches long.

August 8, 1893. A very good growth of blades over whole plot. Has stood drought remarkably well.

January 20, 1894. Good; green, might make fair pasture.

June 18, 1894. A good growth of blades giving the appear-

ance of covering the ground completely, but plants still confined to lines in which seed was drilled; unlike timothy in this respect. Many culms as much as 42 inches tall. Panicles 5 to 7 inches long. Blades 8 inches to 1 foot long, ¼ inch wide. At the outside along paths and next adjacent plots the growth is better, the blades assuming a darker and more thrifty color and reaching a length of 18 inches.

July 10, 1894. Cut this yesterday. A good growth of blades left that would furnish some pasture.

July 26, 1894. This has grown perceptibly since cutting, and would now make good grazing. Very much superior to the timothy plot.

August 23, 1894. Good. Would make first-rate pasture. No decided recent growth, however.

September 22, 1894. A uniform growth of blades here, some as much as 13 inches high. Would make fine grazing

November 6, 1894. Very good over whole plot. Would make excellent grazing. Growth dense, about 8 inches high.

December 4, 1894. Largely brown, from frost.

March 6, 1895. Very brown, but with green blades in midst of tufts, showing that the roots are everywhere alive.

March 30, 1895. Good. Green and brown evenly mixed. Would make some pasture.

April 29, 1895. *Very good.* A uniform growth of grayish green blades, 10 inches high on an average. In places at edges 14-16 inches high. Much finer than timothy plot at present.

May 23, 1895. Very good. Heading out. Stems with heads 36 inches high. Some heads much less advanced and not showing stamens. A good growth of blades, some of them 10 inches long and ¼ inch wide, keeled on the back. Some heads 10 inches long, with an expanse of 5 inches.

June 29, 1895. Cut this on the 27th. Could be used for grazing now. Culms with panicles average 42 inches; some reaching 52 inches.

July 25, 1895. The orchard grass plot now presents a good appearance. Recent rains have caused it to freshen up and the whole plot is now green.

March 26, 1896. Good. Some green.

April 17, 1896. Good. Growing rapidly. 6 inches high.

April 27, 1896. Growing rapidly. In advance of timothy.

July 6, 1896. Very good. Ground appears to be covered, but the rows in which it was drilled can still be seen. Stems rather scattering, but growth of blades good; 11¾ inches long, 5-16 inch wide. Stems brown and dry, about 32 inches long.

July 28, 1896. A good growth of blades. 8-10 inches long. Few heads.

June 20, 1897. Seeds ripe. Heads becoming brown.

May 23, 1899. Average height about 34 inches. Headed out. A splendid stand on this old plot. Will make a good yield of hay.

August 23, 1899. The grass in this plot has been cut, but is now looking fresh and green again.

The grass grows spontaneously throughout Kentucky, being frequently encountered along roadsides and in fence corners where it has come up from seed scattered by passing wagons. It is not so commonly sown in Blue-grass Kentucky as it is outside this region, and I am informed by local seedsmen that most of the demand for seed comes from the mountain and western sections of the State. According to one of our dealers, Mr. D. C. Frost, this grass stands first among forage plants sown by farmers outside the Blue-grass region, while within it ranks only sixth.

Dactyloctenium ægyptium (Egyptian grass). I have seen nothing of this grass in Kentucky, except a small plot obtained in 1896 from seed furnished by the United States Department of Agriculture. It produced a very scant growth, averaging, when fully grown, about one foot high, with the tallest plants about 14 inches. The stems terminate in from two to five rather thick spikes, the axes of which are free from spikelets at the tips and project in the form of a short spine. In some respects it resembles the common yard-grass. It does not impress me as a promising grass for this region. Plants from seed sown in the spring of 1896 were fully developed and in flower on April 25. It is an annual.

Danthonia compressa (Wild oat-grass). A slender-stemmed native grass, with narrow blades and few-flowered panicles. Observed only in the mountains at Pineville, in 1892. A specimen in the Station collection measures about 29 inches in height.

Danthonia spicata (Wild oat-grass). Also native of the State, but more widely distributed than *D. compressa*. Smaller and with the blades more slender and shorter. Pineville, June 15, 1892; Crab Orchard, June 18, 1892; Junction City, June 19, 1892; Jackson, May 26, 1895; Russell, June 9, 1898; Central City, May 15, 1899.

Deschampsia flexuosa (Wavy hair-grass). A few tufts of this grass have been observed by me about the grass plots on the Experiment Farm at Lexington, produced in all probability from seeds mixed with European grass seeds of other kinds. It appears to have no value for forage. The blades are small, slender and mostly at the bases of the stems. The panicle may be four or five inches long, the flowers, at length purplish with a satiny lustre, mostly out toward the extremities of rather long, hair-like branches. Plants in the collection measure 18 to 20 inches in length.

Eatonia nitida (Slender eatonia). A slender-stemmed grass with a rather long drooping panicle, flowering in early spring. Most of the blades are at or near the base. Height, about 2 feet. A perennial. Jackson, May 26, 1895; Natural Bridge, May 10, 1896; Cecilian, May 11, 1899; Central City, May 15, 1899; Prentiss, Ohio County, May 12, 1900 (from Mr. E. G. Austin).

Eatonia obtusata (Blunt-scaled eatonia). A native perennial, with slender panicle and rough blades ¾ inches long and in some cases ¼ inch wide, the sheaths finely downy. Cave City, May 19, 1898.

Eatonia pennsylvanica. Similar to the preceding, but with the panicle less compact, the branches being longer, less numerous, and the flowers fewer in number. High Bridge,

June 8, 1892; Central City, May 15, 1899; Cloverport, June 3, 1899.

Eleusine indica (Yard-grass, crab-grass). A tufted, leafy grass of dooryards, flourishing especially where water is thrown, with 4 to 6 one-sided spikes, diverging from or near the upper extremity of the stem. Annual, but persistent, growing again rapidly when cut, and liked by stock, though commonly looked upon as a weed. In moist rich ground, where not trampled by stock, it grows to a height of 33 inches or more. The stems bear numerous, rather broad leaves, 13 inches long in some cases, of a deep, glossy green color, with soft, scattered hairs on the upper surface and at the bases of the sheaths. The blades differ from those of many grasses, but resemble those of orchard grass, in being folded so as to produce a decided keel on the back. Yard grass stands heat remarkably well and seems to have qualities which might make it valuable for summer forage. West Point, June 27, 1892; Lexington, July 3, 1896; Lexington, August 1, 1889.

Elymus canadensis (Nodding wild rye). This is a coarse rough bladed grass with a head 4 to 5½ inches long, somewhat resembling that of bearded wheat. Blades often 12 inches or more long and ⅜ inch broad. Occurs along Kentucky River. Clay's Ferry, Aug. 22, 1893.

Elymus striatus (Slender wild rye). Similar to the preceding grass, but the heads smaller, about 2½ inches long in herbarium specimens before me. Probably of little value as forage. Tyrone, July 14, 1892; Hopkinsville, Aug. 8, 1892; Lexington, Aug. 7, 1893.

Elymus virginicus (Lyme-grass, wild rye). A coarse wheat-like grass somewhat resembling the two preceding species and like them of no agricultural value. Not rare on damp ground along streams. Brooklyn Bridge, June 22, 1892; Maysville, June 27, 1892; Lexington, July 27, 1893; Clay's Ferry, July 27, 1893; Clay's Ferry, Aug. 22, 1893. It has been sent to the Station from Bowling Green by Mr. E. W. Slayton.

Eragrostis abyssinica (Teff). A plot of this annual was planted on the Experiment Farm in the spring of 1896, with seed furnished by the United States Department of Agriculture. The seed germinated well, producing a fine growth of a very pale green color, which on July 6 had reached a height of 32 inches, though not yet in bloom. The blades which were scattered along the stems measured at this date 17½ inches in length and ¼ inch in width. On July 23 some of this grass, then with fully developed panicles, measured 3½ feet in height, the panicles themselves measuring in some cases 12 inches in length. The stems are rather slender, the panicles long and slender and disposed to droop, the branches thread-like. Yet from the closeness with which it grows it is calculated to produce a large amount of forage. We have been very favorably impressed with the grass, and though an annual, think it may prove of value. It stands drought well, and grows rapidly. When cut it produced a decided growth of blades again before fall. Professor Scribner wrote me under date August 24, 1896, that it was one of the most promising grasses grown at the Tennessee Station in 1895. It seems to be a native of northeastern Africa, where the seeds, which are produced in large numbers and are easily harvested, are used as food. It is not yet listed by our seedsmen, so far as I have examined their catalogues.

Eragrostis capillaris. A native annual, probably not valuable in any way, observed in the mountains of southeastern Kentucky by Kearney.

Eragrostis frankii. A strong scented grass reaching a height of about 14 inches, with a small-flowered panicle, sometimes 6 inches long and 1½ inches in expanse. Inclined to grow in tufts, on low ground along streams. Common from the mountains to the Mississippi River. Frankfort, July 30, 1892; Lexington, August 17, 1893; Clay's Ferry, August 22, 1893; Lexington, September 8, 1894; Clinton, 1898.

Eragrostis hypnoides (Creeping meadow-grass). A low grass, sometimes attaining a height of about a foot, which

spreads by runners which send out roots at intervals and from the same region produce more or less upright branches bearing small and rather compact panicles. A weed. Clay's Ferry, August 21, 1893; Clinton, 1899.

Eragrostis major (Stink-grass). While walking about cultivated ground in Blue-grass Kentucky one is frequently reminded of the presence of this grass by the peculiar buggy odor it exhales. For its genus it is a rather coarse species, attaining sometimes a height of two feet, the stems bearing compact panicles which, when fully developed, measure from about 2½ to 5½ inches in length and have an expanse of from 1½ to 2½ inches. A weed, without any redeeming qualities. Lexington, August 13, 1889; July 3, 1890; October 6, 1894.

Eragrostis pectinacea (Purple eragrostis). Miss Sadie F. Price reports this grass as having been observed at Bowling Green. Professor Scribner says it is common in Tennessee in dry sandy soil, and is made use of for dry bouquets.

Eragrostis purshii. A tufted species growing to a height of 15 inches. A rather common weed, occurring in all parts of Kentucky. Lexington, July 3, 1890; Hickman, August 9, 1892; Clay's Ferry, August 21, 1893.

Erianthus alopecuroides (Spiral-awned beard-grass). A coarse native grass which may reach a height of eight feet or more, bearing at the summit of its stem a close spike-like panicle 5½ to 7 inches long and 1 to 1½ inch in expanse, becoming woolly and of a pale brownish cast when fully mature. Probably of no value for agriculture, but possibly worth cultivating for ornament, as it is one of the most imposing native members of its family. It has been observed by me only at the Sinks of Roundstone Creek, near Livingston.

Erianthus ravennæ (Woolly beard-grass). A tall grass somewhat resembling the preceding, but with a more spread-

ing panicle, often seen in cultivation about lawns. Introduced from Europe. Lexington and elsewhere in the State.

Euchlaena luxurians (Teosinte, Mexican forage plant). Teosinte makes as good forage as corn in Kentucky. Planted in April it continues to grow until killed by frost, for it comes from the South and requires a longer season than ours to reach maturity. I have thought sometimes that it endures drought better than corn, at any rate it furnishes excellent green fodder throughout late summer. Several plots have been grown on the Experiment Farm. The seeds invariably germinated well. The plants after coming up grew rapidly. Planted May 7, 1895, it was 15 inches high June 29 with blades 19 inches long and ¾ to 1 inch wide, the general character of the plant so much like corn that it might have been taken for the latter. On August 31, 1895, the plants were 4½ feet high, the stems ¾ inch in diameter at the base, the blades as much as 2 feet 10 inches long. It continued to grow until the latter part of September, reaching finally an average height of about 6 feet, and when finally killed by frost showed no trace of flowers. Planted a little earlier and given more room it grows here to a height of 8 to 10 feet, but I have never known it to produce seeds. It is a valuable plant for both green and dry fodder, but its failure to fruit must always render its cultivation somewhat costly, and I think at present corn or sorghum are to be preferred, excepting possibly for some of the counties of southwestern Kentucky, where it should at least be tried. It is better adapted to the southern tier of states, where, according to Professor Tracy, it gives the heaviest yields of any forage plant grown, "Georgia reporting 38,000 pounds of green forage per acre, Mississippi, 44,000, and Louisiana, the enormous amount of over 50 tons." The trial plots grown at the Experiment Farm were sown in drills, but it was evident that this method does not give the plants sufficient room to get from them the greatest possible quantity of forage. It is best sown in hills, like corn, but rather farther apart, using 4 to 5 pounds of seed to the acre. It has been tried at Louisa, Lawrence County, by Col. Jay H.

Northup, who wrote in a letter dated August 27, 1896, that his plants were doing exceedingly well, ranging at that date from 8 to 10 feet high, with as many as 25 shoots from a single hill.

Teosinte is a native of Central American countries, from which circumstance the name Mexican fodder plant is sometimes applied to it. An eastern seedsman's catalogue before me quotes seeds at 80 cents per pound.

Festuca elatior (English blue-grass). But few of the grasses tested on the Experiment Farm have done as well as this. It spreads by the roots so as to cover the ground closely in time, and afterward excludes everything else in the way of plants. A plot started in the spring of 1892 is still in good condition, though it has had no attention since the first year, beyond cutting it from time to time. About June 15 the grass in this plot averages about 4 feet in height, with some plants nearly 5 feet high. It is generally in bloom and ready to cut at this date, and by the last of the month the seeds are ripe. On a rather heavy soil that holds the water pretty well it will endure any drought we have, and produce good pasture in summer and fall after being cut. On the Experiment Farm it has suffered from drought only one season (1893), although the soil is poor and inclined to dry out very thoroughly in hot weather. It does not suffer from frost more than Kentucky blue-grass, and even after snows, some green blades can generally be found among the dense mat covering the ground. In the quality of durability we have grown nothing that surpasses it. From notes made on this plot the following are quoted:

May 13, 1893. A splendid growth 8 inches high. Uniform.

June 12, 1893. In Flower and at its best. Averaging 4 feet 2 inches in height. A uniform growth with rather pale green blades and slender stems, swaying in the wind. Blades form a mat among bases of stems, averaging 18 inches high. Panicles about 11 inches long, ranging from 8 to 12 inches; inclined to be one-sided and not much spreading; pale green at first, becoming purplish later.

Aug. 8, 1893. A very good and uniform growth 6-8 inches

long. Stood the drought of July very well. This month the dryest July in 9 of which Prof. Muncy, Meteorologist of the Station, has record.

Sept. 16, 1893. Very good at edges along paths and in places elsewhere, but a good deal has been dried out and is now dead as far as appearance goes.

January 20, 1894. Good. Green blades 6 inches long.

June 16, 1894. Grass uniformly good, averaging four feet high. Good growth of blades of a bright-green color. Fresh stamens exposed this morning. Blades 16 inches long, ¼ to to ⅜ inch wide, striate above and opaque; glossy below at length. Panicles 9–11 inches long, pale-green when the anthers are exposed and erect; the lower branches extending outward from axis; closes up when more mature, droops somewhat and assumes a purplish color; a part of the plants, probably a third, is now in latter condition. Presents a fine appearance. Lines in which seed was sown pretty well obliterated.

August 23, 1894. In good condition, showing a growth that would make excellent grazing. Blades 7 inches long on an average, many a foot or more long. (It was cut in July.)

September 22, 1894. A splendid growth of bright-green blades 8–12 inches long and 1¼ inch wide; glossy.

November 6, 1894. Good. A fine growth of blades 10–14 inches long.

December 4, 1894. Good; some brown from frost.

March 6, 1895. Brown from snow and frost, but with some green blades among the others. Good.

March 30, 1895, second warm day of spring. Good; blades pushing up rapidly.

April 29, 1895. A fine uniform growth of glossy green blades, averaging nine inches high.

June 29, 1895. Stems as much as 57 inches long. Panicles 7½ to 11 inches long. Average height 42 inches, about. A fine growth of blades at bases of stems. A splendid grass. Seeds ripe and dropping. Stems green yet.

August 23, 1899. This plot is still in fine condition. A splendid growth of broad blades.

English blue-grass is thoroughly at home in Kentucky, often springing up along roadsides from scattered seeds. It is frequently grown in this part of the State, but is perhaps not made use of as much as it should be. One of our seedsmen places it tenth on the list of forage plants called for by farmers. It is both nutritious and palatable. Forty pounds of seed are sown on an acre. Seeds sell for from $22 to $25 per hundred pounds.

Festuca nutans (Nodding fescue-grass). A native perennial grass reaching a height of about 34 inches, with a few-flowered panicle, the spikelets at the extremities of the branches. Collected at Torrent, June, 1899.

Festuca octoflora. A slender-stemmed native grass, with contracted panicle of rather large spikelets. Height about 12 to 18 inches. Blades very narrow. Of no agricultural value. Nortonville, May 13, 1898.

Festuca ovina (Sheep's fescue). A plot of this species was started on the Experiment Farm in 1894 and is still in good condition. After the first season it occupied the ground very well, growing in tufts along the lines in which the seed was planted, and never spreading from them. The blades are very slender, folded, and are of a bluish green color owing to a gray bloom which covers them. By the middle of May or a little later its panicles are fully developed and in early June the seeds have ripened and the stems become brown. The quantity of forage produced is always small, the blades not often exceeding 7 inches in length, while the stems, which are exceedingly slender, with the panicles were not observed to surpass 22 inches in height, and were oftener in the neighborhood of 15 inches. Our plot on the Experiment Farm was started in the spring of 1894 and continues at the present time in good condition, although still growing in the lines as originally drilled. It is not adapted for hay, but may serve for grazing in sections where blue grass does not thrive. It has one very good quality for pasture, which is, hardiness in fall and winter, when it is generally one of our best plots in appear-

ance. Whether it will stand the trampling of stock I am unable to say. It does not spread by its roots, and the dropped seeds have never germinated in the plot. The following observations are from notes on the plot:

September 22, 1894. This has been growing since the recent rains and presents a good appearance. Blades very narrow; 4-6 inches long.

November 6, 1894. Very good. Color bluish, owing to a gray bloom. Tufts in lines often meeting.

December 4, 1894. Good. No brown.

March 6, 1895. With tufts of narrow blades; only a little brown at tips.

March 30, 1895. Very good. Uniformly green. Dense tufts of narrow deep green blades.

April 29, 1895. Covers the ground fairly well, the tufts joining in the rows, with a diameter of from 8 to 10 inches. Now with contracted panicles; 9 to 10 inches high.

May 20, 1895. Now at its best. A grayish purple aspect as one looks over the plot. Stems as much as 22 inches high. Average about 20 inches. Slender; upright; panicle 4¼ to 5 inches long; 2¼ inches in expanse; spikelets a decided purple on one side, green on the other, the branches purplish. Blades as much as 7 inches long, folded, flattened, about 1-25 inch wide, dark bluish green. Does not spread rapidly; can now walk between rows in which seed was drilled; but with the spreading of tufts gives appearance of a completely covered plot.

June 29, 1895. Stems completely brown and seeds ripe, mostly dropped. Blades much as in spring. Would not yield much hay, nor very much grazing.

June 25, 1895. Stems dead. Blades not much larger than in spring. Tufts not spreading.

The grass is reputed to be adapted to uplands where the soil is poor. 35 pounds of seed are sown on an acre of ground. It is believed to be native to both this country and Europe.

Festuca pratensis (English blue-grass). This grass and *F. elatior* are commonly regarded by botanists as varieties of one spe-

cies, but grown side by side with the other it shows so many differences that it is best to treat them separately. It is a much slighter, less vigorous grass, with a narrower shorter blade, and in our plot, never spread from the lines in which seed was sown. This is a very important character when the grass is considered as forage, and renders it much less desirable than the tall English blue-grass. The yield from the plot has never been much more than half that from the other. Some of my field notes are given below:

June 12, 1893. This grass averages less tall than *Festuca elatior*. It is less coarse, the blades at the base much more slender and standing erect, the tips being highest. Panicles more contracted, pale green, showing at no time the distinct purple color of those in the other plot. It is somewhat earlier in flowering, most of the panicles at the sides of the plots having pretty well developed seeds; in the center of the plot some are still flowering. Tallest stems, with panicles, measure 3 feet 8 inches; average about 3 feet 6 inches. Longest panicles, 10 inches; average about 8 inches. Longest blades at bases of plants about 1 foot 4 inches. A rather close growth of about the same color as in the other plot; both have a pale gray bloom on the upper side of blades when young, but become glossy on both sides when older.

January 20, 1894. In good condition. Some green, but mostly concealed by last year's growth.

June 16, 1894. A fair growth, but strictly confined to lines in which seed was drilled. Averages 35 inches high. Panicles 5¾ to 7 inches long. Blades reaching a length of about 10 inches, averaging less than ¼ inch wide; erect.

August 23, 1894. Condition good. Would make some grazing. Not as good as *F. elatior*, but has endured the evere drought of the past month very well.

September 22, 1894. A fair growth of slender blades 8½-9 inches long; 1-16 inch wide. Plot invaded by yellow fox-tail at one side, and throughout to some extent by crab-grass. It does not hold its own against these as does *F. elatior*.

November 6, 1894. Improving since the weather became cool and the ground moist.

March 6, 1895. Brown, with some green blades appearing. Looks well, but does not form the same close mat as does *F. elatior.*

July 6, 1896. Not as good as usual this season. Original drills still apparent. Blades not more than 10¾ inches long. Stems with panicles few, owing to drought of early spring. Does not approach *F. elatior* in amount of forage. Growth so scant that weeds are coming up between rows.

May 23, 1899. Can still see lines in which this plot was drilled, although they long ago disappeared in the adjoining plot (occupied by *F. elatior*). Average height not more than 8 inches. Mostly not in flower.

I find seeds advertised for $13 per hundred pounds.

Festuca rubra (Red fescue). Our plot of this grass was started in 1892, and is still good. In the quality and amount of forage it does not differ much from sheep's fescue, but there is one important difference, namely, its disposition to spread at the roots. The lines in which it was drilled were long ago obliterated.

It is in bloom about May 20, when the stems with panicles average about 26 inches high, the panicles ranging in length from about 3¼ to 4¾ inches, and expanding from 1½ to 2 inches. The largest blades do not exceed 9 inches, while they are more often about 5 inches long.

Like sheep's fescue, it is reputed valuable for dry gravelly uplands. Its habit of spreading may render it valuable for binding soils liable to wash badly. It is sold for $20 per hundred pounds of seed. 25 pounds serve for an acre.

Holcus lanatus (Velvet grass). Velvet grass has not proved itself in any way remarkable in our plot. It has been replanted several times, but winter kills badly, and soon disappears. The plot was on rather low ground, however, where water sometimes stands for short periods in winter, and it is probable it would have done better on higher ground, where the surface drainage was better. It seems to be well adapted to this region, and may be found growing spontaneously in eastern Kentucky, though it is not common.

April 23, 1898, Mr. John Pearl, of Fariston, Laurel county, wrote me enclosing a specimen of this grass from a meadow at London, Ky., on the place of Mrs. S. E. Hardin, where he reported it had been growing for many years and appeared to "get better every year."

The grass is peculiar in having the broad blades and their sheaths covered with a soft velvety down. On the Farm it has grown to a height of 26 inches, the rather close gray panicles measuring from 2 to 5 inches, and expanding an inch or somewhat less. The blades are rather short (about 3 inches long), but broad, and are produced in large numbers. The panicles are fully developed during the last week in May. It is a native of Europe, being known in England as Yorkshire fog. It has no very good reputation there, being commonly regarded as a weed, to be got rid of as speedily as possible. It has been observed growing spontaneously in Jessamine county, and at Pineville.

Homalocenchrus oryzoides (Rice cut-grass). A coarse native grass, common in wet places along ponds and streams. The edges of the blades are very rough and harsh to the touch. It produces an open panicle in September, often 8 inches in length and 6 inches in expanse. It produces in midsummer a large quantity of bright green blades, which are sometimes cut for hay by colored people, who render it a little more palatable by the addition of salt.

Lexington, Sept. 2, 1889; Lexington, Aug. 7, 1893; Lexington, Oct. 6, 1894.

Homalocenchrus virginicus (White grass). A native species similar to the preceding, but with the panicles smaller and simpler, the stems more leafy; the blades not so harsh. Grows on wet ground.

Nortonville, Aug. 7, 1892; Lexington, Aug. 29, 1892; Lexington, October 6, 1894. Observed also by Kearney in the mountains.

Hordeum pusillum (Barley grass). Specimens of this, collected by me at Bowling Green, May 18, 1894, measure about

16 inches inches in height and bear spike-like panicles resembling those of cultivated barley, from ¾ to 3 inches long. The grass is said to be liked by cattle.

Hordeum vulgare (Barley). A well known cultivated grain of eastern origin, where with wheat it has been grown for many centuries. It produces a two or six-rowed spike somewhat like that of wheat, but rather more strongly bearded. These two varieties are sometimes ranked as distinct species. The seed is of a brownish hue, in one variety, known as imperial black barley, of a decided blackish brown color. It is more slender than wheat, with the same general shape, but is not as slender as rye. Both spring and winter varieties are in cultivation.

Formerly it was extensively cultivated in Kentucky and commanded a price of from 60 cents to $1.00 per bushel. At present but little is grown here. One of our foremost seedsmen informs me that he sold seed for but one field in 1899.

Hystrix hystrix (Bottle-brush grass). A tall, broad-bladed, native grass growing in rocky places along Kentucky River. High Bridge, June 8, 1892; Brooklyn Bridge, June 22, 1894; Tyrone, July 14, 1892. Observed in the mountains of Kentucky.

Ixophorus glaucus (Pigeon grass, yellow foxtail). A common weed in cultivated ground. Produces late in summer a cylindrical, hairy spike, which when mature assumes a yellow color. Annual, and of no value for forage. Occurs throughout Kentucky. Lexington, August 12, 1890; West Point, July 27, 1892; Guthrie, August 4, 1892; Nortonville, August 7, 1892; Louisville, September 6, 1894 (received from Mr. Karl Yungbluth); Brooklyn Bridge, August 15, 1895; Clinton, 1898.

Ixophorus italicus (Italian millet, German millet, Hungarian grass). An introduced annual forage plant, very commonly grown in Kentucky for hay and for soiling. Its rapid growth and large yield makes it of value for the purpose. The seeds

are used to some extent for poultry. From a bushel to a bushel and a half should be sown to the acre.

Ixophorus verticillatus (Foxtail grass). A leafy stemmed weed, with panicles in the form of cylindrical, somewhat interrupted, green spikes. Common about Lexington in cultivated ground. Lexington, August 2, 1889; Lexington, September 26, 1889; Lexington, August 3, 1893.

Leptochloa mucronata. An annual species, sometimes found in cultivated ground. The stems at their summits bear numerous slender spikes, together forming a loose panicle-like cluster, which may be as much as 16 inches long and 8 inches in expanse. Lexington, September 3, 1890.

Lolium italicum (Italian rye-grass). This introduced species has been highly recommended for meadow, but has never done well in the plots of the Experiment Farm, the growth being light, and the plants lacking in vigor. Where we have succeeded in getting a good stand it disappeared in the course of a couple of seasons. Plants preserved as herbarium specimens measure 20 inches in height, some of the stem blades being 5½ inches long and 1¼ inches wide. The large spikelets alternate along the terminal portion of the stem producing a slender spike 6 to 7½ inches in length.

Italian rye grass is little more than an annual, and probably is not as valuable here as it is in England. With the next, of which it is sometimes considered only a variety, it has been very highly praised by British farmers. By one of our seedsmen the seed is advertised for $7 per hundred pounds. Fifty pounds serve for an acre of ground.

Lolium perenne (Perennial ray-grass, perennial rye-grass). This species resembles the Italian rye-grass closely, the important character separating the species being the absence of bristles on the chaff of this, the preceding species being provided with short ones. It has not proved a remarkable grass in our plot, and I am unable to recommend it from the experience we have had with it. The seeds sell for the same price

as the preceding, and are sown in the same quantity to the acre. In our plot it was in bloom and ready to cut in the latter part of May.

Melica diffusa (Tall melic-grass). A native grass credited to Kentucky by Britton and Brown in their "Illustrated Flora." It is not in the Station collection.

Melica mutica (Narrow melic-grass). This is also a native species, and has been recorded by Miss Sadie F. Price as occuring in Warren county.

Muhlenbergia capillaris (Long-awned hair-grass). A native grass, growing in sandy soil, credited to Kentucky by Dr. Asa Gray.

Muhlenbergia diffusa (Nimble will). A slender, low-growing grass, often seen about lawns and in woodland pastures, where it sometimes crowds out the more valuable blue-grass. It grows to a height of from one to two feet, according to the soil, producing numerous sharp-pointed blades, one inch or less in length. The panicle, which is developed in August and September, is slender and wisp-like, with small flowers, the scales of which bear slender bristles. It spreads to some extent by sending out roots at the joints of the stems.

While this grass is commonly regarded as a weed and is certainly objectionable in a good lawn or pasture of blue-grass, it has when young some value as forage, though the amount produced is small. It has been observed to be common in the woodland pasture of the old Henry Clay place. Brooklyn Bridge, June 22, 1892; Lexington, September 16, 1892; Clay's Ferry, August 22, 1893; Lexington, September 30, 1893; Louisville, September 6, 1894 (Karl Yungbluth); Lexington, September 22, 1894.

Muhlenbergia mexicana (Meadow muhlenbergia). This is a taller species of the genus, with more compact panicle and larger blades (2½ to 2¾ inches long in a specimen before me, sometimes as much as 6 inches). Of no value for forage. Lexington, September 6, 1890; mountains of eastern Kentucky (Kearney).

Muhlenbergia sylvatica (Wood muhlenbergia). A native perennial, spreading by underground root stocks. Height about 2 feet. Blades sometimes reaching a length of 6 inches, with a width of 3-16 inch. Clay's Ferry, August 22, 1893.

Muhlenbergia tenuiflora (Slender muhlenbergia). Similar to the preceding and like it spreading by means of scaly root-stocks. Panicles much larger and more slender. A woodland species. Nortonville, August 8, 1892; eastern Kentucky (Kearney).

Oryzopsis melanocarpa (Black-fruited mountain rice). A tall, long-leaved, native perennial, found in rocky woods. A specimen in the Station collection measures nearly four feet in height, the upper part of the stems with blades 10 inches in length, and bearing slender, large-flowered panicles about 7 inches long. Brooklyn Bridge, June 22, 1892.

Panicularia acutiflora (Sharp-scaled manna-grass). A tufted native perennial about 18 inches high, growing on wet ground. The panicle is very slender, the spikelets very large. Numerous slender blades arise from the base of the stems. Cave City, May 19, 1898.

Panicularia elongata (Long manna grass). A native species collected at Torrent, June 4, 1898.

Panicularia fluitans (Manna grass, floating meadow-grass). This species grows in wet ground along ponds and ditches, sometimes in shallow water, producing a coarse forage of some value. In European countries it is said to be cultivated to some extent for meadow, and the seeds are gathered for food. It may perhaps prove useful for wet land in this country. I have not seen the grass mentioned in our seedsmen's lists, but probably the seeds could be obtained from abroad by any of the prominent seedsmen. It grows to a height of three to five feet, and bears blades which may reach a foot in length, and have a width of ½ inch. The panicle, with a small number of long and narrow spikelets, is some-

times more than a foot long. It is credited to Kentucky by the botanists, Britton and Brown.

Panicularia nervata (Meadow spear-grass). A leafy-stemmed, native perennial grass, growing on wet land to a height of 4 feet, producing in June a large spreading panicle often as much as 9 inches in length and 5 inches from tip to tip of the spreading branches. Blades of preserved specimens are 15 inches long and ¼ inch wide. It has all the outward appearance of a good forage plant, but is only seen growing spontaneously in the State. Whether or not it has been cultivated I am unable to say, but it is certainly worthy of trial on land that is too damp for the plants in common use. In nutritiousness it ranks with the best of our grasses, and is said to keep its value longer than most grasses when left standing, thus giving a greater range of time for cutting. Low ground, Lexington, June 9, 1890; Tyrone, June 9, 1892; Lexington, June 11, 1892; Crab Orchard, June 18, 1892; Lexington, May 16, 1894; College campus, Lexington, June 29, 1894.

Panicularia pallida (Pale manna-grass). A native perennial, growing in water at the edges of ponds. Credited to Kentucky by Dr. Asa Gray.

Panicum agrostoides. A native perennial growing along streams and ponds in damp soil. Stems sometimes 3 feet high, the panicles 7 inches long, with numerous rather small spikelets, the branches not spreading much. Blades long and broad. Possibly of value for cultivation on wet ground. Guthrie, August 4, 1892; Nortonville, August 7, 1892; observed also by Kearney in the mountains of eastern Kentucky.

Panicum anceps (Beaked panicum). A coarse, long-bladed grass of damp ground. Height 2 to 4 feet. Panicle straggling, 10 inches or more long, the lower branches widely separate from the upper, the spikelets curved, acute. With a scaly, creeping root-stock; stem flattened. Perennial and native to this country. Guthrie, August 4, 1892; Hopkinsville, Aug. 8, 1892; Greensburg, July 8, 1895; Dickey's Mills, July 14, 1896.

Panicum barbulatum (Barbed panicum). A native grass of wet ground. Aden Springs, June 24, 1892; Guthrie, August 4, 1892.

Panicum capillare (Old witch grass). A hairy, annual weed of cultivated fields, attracting attention because of its large and wide-spreading panicle, which often measures 18 inches in length and 16 inches from tip to tip of the very slender branches. Late flowering, with small spikelets at the extremities of the branches. Blades from ½ to ⅝ inch wide. 18 inches to 4 feet high. Of no value for forage. Lexington, October 2, 1889; Lexington, September 6, 1890; Lexington, September 24, 1894.

Panicum clandestinum (Hispid panic-grass). A native grass of moist soil in thickets and woodland. Sometimes 3 feet high, with stem blades 1½ inch wide, 8 inches long, clasping at the base. The panicle is small, 4¾ long by 2¼ inches in expanse, the spikelets few in number. Aden Springs, June 24, 1892; Lexington, June 5, 1894.

Panicum commutatum. Credited to Kentucky by Professor Beal.

Panicum crus-galli (Barn-yard grass, Japan barn-yard millet). A coarse annual with broad leaves and loose, bristly panicle, which may be 10 inches long and six from tip to tip of the longest branches. Common in rich moist soil, where it sometimes grows to a height of seven feet, though commonly not so tall. Blades often 15 inches in length and ⅝ or more in width. It has been grown from seed on the Experiment Farm, but did not show itself remarkable in any way. Planted April 25, it was 4 feet high when the panicles were developed, August 20. On first rate soil it produces a large amount of forage suitable, like millet, for use when green. It does not cure well.

Lexington, June 28, 1892; Lexington, August 2, 1892; Lexington City Reservoir, very common and rank of growth, August 27, 1896.

Panicum dichotomum (Forked panicum). A common native perennial, growing in woodland.

Tyrone, June 9, 1892; Pineville, June 15, 1892; Crab Orchard, June 18, 1893; Jackson, May 26, 1896.

Panicum depauperatum (Starved panicum). A slender native perennial, of no evident value.

Crab Orchard, June 18, 1892.

Panicum elongatum (Long panicum). Credited to Kentucky by Britton and Brown, also by Scribner.

Panicum filiforme. Credited to Kentucky by Kearney.

Panicum latifolium (Broad-leaved panicum). A native grass with slender stems and short broad blades, these in preserved specimens 3¼ inches long by 1 inch wide. Panicle open, with a few rather large spikelets at the ends of thread-like branches. Height about 22 inches. Perennial.

Tyrone, June 9, 1892; Pineville, June 14, 1892; Cumberland Falls, July 12, 1892.

Panicum laxiflorum. Russell, Ky., June 9, 1898.

Panicum microcarpon (Small-fruited panicum). Cumberland Falls, July 12, 1892.

Panicum miliaceum (Millet). A coarse annual grown very extensively in eastern countries for its seeds, from which flour can be made. Not generally grown in this country. It is an excellent soiling plant for milk cows when grown in good ground; on sterile soils the yield is likely to be small. It must be cut when in bloom, as the stems soon afterward become hard and innutritious. Millet grown on the Experiment Farm measured about 22 inches in height, the broad blades 10 inches long and clasping at the base, the panicle loose but not spreading much, its branches bearing numerous large spikelets at the extremities, the whole with a length of about seven inches. The seeds are glossy and fully twice as

large as those of the more opaque and whitish German millet seeds. They weigh about 50 pounds to the bushel.

Panicum pubescens. A slight, native perennial of woodland. Blade, sheath and stem downy. Panicle open and rather small.

Pineville, June 15, 1892; Aden Springs, June 24, 1892; Clay's Ferry, August 22, 1893.

Panicum proliferum (Spreading panicum). A coarse, thick-stemmed, smooth annual growing in damp places in cultivated ground and along ponds and ditches. Sometimes four feet high, the loose panicles 18 inches or more long and expanding as much as 20 inches. Blades ¾ inch wide and 18 inches or more long. Like barn-yard grass it is calculated to produce a large amount of forage, but as far as I know it has not been cultivated. Cattle are said to eat it freely.

Lexington, September 1, 1889; Lexington, September 12, 1889; Van Meters, August 14, 1893; Lexington, September 8, 1893; Lexington, September 11, 1894; Lexington, August 7, 1896; August 27, 1896.

Panicum ramulosum. Southeastern Kentucky.—Kearney.

Panicum sanguinale (Crab-grass, finger-grass). This is a troublesome annual weed, occurring everywhere in cultivated ground, especially in stubble fields, and among late potatoes where these are not well tilled. In the latter part of July it ranges from about 12 to 18 inches in height, though in good soil growing considerably taller. The stems are very slender and bear at or near the upper extremity from 3 to 7 slender spikes from 3 to 4 inches long, and, when mature, of a purplish hue. The short blades and their sheaths are pubescent. The plants send out roots at the lower joints of the stems. It makes a very good hay, though rarely used for the purpose in this region. At the South it is with Bermuda-grass considered a valuable hay-plant, and we are told by Prof. Tracy, of Mississippi, yields as much as two tons to the acre. He says of it, "Although not often in the market, crab-grass

furnishes more forage for home use in the Gulf States than any other grass.''

Lexington, July 24, 1889; Lexington, July 3, 1890; Louisville, September 6, 1894 (Karl Yungbluth).

Panicum scribnerianum. Credited to Kentucky by Miss Sadie F. Price.

Panicum texanum (Texas millet). This grass is a native of Texas whence seeds have been distributed to other states. In Texas on low and rather damp ground it grows to a height of four feet, and produces several cuttings during a season. It is grown also for hay in Louisiana, and is there regarded as a valuable forage plant. On our Experiment Farm, seeds from the United States Department of Agriculture were planted in 1896, and in the latter part of July the plants were fully grown, measuring about 18 inches in height and bearing large-flowered slender panicles 3–4 inches long. The plants show a disposition to branch and bear numerous rather short, broad blades, which taper rapidly from their bases. It did not impress me as a promising addition to the list of forage plants for this region. The grass was grown on rather poor soil, in which at the time there was but little moisture.

Panicum virgatum (Tall smooth panic-grass). A native perennial, found occasionally in moist sandy soil along streams. Height sometimes as much as 5 feet. Panicle exceptionally large, loose and long-branched, the large spikelets borne at the extremities chiefly, the flowers with slightly purplish chaff, and deep umber-brown stamens. Blades may be 14 inches long and ¼ inch wide.

Clay's Ferry, August 22, 1893.

Panicum viscidum. This is included in Miss Price's list of Warren county plants. I have not collected it from the State.

Paspalum floridanum. Kentucky—Britton and Brown.

Paspalum laeve (Field paspalum). A common grass in wet ground in cultivated fields. Sometimes reaches 3 feet in

height, with blades 18 inches long and ¼ inch wide. Stems bear from 3 to 7 slender spikes placed at intervals near the summit, the uppermost terminal in position. Spikelets large, oval, in two rows. Commonly regarded as a weed, but with some value as forage.

West Point, July 28, 1892; Guthrie, August 4, 1892.

Paspalum longipedunculatum (Long-stalked paspalum). This differs from the preceding in having but 1 to 2 spikes. It grows in sandy soil. Credited to the State by Britton and Brown; also by Kearney.

Paspalum mucronatum (Water paspalum). Kentucky—Miss Price.

Paspalum setaceum (Slender paspalum). Much like the preceding. Spikelets small, the spikes generally 1 or 2 in number. Annual. Native. Common.

Lexington, Sept. 23, 1890; Burnside, July 11, 1892; Hopkinsville, Aug. 8, 1892; Van Meters, Aug. 14, 1893; Louisville, Sept. 26, 1894 (Karl Yungbluth); Hawesville, Aug. 16, 1895.

Phalaris arundinacea (Reed canary-grass). A persistent perennial, the seeds of which are frequently brought into this country from Europe, but believed to be native to the United States. A plot started on the Experiment Farm in the spring of 1893 is still doing well, although it has never furnished as much fodder as have some other grasses. It grows in large tufts, which spread rapidly by underground shoots, and soon covers the ground thickly. The blades appear very quickly in spring, and remain green at all times thereafter until frosts come. The blades are coarse, rather harsh, and large, constituting the bulk of the forage, while the stems are likely to be few in number. Some notes made from time to time on the plot will explain more fully the character of the grass.

January 20, 1894. A rather scant growth.

June 19, 1894. A gretty good growth, consisting of broad tufts, presenting a bright thrifty appearance. A few heads, perhaps two dozen in all. Looks like good grazing. Stems

with panicles 37 inches tall. Panicles 4½ inches long, spike-like when old, the branches spreading when in flower; pale green when young, dark green to purple when older. Blades flat, 8–10 inches long, ½ to ⅝ inch wide, base yellow. Ligule white, conspicuous, rounded.

July 10, 1894. A good growth of wide blades in clumps 12–18 inches across. Some panicles now brown.

July 26, 1894. A very good growth of coarse, sharp-pointed blades in large tufts covering most of the plot; bright green; would make good grazing.

August 23, 1894. A fine growth of coarse blades covers most of the ground. Would make excellent grazing.

September 22, 1894. Good. A fine growth of coarse blades 10–12 inches high over whole plot.

November 6, 1894. Still in fairly good shape. Blades begin to show the effect of frost and some are brown. Would make good grazing.

December 4, 1894. Largely brown from frost.

March 6, 1895. Chiefly brown, but with small green blades appearing in the tufts.

March 30. 1895. Rapidly becoming green again. Coarse upright blades, five inches high.

April 29, 1895. A fine rank growth of coarse blades with a gray bloom. Eleven inches long and ½ inch wide. Would make good grazing or hay. No trace of stems.

May 20, 1895. Now in good condition. Several tufts at edge with panicles appearing, but most with no trace of flowers. Blades ½ to ¾ inch wide.

June 29, 1895. Stems with panicles now 43 inches high. Panicles 3½ to 6½ inches long, ⅜ to ½ inch in diameter. Blades in dense tufts at base of stems; those on stems above middle, small and inconspicuous. Panicles now brown and seeds ripe. Blades at base of stems 9½ to 11¼ inches long; ⅝ to ¾ inch wide. Would make a fair amount of hay. Good for grazing.

May 24, 1899. Covers the ground completely. A fine growth, mostly blades.

Reed canary grass is adapted to rather low wet ground.

From its manner of spreading by creeping root-stocks it can be made useful in binding the soil of embankments. The seed is advertised at $65 per hundred pounds in a list of this season now before me. The well-known ribbon-grass of gardens is a variety of this species.

Phalaris canariensis (Canary-grass). This grass, a native of southern Europe, furnishes the elongate glossy seeds used to feed canary birds. It is sometimes grown in this country for the seeds. In Kentucky stray plants sometimes appear in gardens, where the seeds have been thrown in cleaning out bird cages. The spike-like panicle of a specimen collected at Lexington, June 5, 1891, by Professor A. R. Crandall and presented to the Station, is oval in shape, being about ¾ inch long and ½ inch in diameter. The whole plant measures about 14 inches in height, but the grass often grows taller than this.

Phleum pratense (Timothy). On a good loam that holds water well timothy has no superior in this country for a single annual cutting of hay. On light porous soils that give up most of their moisture in midsummer it does not thrive. Nor does it in this region produce an aftermath of any great value, because of the large quantity of water required by the plant and the general deficiency of soil moisture in the latter part of summer. Though somewhat coarse, it is one of the most nutritious of our grasses when ripe, and as hay is greatly liked by horses especially. British farmers sometimes speak slightingly of it: "It is not much liked by horses, cows, or sheep, and swine refuse it." Difference of quality due to climate or soil will probably explain why it is rated so differently in the two countries. Here it is commonly sown mixed with clover, a practice which can hardly be recommended because of the fact that the two plants are not at the best stage for cutting at the same time. The weight of seeds is variously given from 45 to 48 pounds to the measured bushel. About ½ bushel of seeds serves to sow an acre of ground.

Poa alsodes (Grove meadow-grass). A native grass collected at Natural Bridge, May 5, 1895.

Poa annua (Annual spear-grass). About lawns and pastures in early spring the annual spear-grass is to be seen in tufts and patches where it is conspicuous among blue-grass from its lighter color. In April and May its small panicle is developed. The seeds soon afterward drop, and the grass itself then disappears. The short blades are tender and sweet, and are cropped close to the ground wherever cattle can reach them. Stems with panicles not often exceeding 10 inches in height. Panicles 2 to 2¾ inches long, with an expanse of about 1½ inch. Blades from 1 to 3½ inches in length and with a width of about ⅛ inch.

Lexington, May 26, 1890; Wilmore, April 12, 1895; Guthrie, May 15, 1898.

Poa autumnalis (Flexuous spear-grass). Credited to Kentucky by Dr. Gray.

Poa brevifolia (Short-leaved spear-grass). A native grass.

Midland, April 29, 1893; Filson, May 8, 1893; Dix River, April 13, 1895; Natural Bridge, May 5, 1895.

Poa chapmaniana (Chapman's spear-grass). Cave City, May 19, 1898.

Poa compressa (Canada blue-grass). This is a short, wiry, perennial, found growing spontaneously in Kentucky, generally in rather poor soil. It is very persistent where it gets a start, spreading like ordinary blue-grass by underground shoots and completely occupies land to the exclusion of most other plants. A plot sown on the Experiment Farm in 1893 has had complete possession of the ground at all times since the grass appeared above ground. It does not produce much forage, and that produced is rather dry, the blades being short and narrow, and the stems hard. It is not worth considering for hay, and for pasture is scarcely worthy of trial except in thin soils where common blue-grass does not maintain itself. For

binding embankments it has a value. The notes following relate to our plot.

May 13, 1893. A short growth, 5–6 inches high; bluish green.

June 12, 1893. A rather short erect grass with close panicles, flattened stems, and short blades. In flower, and at its best. Tallest stems about 1 foot 8 inches high. Average about 1 foot 6 inches. Panicles 3–4 inches long, green, with some purple at edges of chaff. Blades at base largely dry and brown; short; about 2 inches long. Looks tender and succulent. No tendency to form tufts.

June 18, 1894. A very good and uniform growth averaging 18 inches high. Stems wiry, upright. Living blades short and all arising from stems. Not much grazing or hay about it. Panicles 2-4 inches long, the branches standing out rigidly from the axis. Blades 2¾ inches long, 1⅛ inch wide, folded, the back forming a ridge.

September 22, 1894. This has stood the drought well and is now sending up a good growth of characteristic, erect bluish blades.

November 6, 1894. This has grown but little since damp cool weather set in, in which respect it differs from most of the other grasses of the plots. Not suited to fall grazing.

March 6, 1895. Brown, but alive everywhere, with a trace of green when looked at closely.

March 30, 1895. Good. A uniform growth of green blades coming up rapidly.

April 29, 1895. No stems yet.

May 22, 1895. Good. Growing rapidly, but no panicles yet. Much darker, bluer green than Kentucky blue-grass.

June 29, 1895. A uniform growth 18 inches high. Late. Just maturing. Panicles still green in the main, though seeds have developed. Drill lines completely obliterated as in Kentucky blue-grass. Might do well for pasture in some soils. Short for hay.

July 28, 1896. Holds its own well. No weeds among it. Ten inches high to top of panicles. Very even growth, but not a heavy yield owing to scant blades and wiry culms.

June 20, 1897. Looks well. Just beginning to flower.

August 23, 1899. This is an old plot, but the grass looks well. Keeps free from weeds and is as thrifty as ever it was. Wiry.

The following localities at which this grass has been collected indicate that it is generally distributed in the State:

Lexington, June 5, 1892; Tyrone, June 9, 1892; Junction City, June 19, 1892; Lexington, June 23, 1894; Lexington, July 9, 1896; Russell, June 9, 1898; Rockhaven, June 3, 1899; Newport, June 15, 1899.

Poa nemoralis (Wood meadow-grass). This species has been recommended as suitable for shaded ground, but the seed bought of an eastern dealer and tried at the Experiment Farm proved to be very largely ordinary blue-grass seed, a circumstance that has restricted our observations upon it. The few plants of wood meadow-grass secured from this seed persisted only for a couple of seasons. It is probably better suited to more northern localities, but a fairer trial may lead to a change of opinion on this point. It resembles blue-grass in a general way, but grows rather taller in the same soils, and bears a more open and graceful panicle. It is in bloom here from the first to the middle of June, according to the advancement of the season, when the stems with panicles average about 20 inches in height, the panicles ranging from about 4 to 6½ inches.

Poa pratensis (Blue-grass, Kentucky blue-grass, green grass, smooth meadow-grass).

> Ever smelt Kentucky grass,
> Or heard about its blueness?
> Seems as if the whole blamed world
> Was bursting out with newness.
>
> Skies and folks alike all smiles,
> Gracious! you are lucky
> If you spend a day in June
> Down in old Kentucky.—Alfred Monson.

This little plant has contributed more to the reputation of Kentucky than any other one product. In what is known as Blue-grass Kentucky the wealth and consequent leisure for ed-

ucation and other means of self improvement of a large part of the population is derived from stock raising, a vocation rendered easy and profitable by the abundant pasture which blue-grass affords throughout much of the year. Kentucky would not be Kentucky without it. But it is not peculiar to Kentucky, for it occurs throughout much of the Northern hemisphere, constitutes the bulk of the pasture of the middle and northwestern states and is everywhere at the North used as a lawn grass. In the southern tier of states it does not thrive, and is not to be recommended for that part of the United States. The chief difficulty in growing it there appears to come from the destructive effect of the summer sun. It suffers from that source in Kentucky at times, and occasionally during protracted droughts becomes quite brown in August. The fall rains quickly restore it again. During most winters it furnishes some grazing, and it is only when the weather becomes very severe that the blades become entirely brown. While blue-grass occurs everywhere in the State from the Big Sandy to the Mississippi River, it does not grow well in any but limestone soils, and in a large part of western Kentucky constituting perhaps fully half of the State it cannot be depended on for forage. I have seen it growing at Clinton, Hickman county, but it does not there spread and take possession of fields, lawns and roadsides as it does in the region about Lexington.

Blue-grass is a variable plant. In open pasture where the turf is long-established it is often of a pure green color, with narrow, slightly folded blades, the tips of which are somewhat turned up and prow-shaped. The stems bearing panicles are apt to be rather short in such situations, not often exceeding two feet in height. When less crowded the blades become darker in color, wider, and the stems taller. Where the soil is specially good and moist, the blades assume a bluish cast from a gray bloom which coats them, are longer (12 to 18 inches), wider (¼ inch not infrequently), and droop so as to form a thick and characteristic mat over the surface of the ground. From the midst of a rosebush in my yard I obtained May 23, 1897, a plant that measured 40 inches to the top of

its panicle, the latter being six inches long, with a greatest expanse of six inches. The panicles begin to appear on scattered plants about May 1, and from about May 23 to May 29 they are everywhere in bloom and at their best. They are brown, the seeds ripe and dropping, during most seasons, by the 25th of June.

Blue-grass is not regarded as a profitable meadow-grass. The hay made from it is good enough, but the slightness of its stems and upper stem-blades, together with the small number of stems produced, makes the yield small. As a pasture-grass for this section it leaves little to be desired. It is nutritious, persistent, hardy, forms a dense turf, and thrives under the cropping and trampling of stock.

Poa sylvestris (Sylvan spear-grass). Hillsides in woods. Tyrone, May 18, 1891.

Poa trivialis (Roughish meadow-grass). An introduced grass, adapted to bottom lands, and thriving best where the heat is not very severe in summer. It resembles ordinary blue-grass, but lacks the creeping habit, and has rough leaf-sheaths. Specimens grown in the plots of the Experiment Farm measure about 28 inches in height, the rather slender panicle constituting seven inches of this and expanding about 1½ inch. It is in flower in the latter part of May. I have several times had seed planted, but have never succeeded in getting a good stand. Our land is rather dry, however, and possibly it would do better where the condition of the soil was more in its favor. In European countries it ranks among the best of forage plants.

Secale cereale (Rye). This is one of the cereals, and is very commonly cultivated in Kentucky for soiling. It is sown for this purpose early in the fall, and the succeeding spring furnishes an excellent pasture for milk cows and sheep. The long, grayish green spike-like panicles are fully developed some seasons by the middle of May. The seeds are rather dark in color, and are more slender than those of either wheat or barley. The fact that it will grow in poor soils, in dry situations, where such grains as wheat and corn do not do well, will always by

itself make rye a valuable member of the cereal group of forage plants. In addition to this quality its straw is long and exceptionally tough, rendering it useful for various domestic purposes, for which the shorter and more brittle straws of wheat and oats are not suited.

The grain makes excellent bread, scarcely inferior to that made from wheat. But the young grain is peculiarly subject to the attacks of a parasitic fungus, which sometimes causes many of the seeds to push out from among the chaff in the form of a black spur, thus constituting the so-called spurred rye, otherwise known as ergotized rye. When ergot is prevalent among the grain it is likely to cause sickness and even death among those who may use flour made from it. Of course these enlarged grains can to a great extent be removed at the mill, but it is perhaps safest to avoid grain that is badly infested. The same fungus attacks wheat, blue grass, orchard grass, and other members of the family, but is only occasionally prevalent on them.

Sieglingia seslerioides (Tall red-top). This is a showy, native perennial grass, likely to be encountered along railroads or in neglected ground anywhere in Kentucky. Quite often only a clump or two is present in a place, but when allowed to have its way it may spread and eventually occupy an acre or more of ground. On the State College campus at Lexington it has been introduced by some chance, and each year presents a fine appearance on the slope below the Station building. The stems reach a height of from three to four and a half feet, and bear panicles often ten inches long and six inches in expanse. The blades are frequently sixteen inches in length. The stems are rather hard and wiry, and the branches of the panicle are coated with a peculiar greasy material. It is in flower during the latter part of August and early September. The grass has sometimes been sent to the Station by correspondents who wished to know its value for forage. Occasionally it is complained of as a weed. When fully grown it is rather woody and tough for forage, but I have seen the statement in print that it is valued as a forage plant at the South, though it is said to disappear under continued grazing.

Lexington, Sept. 6, 1893; Lexington, Oct. 20, 1894; Brooklyn Bridge, Aug. 15. 1895; Cynthiana, Aug. 7, 1897 (From Supt. J. A. Thorn, of Battle Grove Cemetery.)

Sporobolus asper (Prairie-grass). A native perennial recorded from Kentucky by Miss Sadie F. Price. Not recognized as having any agricultural value.

Sporobolus vaginæflorus. Credited to Kentucky by Britton and Brown; also by Kearney.

Stipa avenacea (Black oat-grass). A native perennial of dry soils. Reaches a height of three feet, and bears a few-flowered panicle producing at length seeds which are enclosed in a blackish brown scale bearing a long twisted and bent bristle. The blades are narrow and few in number. It has been collected only at Pineville, June 15, 1892.

Tripsacum dactyloides (Gama grass). A coarse grass of damp soils in swamps and along streams. It is a native, and perennial. It reaches a height of seven or eight feet, and produces broad blades somewhat resembling that of corn. The spikes occur singly or in pairs either in the axils of the leaves or at the summit of the stem. They are sometimes 10 inches or more in length, the lower third bearing pistillate, and the upper two-thirds only staminate flowers. It is represented in the Station herbarium by specimens collected by Professor C. W. Mathews, at Cumberland Falls, July 14, 1892.

Trisetum pratense (Yellow oat-grass). This oat-grass has been grown on the Experiment Farm from seed obtained of a seedsman in New York City. It has not done well, in no case giving a first rate stand, and such plants as were secured did not (on rather poor soil) bear the marks of a first rate forage plant either for hay or pasture. In European countries it is sown in mixtures for permanent pasture, and ranks high among the grasses used for that purpose. Our plants reached a height of two feet by the middle of June and bore somewhat compact panicles, 1¼ by 4½ inches, of a yellowish color and satiny lustre. Judging from accounts given of it by European writers

it is probably worthy of trial in this State on uplands. Sheep are said to be especially fond of it. I find the seed advertised at $85 per hundred pounds. About 25 pounds are sown to the acre. It is a perennial.

Triticum vulgare (Wheat). Kentucky farmers raise from about seven to thirteen million bushels of this cereal annually. The bulk of the crop is produced by counties in the central northern section of the State, yet several of those adjacent to the Mississippi River rank among the best wheat-growing counties of Kentucky. According to our State Commissioner of Agriculture, in 1898, with a total yield for the State of 13,481,829 bushels, the following eighteen counties produced more than 200,000 bushels:

Christian	687,923
Union	583,022
Hickman	522,656
Daviess	479,868
Logan	468,758
Woodford	382,985
Henderson	372,823
Shelby	350,430
Fulton	288,496
Warren	284,056
Breckinridge	246,829
Mercer	243,090
Scott	242,537
Nelson	240,207
Fayette	237,796
Larue	237,765
Hardin	223,436
Boyle	204,556

The yield per acre not infrequently reaches thirty bushels in the better class of soils, but generally is somewhat below this, and perhaps the average for the State, taking one season with another, will not exceed fifteen bushels per acre. Only fall wheat is grown, and generally the preference is for some smooth red wheat of medium hardness.

Quite often stock is allowed to graze young wheat during fall and winter, especially when the weather is so mild as to cause the plants to grow too rapidly. Aside from this no

green forage is derived from the crop. The chief enemies of wheat in the field are the Hessian fly, the grain aphis, the wheat bulb-worm, smut and red rust. The stored wheat is frequently attacked by the grain weevil, while the ground product in mills is often damaged by several small moths, sometimes also called weevils.

Uniola latifolia (Broad-leaved spike grass). A tall and showy native perennial, common along streams in rich soil. Noticeable because of its loose panicle of very large flattened spikelets, the latter sometimes an inch in length. Blades numerous, 6–7 inches long and ¾ inch wide. Grows to a height of three or four feet.

Burnside, July 12, 1892; Frankfort, July 30, 1892; Clay's Ferry, Aug. 22, 1892; Clay's Ferry, July 27, 1893; Brooklyn Bridge, Aug. 15, 1895.

Uniola laxa (Slender spike grass). A native grass credited to Kentucky by Britton and Brown.

Zea mays (Corn, maize, Indian corn). This is the king of grasses. It is more generally grown in Kentucky than wheat, and of the two appears to be much better adapted to the southern and eastern counties. Such counties as Pike, Lawrence and Whitley are among the best corn counties in the State, each of them producing more than 500,000 bushels in 1898. During the same year five counties, Christian, Henderson, Ohio, Union, and Warren, produced more than a million bushels each. These latter counties constitute part of a group chiefly underlaid by rocks of the carboniferous period. Another important corn-producing section is constituted by about a dozen counties in the center of the blue-grass region, the underlying rocks being here of lower silurian origin. The State produced 55,443,918 bushels in 1898. The yearly product ranges from 35 to 69 million bushels, the latter figure being somewhat surpassed in 1889. Most of the varieties grown in the United States are to be seen in our fields, dent, flint, sweet and pop-corns, but of the field corns a white dent is generally preferred, and appears to give the most satisfactory results.

Stockmen frequently sow corn for green forage, usually planting in drills, for which purpose it competes for favor with sorghum; the latter stands drought rather better, but I think has no other advantage. The dry fodder is also used for stock after the corn is husked, but in this form loses in quality, and a good deal of it is wasted. When stripped from the stalk early in the fall and cured as hay the blades make a nourishing winter food. The silo could be profitably used, in western Kentucky, especially, for the preservation of fodder from corn fields, but as yet few of these structures are to be seen in the State.

The most troublesome enemies of the crop are the corn worm, the corn root worm of Kentucky (*Diabrotica 12-punctata*), the corn root aphis, and corn smut. The chinch-bug is destructive locally at times.

Zizania aquatica (Wild rice). A tall coarse native grass, found growing shallow water, where its large seeds (¾ inch long) constitute an important food for wild water fowl. It sometimes reaches a height of 8 or 9 feet. The staminate flowers of its panicle are below the pistillate, contrary to the usual arrangement where the male and female flowers are distinct. The stems and blades when cut at the proper season make good hay. I find the seeds quoted at $15 per hundred pounds. The grass is credited to Kentucky by Drs. Short and Peter in their list of Kentucky plants.

2. Analyses of Some Kentucky Grasses.

BY A. M. PETER, CHEMIST.

In the following tables are given the analyses of some of the grasses described in the first part of this Bulletin, the samples having been obtained and analyzed from time to time mostly from the experimental grass plots, during several years past. The analyses were made by Messrs. H. E. Curtis, J. C. W. Frazer and the writer. The methods employed were those of the Association of Official Agricultural Chemists. Some of these analyses have already been published in the Annual Reports of this Station, but are included here because they have never before appeared in a bulletin. Other analyses of Kentucky grasses have been published in Bulletin No. 5 (now out of print).

The samples for analysis were taken, in most instances, by cutting the grass an inch or two above the ground, as it would be cut for hay. The grass was brought at once to the laboratory and weighed, then dried in a warm room, weighed again, ground to powder and analyzed, and the results calculated both upon the fresh grass, as cut, and the material when perfectly free from moisture. The results are printed in the table of analyses under the corresponding headings. In some cases the fresh grass was not obtained but only the hay made from it, as will be evident from the low percentage of moisture shown in the fresh material. The small numbers refer to the notes following the table, in which additional information in regard to some of the samples is given.

In the ordinary analysis of a feeding stuff it is customary to determine the percentage of moisture, ash, protein, fiber, nitrogen-free extract and fat. In addition to these we have determined in most of our analyses the percentages of phosphoric acid, nitrogen and potash, as these are important in

judging the value of a feed stuff as a manure-maker, or the value of a grass for enriching the soil. A large part of these constituents of fertilizers passes into the manure, when the material is fed to stock, and the richer the food is in these the more valuable the manure is likely to be.

It may not be out of place here to give a brief statement explanatory of the nature of the substances into which a feed stuff is usually separated by analysis.

Water is contained in all feed stuffs and its amount varies greatly, being usually largest in the young plant, becoming less as the plant becomes more woody. In dried materials like hay it may be about 10 per cent., but is quite different in different materials, and varies in the same material with the moisture of the air in which it is kept.

Ash is the mineral matter which is left when the feed stuff is burned. It usually consists mainly of carbonates and phosphates of lime and potash. The ash of grasses usually contains also a large proportion of silica. Besides the mineral substances which are actually contained in the vegetable matter itself, the ash usually contains sand or soil that has adhered to the plant in the form of dust. Animals derive the phosphates of their bones from the ash constituents of their food, but the phosphates and potash are only partly used up in this way, the rest going to enrich the manure.

Protein is the name for a class of substances containing nitrogen. This is one of the most important constituents of feeding stuffs, as it is the one which furnishes the material for making flesh, blood, muscles, &c. Protein is often divided in analysis into *albuminoids*, or substances similar to albumen or white of egg, considered very valuable as food, and *amids*, which are considered less valuable. In very young, tender grasses the proportion of amids is apt to be large.

Fiber is the woody part of plants and is the least digestible constituent of feed stuffs. A part of it, however, is usually capable of being digested and serves a similar purpose in the food to the nitrogen-free extract.

Nitrogen-free Extract is the starchy part of the feed-stuff, including, besides starch, the sugars, gums, &c., and is an

important part of a food. As grasses become ripe the proportion of nitrogen-free extract largely increases.

Fat is that part of the feed stuff that is soluble in ether and includes, besides true fat or oil, the wax and green coloring matter of plants. The fat of food may be stored up in the body as fat, or burned to keep up the heat and energy of the animal.

In the following tables the first column contains the number of the sample; the second the common name of the grass and a reference to the page in the first part of this Bulletin where its description is to be found. After this follows the analysis, calculated upon the grass in its green state, as cut, or the hay as it was in the laboratory without artificial drying; and next, the analysis calculated upon the same material after it has been entirely freed from moisture by drying with the aid of heat. Inasmuch as the percentage of water is so various, the latter set of figures is the best to use in comparing the analyses. Next is a column showing the time of cutting, and lastly the number of the sample is repeated.

Some general ideas of the relative value of different grasses as food may be had from a comparison of their analyses, but a correct estimate can only be had when the proportion of each constituent that is digestible—that is, the co-efficient of digestibility—is known.

Station Number.	NAME OF GRASS.	In the Fresh or Air-dry Material; per cent.					
		Water.	Ash.	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
394	Red-top hay (p. 60)	10.96	5.16	4.34	24.27	53.74	1.53
3593	Red-top (p. 60)	56.64	2.93	3.77	11.71	23.94	1.01
3594	"	66.41	2.85	2.69	10.69	16.73	.63
5709	"	59.74	2.43	2.72	12.39	21.85	.87
3580	Creeping red-top; dry hay (p. 63)	6 51	5.68	6.44	30.41	48.87	2.09
3592	Creeping red-top; dry hay	58.13	2.90	4.63	11.17	22.30	.87
3581	Johnson-grass (p. 64)	61.22	2.01	2.01	13.60	20.64	.52
3599	" "	51.48	2.78	2.64	17.96	24.41	.73
3631	" "	51.10	3.32	2.65	16.16	25.93	.84
5716	" "	70 84	1.71	1.27	10.53	15.19	.46
5717	Fleshy roots of same (p. 64)	88.92	1.01	.47	3.19	6.26	.15
3621	Kafir corn (p. 65)	75.64	1.73	1.89	8.19	12.12	.43
3610	Sweet vernal-grass (p. 66)	67.26	1.81	2.62	9.82	17 62	.87
5705	" " "	63.15	1.93	2.57	11.49	19.78	1.08
3583	Tall oats-grass (p. 67)	63.64	1.97	2.94	11.41	19.09	.95
3609	" "	73.38	1.64	2.58	8.88	12.83	.69
5706	" "	70.69	1.54	2.27	10.49	14.40	.59
3587	Smooth brome-grass (p. 70)	50.26	3.56	3.46	15.33	26.32	1.07
3611	" " "	40.60	2.94	3 59	17.28	34.32	1.27
3612	Hairy brome-grass (p. 70)	51.38	3 32	4.18	13.64	26.21	1.27
3586	Rescue grass (p. 72)	53.84	2.63	3.85	12 40	26.59	.69
2022	" "	61.91	2.86 [7]	3.33	11.00	20.09	.81
3576	Orchard grass; dry hay (p. 73)	8.36	8.69	7.06	33.35	41.41	2.13
3588	" "	52.86	3.24	3.85	15.62	22.98	1.45
5703	" "	69.15	2.01	2.35	10 83	14.93	.73
234	" "	71.91	2 12	2.49	8.41	14.43	.64
3613	Wavy hair-grass (p. 77)	49 37	3.30	3 68	15.02	27.30	1.33
3626	Yard-grass (p. 78)	77.07	2 52	2.90	6.84	10.27	.40
3619	Teff (p. 79)	69.52	2.39	2.04	9.91	15.56	.58
3598	Stink-grass (p. 80)	73.97	1.86	3.31	8.58	11.88	.40
3615	Teosinte (p. 81)	79.84	1.29	.87	6.18	11.55	.27
3633	"	81.47	1 36	2.02	4.75	10.12	.28
5711	English blue-grass (p. 82)	65.33	2.51	2.98	11.73	16.68	.77
223	" "	76.57	2.69	3.63	4.88	10.94	1.29
232	" "	74.36	2.23	2.50	7.36	12.78	.77
239	" "	69.62	2.30	2.52	8.78	16.06	.72
376	Hay of same	10.78	6.99	7.50	25.53	47.34	1.86
378	" " "	10 62	6 27	6.31	30.34	45.03	1.43
382	" " "	7.97	10.03	7.62	26.07	46.50	1.81
126	Seed " "	8.87	5.67	12.75	19.75	51.48	1.48

In the Water-free Material; per cent.								DATE OF CUTTING.	STATION NUMBER.
Ash.	Protein.	Fiber,	Nitrogen-free Extract.	Fat.	Phosphoric Acid.	Nitrogen.	Potash.		
5.80	4.87	27.26	60.35	1.72	.....	.....	.....	In full bloom, 1887.....	394
6.76	8.69	27.01	55.22	2.32	0 59	1.39	2.27	June 28, 1894.....	3593
8.47	8.00	31.82	49.84	1.87	0.55	1.28	1.69	" 29, "	3594
6.05	6.77	30.78	54 25	2.15	0.59	1.08	1.81	" " 1897.....	5709
6.08	6.89	32 52	52.27	2.24	0.50	1.17	2 09	July 17, 1893.....	3580
6.93	11.05	26.67	53 28	2.07	0.62	1.77	2.31	June 23, 1894.....	3592
5.17	5.19	35 05	53.26	1.33	0 55	0.83	0.85	July 19, 1893.....	3581
5.73	5.44	37.02	50.30	1.50	0.65	0 87	0.63	" 26, 1894.....	3599
6.80	5.41	33.05	53.02	1.72	0.69	0.87	0.39	Sept. 8, 1896.....	3631
5.87	4.36	36.11	52 09	1.57	0.47	0.70	1.25	July 31, 1897.....	5716
9.09	4.23	28.78	56.58	1.32	1.17	0.68	4.73	" " "	5717
7.10	7.76	33.62	49.77	1.75	0.94	1.24	2.30	" 29, 1896.....	3621
5.52	8.01	30.01	53.80	2.66	0.59	1.28	1.93	May 24, 1895.....	3610
5.23	6.98	31.17	53.70	2.92	0 65	1.11	1.85	June 5, 1895, [2]	5705
5.42	8.08	31.39	52.51	2.60	0.59	1.29	2.18	" 19, 1894.....	3583
6.18	9.70	33.36	48.16	2.60	0.67	1.55	2.82	May 24, 1895.....	3609
5.24	7.80	35.78	49.16	2.02	0.60	1.25	2.31	June 5, 1897, [3]	5706
7.15	6.97	30.83	52.90	2.15	0.52	1.11	2.38	" 20, 1894, [4].....	3587
4 95	6.05	29.09	57.77	2.14	0.47	0.97	1.40	July 6, 1895.....	3611
6.82	8.57	28.06	53.92	2.61	0.51	1 37	2.35	" " "	3612
5.69	8.33	26.87	57.62	1.40	0.65	1.33	1.32	June 23, 1894, [5].....	3586
7.52 [7]	8.74 [8]	28.88	52.72	2.14	.....	.....	.....	July 27, 1892, [6].....	2022
9.48	7.70	36.39	45.20	2 32	0.63	1.23	3.14	June 14, 1893	3576
6.87	8.18	33.13	43.73	3.09	0 63	1.30	2.25	" 23, 1894, [5].....	3588
6.52	7.62	35.12	48.39	2.35	0 59	1 22	2.05	" 5, 1897, [3].....	5703
7.55	8.86	29.94	51 40	2.27	.....	.....	.....	" 3, 1887, [9].....	234
6.52	7.28	29.67	53.90	2.63	0.50	1 16	1.85	July 6, 1895.....	3613
11.00	12.64	29.82	44.78	1.76	1,04	2.01	3 71	" 30, 1896.....	3626
7.84	6.68	32.49	51.08	1.91	0.63	1.07	1.96	" 6, 1896.....	3619
7.13	12.71	32 96	45 66	1.54	0.82	2.03	2 60	" 3, 1894.....	3598
6.39	4.32	30.65	57.29	1.35	0.50	0 69	1.22	Aug. 31, 1893.....	3615
7.32	10.89	25.62	54.67	1.51	0.86	1 74	1.48	Sept. 22, 1896.....	3633
7.23	8.58	33.84	48.12	2.23	0.63	1.38	2.41	July 1, 1897	5711
11.48	15.50	20.81	46.71	5.50	.....	.....	.....	May 12, 1887, [10]	223
8.68	9.76	28.72	49.82	3.02	.....	.....	.....	June 3, " [11].....	232
7.56	8.39	28.89	52.79	2.37	.....	.....	.....	" 13, " [12].....	239
7.84	8.41	28.62	53.05	2.08	.....	.....	.....	When heading, [13].....	376
7.01	7.06	33.95	50.38	1.60	.....	.....	.....	" in bloom, [13].....	378
10.91	8 28	28,33	50.51	1.97	.....	.....	.....	" seed fully formed, [13]...	382
6.22	13.99	21.67	56 50	1.62	.....	.....	.....	" fully ripe, [14].....	126

Station Number.	NAME OF GRASS.	In the Fresh or Air-dry Material; per cent.					
		Water.	Ash.	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
3605	Sheep's fescue (p. 84)	65.22	2.04	3.09	12.02	16.91	.72
3603	" "	66.63	2 24	3.99	11.27	16.13	.64
3606	" "	66.00	1.75	3.88	9.60	18.05	.72
5713	Meadow fescue, English blue-grass (p. 85)	56.02	2 95	5.75	14.52	19.69	1.07
3582	Red fescue (p. 87)	68.23	2.14	3.65	10.57	14.60	.81
3604	" "	63.16	1.78	3.61	12.56	18.02	.87
2021	Hungarian-grass (p. 89)	63 72	2.73 [7]	2.23	12.53	18.13	.66
3596	Pigeon-grass (p. 89)	82.49	2.05	2.04	5.53	7.47	.42
3600	Rice cut-grass (p. 88)	64.40	3.92	4.24	10.20	16.59	.65
3597	Meadow spear-grass (p. 93)	68.59	2 35	1.72	9.59	17.31	.44
3601	Barnyard-grass (p 94)	82.93	1.86	2.62	4 74	7 49	.36
3624	" "	87.40	1.68	1.66	4.13	4.95	.18
3625	Spreading panicum (p. 96)	80.99	1.66	2.88	5.53	8.50	.44
3622	Crab-grass; dry hay (p. 96..)	8.21	8 57	5 75	29.19	46.19	2.09
3623	Texas millet (p. 97)	72.85	5.06	2.55	8.25	10.93	.36
3602	Slender paspalum; dry hay (p. 98)	8.81	7.38	9 19	28.78	44.77	1.07
3614	Reed canary-grass (p. 98)	59.34	4.06	3.97	9.61	21.55	1.47
5710	" " "	59.43	3.17	3.41	11 99	21.15	.85
3579	Timothy (p. 100)	47.80	2 27	3 24	16.04	29.65	1.00
3595	"	59.90	2.06	2.79	12.43	21.92	.90
233	"	79.41	1.40	2 13	6.28	10.30	.48
238	"	69.33	2 34	2.70	9.57	15.40	.66
377	Hay of same	9 77	4.69	4.75	28.20	51.11	1.48
397	" " "	11.13	4.14	4 56	27.10	51.27	1.80
398	" " "	13.52	4.82	4.34	27.61	48.30	1.41
371	" " "	9.56	4 10	4 75	29.22	49.62	2.75
3589	Canada blue-grass (p. 101)	55.64	2 22	2.79	12.55	25.78	1.02
5712	" "	50.47	2 27	2.86	14 47	28.58	1.35
5736	" "	66.00	1.72	2.19	11.17	18.02	.90
3590	Kentucky blue-grass (p. 103)	49.36	3.87	5.16	15.45	24.87	1.29
3591	" "	56.64	5.13	4.38	12.27	20.64	.94
226	" "	70.54	2.08	3.79	6.89	15.17	1.53
229	" "	66.05	2.29	3.12	8.65	18.85	1.04
236	" "	54.58	2.76	4.10	11.41	25 82	1.33
375	Blue-grass hay	9.39	7.74	10 43	19.60	50.42	2.47
225	Blue-grass fertilized	73.89	1.85	4.62	5.96	12.63	1.05
228	" "	70.09	2.03	3.69	7.48	15.50	1.21
237	" "	63 25	2 14	3.60	9.25	20.60	1.16
3630	Tall red-top (p. 105)	64.75	2.11	2.69	12.73	17.10	.62

In the Water-free Material; per cent.								DATE OF CUTTING.	STATION NUMBER.
Ash.	Protein,	Fiber.	Nitrogen-free Extract.	Fat.	Phosphoric Acid.	Nitrogen.	Potash.		
5.88	8.88	34.57	48.60	2.07	0.52	1.42	1.65	May 22, 1895	3605
6.70	9.27	33.78	48.32	1.93	0.64	1.48	1.88	" 20, "	3603
5.15	11.42	28.23	53.03	2.11	0.59	1.83	1.69	" 22, "	3606
6.70	13.06	33.01	44.79	2.44	0.73	2.09	1.93	July 1, 1897	5713
6.73	11.47	33.27	45.98	2.54	0.63	1.83	1.96	May 12, 1894	3582
4.82	9.80	34.11	48.92	2.35	0.52	1.57	1.90	" 22, 1895	3604
7.53 [7]	6.14 [15]	34.55	49.96	1.82	.....	.....	.....	July 18, 1892	2021
11.74	11.67	31.58	42.62	2.39	0.71	1.87	5.92	June 29, 1894	3596
11.00	11.92	28.65	46.60	1.83	0.75	1.91	1.52	August 8, "	3600
7.34	5.48	30.53	55.22	1.43	0.36	0.88	1.84	June 29, " [16]	3597
10.88	15.34	27.78	43.94	2.08	0.83	2.47	4.59	August 8, "	3601
13.36	13.17	32.79	39.25	1.43	1.07	2.11	5.17	August 22, 1896	3624
8.76	15.13	29.11	44.70	2.30	0.78	2.42	3.86	Sept. 2, "	3625
9.34	6.26	31.80	50.32	2.28	0.90	1.00	3.09	July 29, "	3622
18.64	9.39	30.42	40.21	1.34	0.94	1.50	1.44	" 31, " [3]	3623
8.09	10.09	31.56	49.09	1.17	0.53	1.61	2.64	Sept. 26, 1894, [17]	3602
9.98	9.76	23.63	53.02	3.61	0.65	1.56	2.43	July 8, 1895	3614
7.82	8.40	29.57	52.12	2.11	0.58	1.34	2.08	" 1, 1897	5710
4.35	6.21	30.72	56.81	1.91	0.53	0.99	1.52	" 17, 1893, [18]	3579
5.14	6.95	31.00	54.65	2.26	0.50	1.11	1.97	June 23, 1894, [19]	3595
6.79	10.33	30.49	50.07	2.32	.....	.....	.....	" 3, 1887, [20]	233
7.62	8.80	31.12	50.30	2.16	.....	.....	.....	" 13, " [21]	238
5.19	5.26	31.26	56.65	1.64	.....	.....	.....	Crop of 1886, [22]	377
4.66	5.13	30.49	57.69	2.93	.....	.....	.....	In full bloom, [23]	397
5.57	5.02	31.93	55.85	1.63	.....	.....	.....	" " "	398
4.53	5.25	32.33	54.85	3.04	.....	.....	.....	Most of bloom had fallen, [25]	371
5.01	6.30	28.28	58.10	2.31	0.54	1.08	2.01	June 23, 1894, [4]	3589
4.59	5.77	29.21	57.70	2.73	0.52	0.92	1.59	July 1, 1897	5712
5.06	6.44	32.84	53.01	2.65	0.56	1.02	2.10	June 17, 1899	5736
7.65	10.20	30.54	49.07	2.54	0.64	1.63	2.19	June 23, 1894	3590
11.83	10.09	28.29	47.63	2.16	0.55	1.62	2.01	" 29, "	3591
7.07	12.85	23.38	51.50	5.20	.....	.....	.....	May 13, 1887, [27]	226
6.78	9.18	25.49	55.51	3.06	.....	.....	.....	" 27, " [27]	229
6.08	9.02	25.13	56.85	2.92	.....	.....	.....	June 9, " [28]	236
8.54	11.51	21.63	55.65	2.67	.....	.....	.....	May 29, 1886, [3]	375
7.07	17.70	22.83	48.37	4.03	.....	.....	.....	" 13, 1887, [29]	225
6.80	12.32	25.01	51.83	4.04	.....	.....	.....	" 27, " [29]	228
5.83	9.80	25.16	56.05	3.16	.....	.....	.....	June 9, " [29]	237
6.00	7.63	36.12	48.49	1.75	0.69	1.22	2.02	Aug. 22, 1896	3630

We give below the co-efficients of digestibility of a few grasses and hays as determined by feeding experiments made at American Stations. The figures are taken from a table compiled by W. H. Jordan, published in the Experiment Station Record, Vol. 6, p. 7 (1894–5). The numbers show how many out of 100 parts of each constituent were found to be digestible. Thus opposite "Timothy," in the column headed "Protein," we find the number 48. This means that forty-eight hundredths of the protein contained in the timothy experimented upon was found to be digestible; or, if a sample of timothy is found to contain 3.24 per cent. of protein, we may calculate that the per cent. of digestible protein contained in it is 3.24 x .48, or 1.56 per cent. The digestibility as well as the composition of grass varies considerably at different stages of growth and in different seasons.

AVERAGE DIGESTION CO–EFFICIENTS OF SOME GRASSES.

GRASS OR HAY.	Number of Single Trials.	Dry Matter.	Ash.	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
Red-top hay	3	60	29	61	61	62	50
Johnson-grass hay	1	54	56	45	58	54	39
Orchard-grass hay	3	56	...	59	60	55	54
Hungarian-grass	4	63	41	62	68	66	52
Hungarian-grass hay	2	65	47	60	68	67	64
Timothy	3	63	32	48	56	66	53
Timothy hay	22	58	37	49	53	63	57
Same, cut in full bloom	5	61	44	57	59	64	56
Same, cut late	5	54	32	45	48	61	51

NOTES TO THE ANALYSES.

[1] From A. P. Farnsley, Louisville. Grown on rich land; yielded 1½ ton per acre. Stored in barn. (1st Ann. Rep., p. 18.)
[2] Seeds had formed, but were not ripe.
[3] In flower.
[4] Had just finished flowering
[5] Heads brown; lower leaves still green
[6] Seeds nearly ripe; plants still green.
[7] Carbonic acid has been deducted. (5th Ann. Rep., pp. 10 and 11.)
[8] Albuminoids, 7.32 per cent.
[9] In full bloom. (1st Ann Rep., p 18.)
[10] About 8 inches high. (1st Ann. Rep., p. 15.)
[11] About 9 inches high; just coming into flower (loc. cit.).
[12] About 9 inches high seed in milky stage (loc. cit.).
[13] Raised by the late Dr. R. J. Spurr on his farm near Greendale, Fayette County (loc. cit.).
[14] From I. Reese, Fern Leaf, Mason County (loc. cit.).
[15] Albuminoids, 4.91 per cent.
[16] Wet ground near pond.
[17] From Louisville.
[18] About half the heads brown.
[19] Nearly done flowering.
[20] Just headed out completely but not yet in bloom; 2½–3½ feet high. (1st Ann. Rep., p. 16)
[21] In full bloom; 3–4 feet high (loc. cit.).
[22] From Dr. Spurr; crop of 1886; ripe and in good condition (loc. cit.).
[23] From A. P. Farnsley, Louisville; crop of 1886; cured and stored in barn (loc. cit.).
[24] Same crop as 397; sample taken from stack January 1, 1887 (loc. cit.).
[25] From W. A. Reese, Eminence (loc. cit.).
[26] Headed out but not in flower. (1st Ann. Rep., p. 14.)
[27] About 16 inches high; just done flowering (loc. cit.).
[28] Seed nearly ripe but stems still green (loc. cit.).
[29] Fertilized with sulphate of ammonia at the rate of 300 lbs. to the acre.

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FIG. 1.—Woodland pastures in April. Horeb pike, 6 miles north of Lexington. Photographed by H. G.

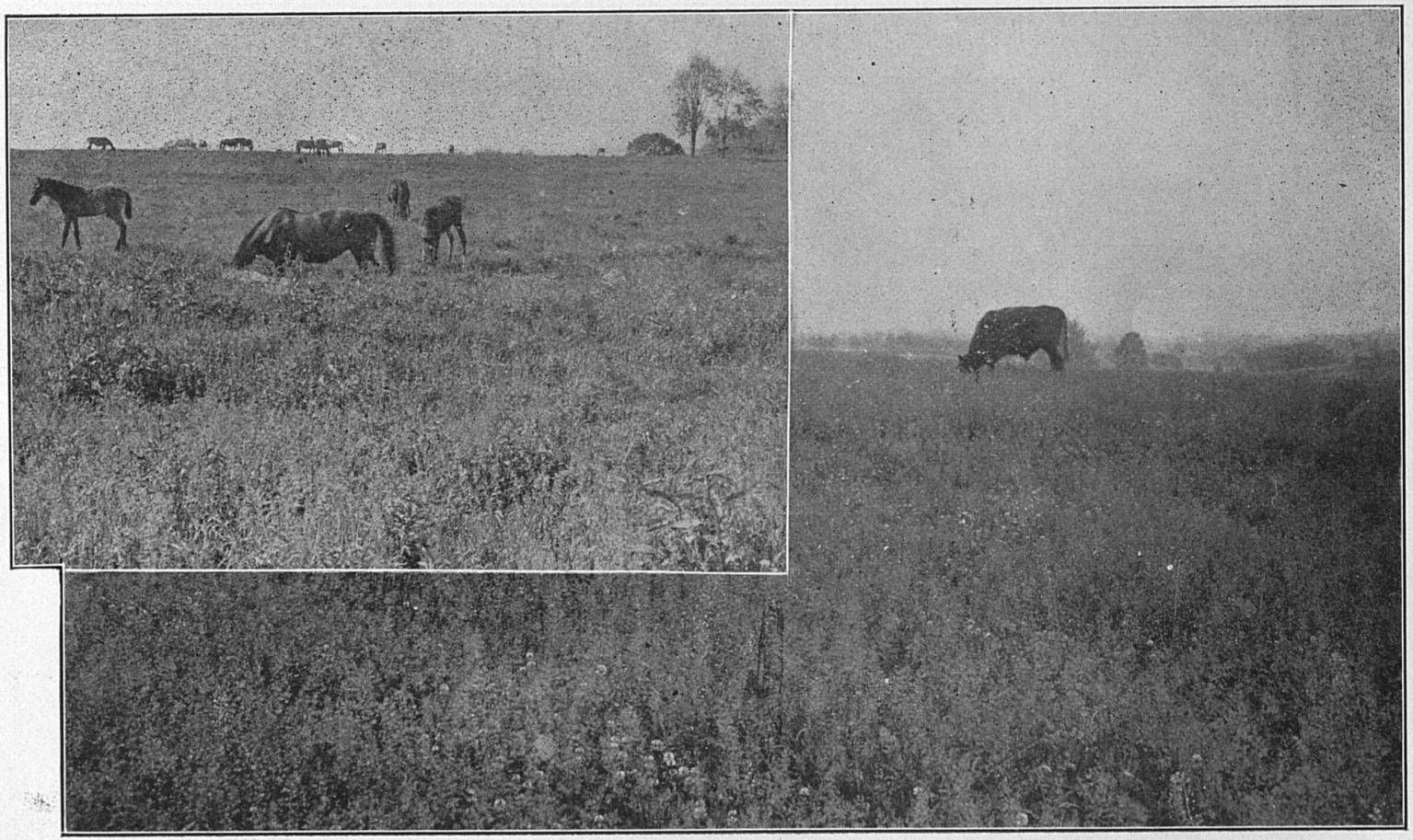

FIG. 2.—Open pasture in May; upper, Newtown pike, about 4 miles north of Lexington; lower, Nicholasville pike, about 3 miles south of Lexington. Photographed by H. G.

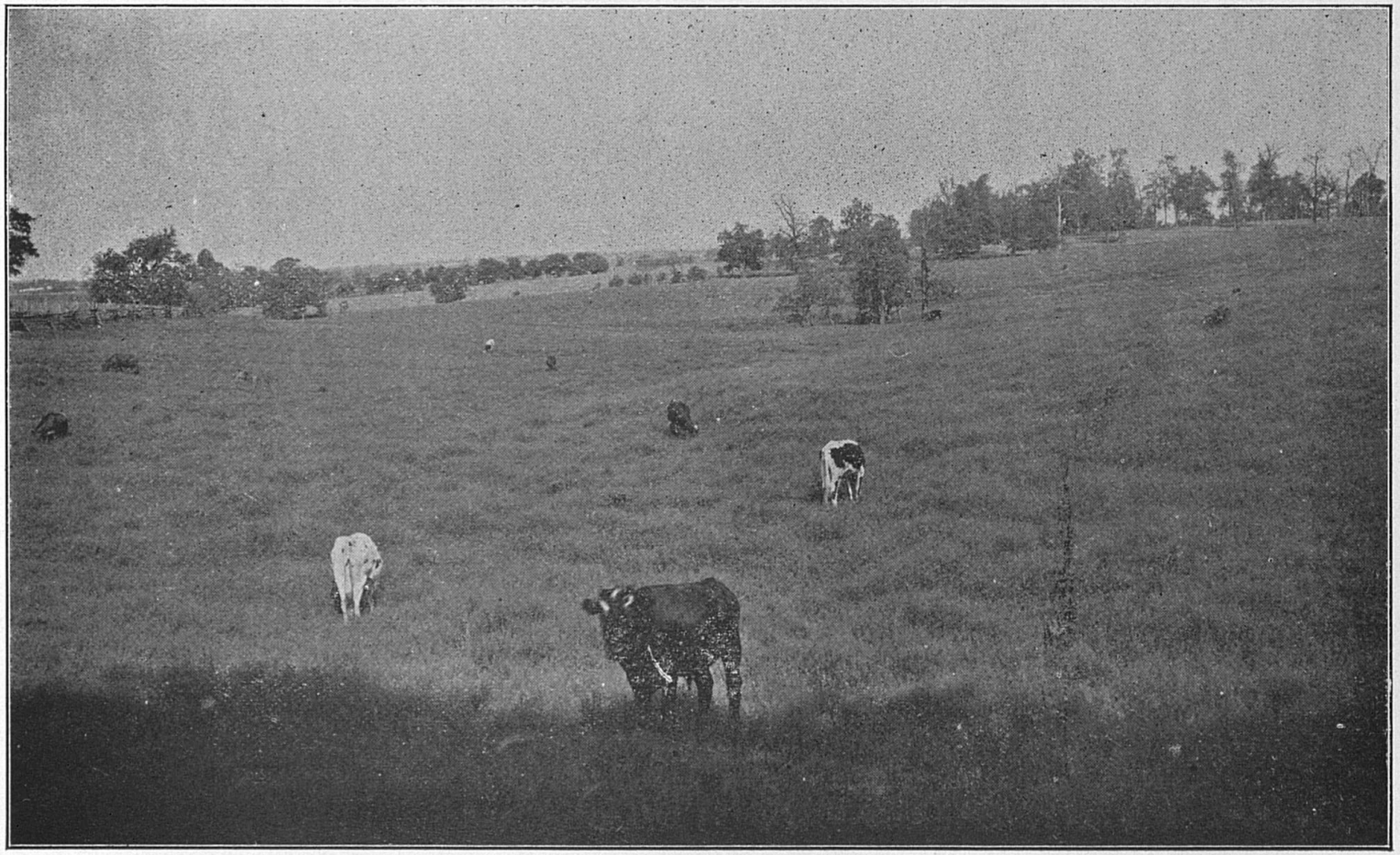

FIG. 3.—Open pasture in May. Nicholasville pike, about 4 miles south of Lexington. Photographed by H. G.

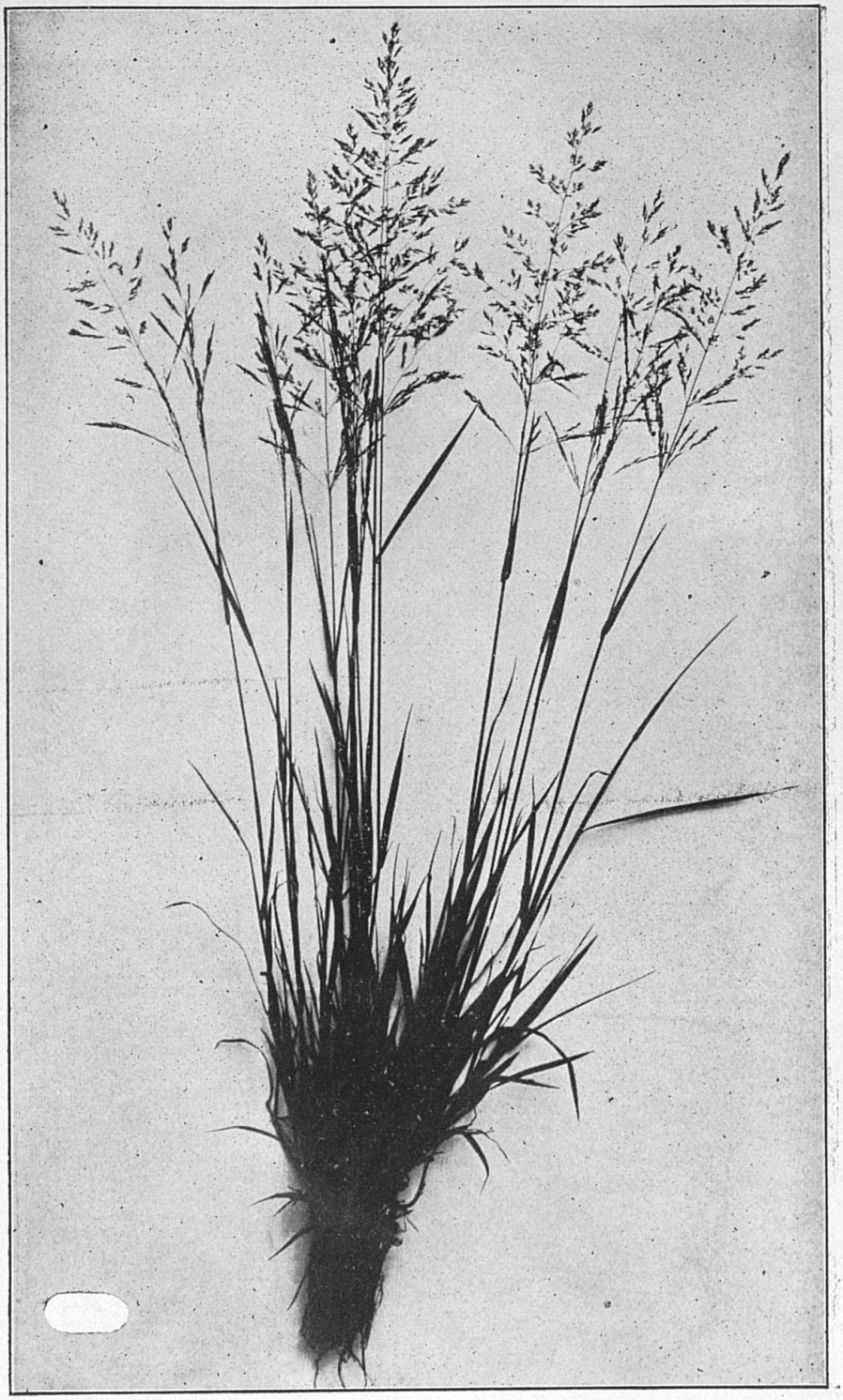

FIG. 4.—*Agrostis alba* (Red-top). Photographed by H. G.



FIG. 5.—*Andropogon halepensis* (Johnson-grass).
Photographed by H. G.

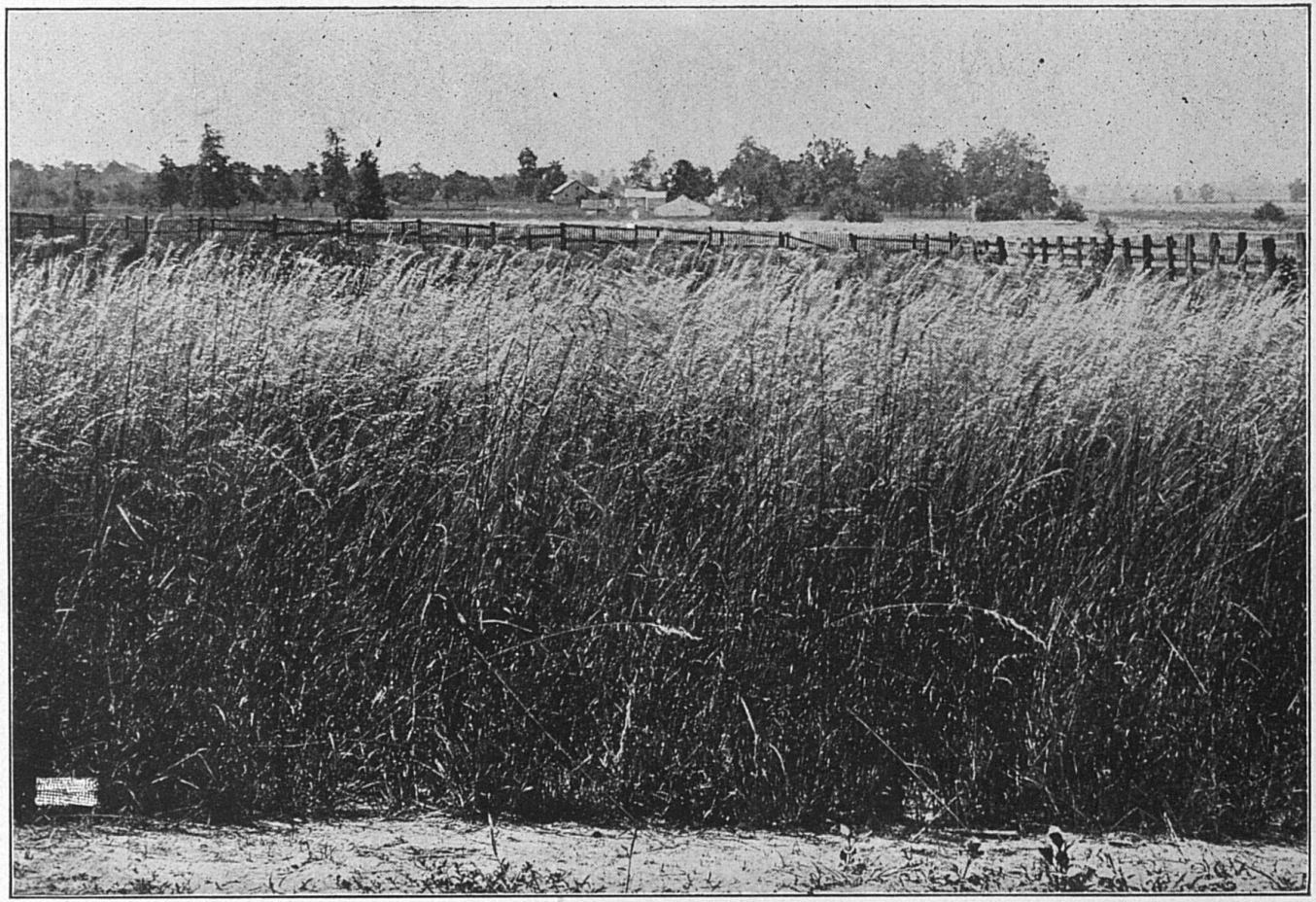

FIG. 6.—Plot of *Arrhenatherum elatius* (Tall oats-grass). Kentucky Experiment Station Farm, June 23, 1894. Photographed by H. G.



FIG. 7.—*Bromus inermis* (Smooth brome-grass).
Photographed by H. G.



FIG. 8.—*Bromus unioloides* (Rescue-grass).
Photographed by H. G.

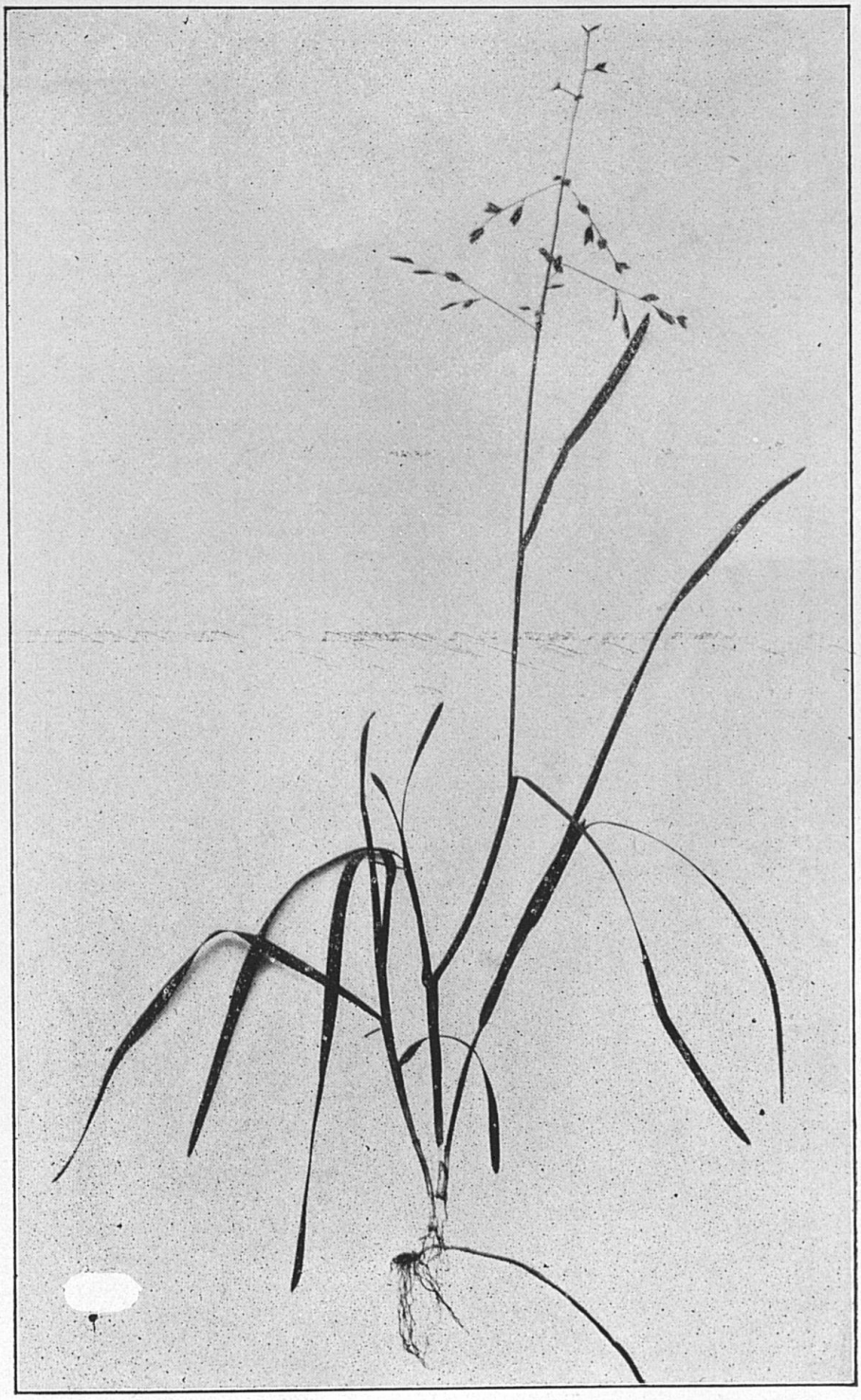

FIG. 9.—*Poa annua* (Annual spear-grass).
Photographed by H. G.

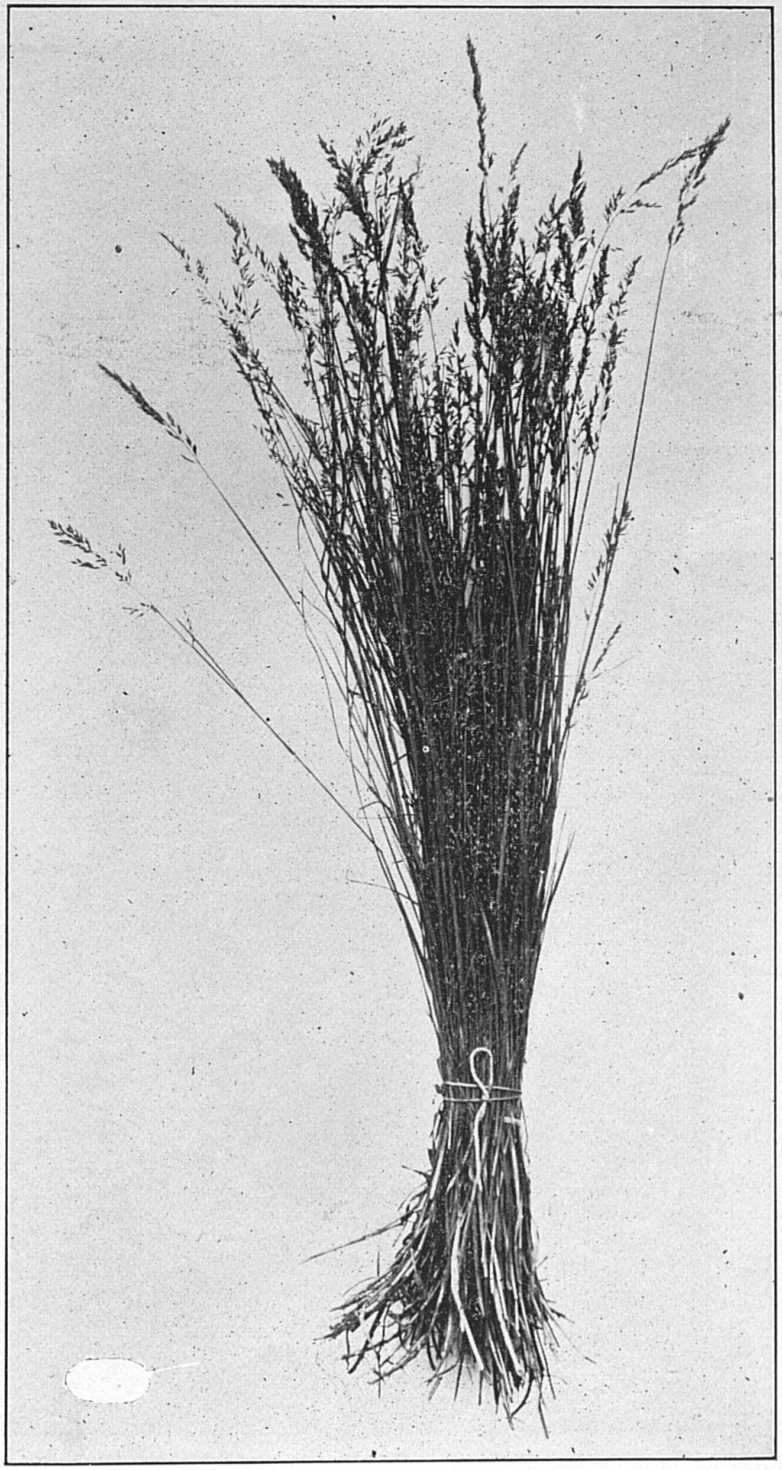

FIG. 10.—*Poa compressa* (Canada blue-grass).
Photographed by H. G.



FIG. 11.—*Poa pratensis* (Kentucky blue-grass). Panicle with stamens exposed. Natural size. Photographed by H. G.

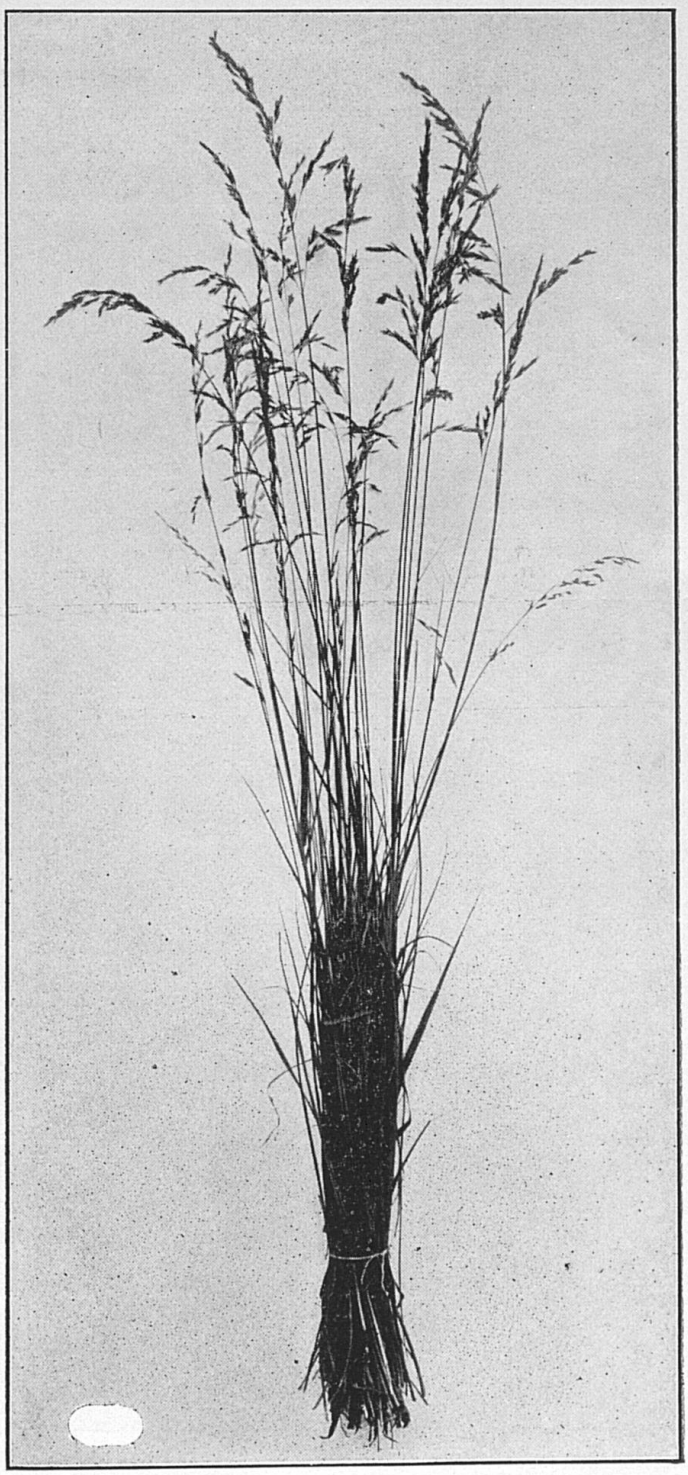

FIG. 12.—*Festuca elatior* (English blue-grass).
Photographed by H. G.

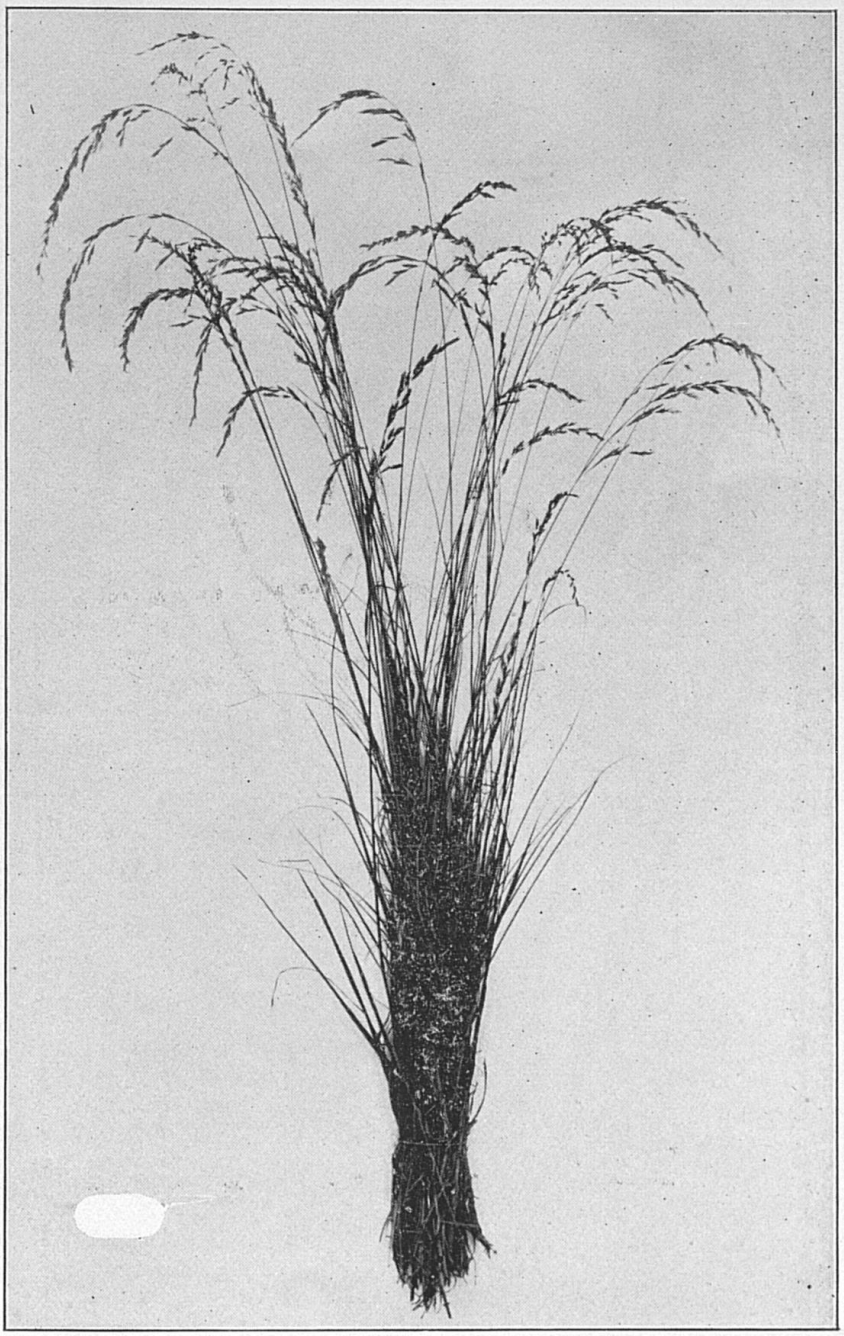

FIG. 13.—*Festuca pratensis* (English blue-grass).
Photographed by H. G.



FIG. 14.—*Ixophorus glaucus* (Yellow foxtail).
Photographed by H. G.

KENTUCKY

Agricultural Experiment Station

of the

STATE COLLEGE OF KENTUCKY.

BULLETIN NO. 88.

COMMERCIAL FERTILIZERS.

LEXINGTON, KENTUCKY.
AUGUST, 1900.
123.

KENTUCKY

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NOTICE.

The Bulletins of the Station will be mailed free to any citizen of Kentucky who sends his name and address to the Station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or of any failure to receive the Bulletins.

ADDRESS:

KENTUCKY AGRICULTURAL EXPERIMENT STATION,

LEXINGTON, KY.

BULLETIN NO. 88.

Analyses of Commercial Fertilizers.

1. *Number of Brands.* There were 221 different brands of commercial fertilizers registered from January 1, 1900 to August 12, 1900. Of these different brands, 129 were complete fertilizers, or fertilizers containing all three of the essential ingredients, namely: phosphoric acid, nitrogen and potash; 24 were acid phosphates, or superphosphates; 9 contained a mixture of acid phosphate and nitrogen compounds only; 25 acid phosphates and potash salts only; and 34 were classed as bones or tankage.

2. *Samples Collected and Analyzed.* Two hundred and ten samples were collected by deputy inspectors, or were sent by farmers from various parts of the State; 229 samples were those sent in by firms as official samples; of these samples 361 were analyzed by the Station.

3. *Results of the Analyses.* The results of the analyses show that of the 361 samples analyzed, 72, representing 55 brands and 22 firms, fell so far below the guaranteed analyses in phosphoric acid, nitrogen or potash, or any two, or all three of these ingredients, as to be unaccounted for by variations in sampling or analysis. It is probable that in most cases, variations can be accounted for by hurried or careless mixing at the factories, or gross mistakes in shipping one brand for another, but in one or two instances, the results show a desire on the part of the manufacturer to guarantee a higher percentage of the essential ingredients than the goods contain.

The great majority of the manufacturers, however, have furnished in most instances, fertilizers fully up to guarantee.

The following table gives the names of all manufacturers legally selling fertilizers in the State this year up to August 12, and the number of samples analyzed of each firm's fertilizers taken from various places in the State or furnished by the manufacturers.

The table also shows in how many of these samples there was a serious deficiency of either phosphoric acid, nitrogen or potash, and in how many the percentages of these constituents are such as to be considered acceptable, from the point of view of the buyer, either because they equal or exceed the percentage guaranteed by the manufacturer, or because a slight deficiency in one constituent is, in the Director's judgment, fully made up by an excess in one or both of the others. Under the heading, "Relative Value Per Ton," is shown in how many instances the "estimated value per ton," calculated from our analysis, equals or exceeds the value calculated from the manufacturer's minimum guaranteed analysis, and in how many it is too low, reasonable allowance having been made for unavoidable variations. This table should be carefully studied. It concisely reviews each firm, showing how the samples of fertilizers taken from various places in the State compare with what was guaranteed. In order, however, to see the amount of variations from the guaranteed analyses, this table should be studied in connection with the table of results of analyses, which follows this introduction. This table can be easily referred to, as the names of the firms are arranged in alphabetical order.

NAME OF MANUFACTURER.	No. of Samples Analyzed.	Phosphoric Acid.		Nitrogen.		Potash.		Relative Value Per Ton.	
		No. Acceptable.	No. too low.	No. Acceptable.	No. too low.	No. Acceptable.	No. too low.	No. Acceptable.	No. too low.
The Abbott & Martin Rendering Co	9	8	1	7	0	5	1	9	0
The Armour Fertilizer Works	16	16	0	14	0	10	0	16	0
Peter Backer & Son	7	5	2	7	0	4	0	7	0
George S. Bartlett	1	0	1	1	0	0	1	1	0
Baugh & Sons Co	2	2	0	2	0	2	0	2	0
The Chicago Fertilizer Co	16	13	3	14	1	9	4	15	1
The Cleveland Dryer Co	13	11	2	9	0	5	1	13	0
Continental Fertilizer Co	9	9	0	3	0	7	0	9	0
The Currie Fertilizer Co	26	23	3	23	1	19	4	25	1
Duncan & Bro.	2	2	0	2	0	2	0	2	0
Furman Farm Improvement Co	3	2	1	2	0	3	0	3	0
Globe Fertilizer Co	24	23	1	23	0	22	0	23	1

NAME OF MANUFACTURER.	No. of Samples Analyzed.	Phosphoric Acid.		Nitrogen.		Potash.		Relative Value Per Ton.	
		No. Acceptable.	No. too low.	No. Acceptable.	No. too low.	No. Acceptable.	No. too low.	No. Acceptable.	No. too low.
Greer Machinery Co.	6	5	1	3	0	4	1	6	0
The Hardy Packing Co..	6	6	0	5	0	4	0	6	0
R. H. Hoskins.	1	1	0	1	0	0	0	1	0
The Jarecki Chemical Co	4	4	0	3	0	3	0	4	0
J. B. Jones	7	4	3	7	0	4	0	7	0
The Jones Fertilizing Co	14	11	3	13	0	7	1	12	2
The Loudenback Fertilizer Co	3	3	0	2	1	3	0	3	0
Louisville Fertilizer Co.	28	27	1	11	1	16	7	27	1
Meridian Fertilizer Factory	3	3	0	3	0	3	0	3	0
Michigan Carbon Works	14	13	1	12	0	10	0	14	0
National Fertilizer Co.	11	11	0	7	1	9	0	11	0
North-Western Fertilizing Co.	27	26	1	21	0	17	4	26	1

The Ohio Farmers Fertilizer Co	26	18	8	20	1	16	3	21	5
Packers Fertilizer Association	1	1	0	1	0	0	0	1	0
Read Phosphate Co	18	15	3	15	0	12	4	18	0
J. F. Singer & Co	2	2	0	2	0	0	1	2	0
Standard Guano and Chemical Manufacturing Co	3	3	0	3	0	1	0	3	0
Swift & Co	16	14	2	13	0	10	0	16	0
Tandy Bros	4	4	0	3	0	2	0	4	0
Tennessee Chemical Co	12	12	0	7	0	11	0	12	0
Virginia-Carolina Chemical Co	12	11	1	8	0	11	0	12	0
The Walton Fertilizer Co	9	9	0	6	1	5	1	9	0
Wood & Stubbs	6	6	0	5	0	6	0	6	0

It is evident from the preceding table that while most of the fertilizers examined ran above the minimum guarantee, yet a thorough and careful inspection seems essential. It is hoped that farmers will generally take advantage of Section 8 of the fertilizer law, and when they purchase fertilizers, at least in quantity, that they take a sample in accordance with Section 8 and send it to the Station for free analysis.

The essentials in taking a sample are: 1. Take it at the time of purchase, and if possible, in the presence of agent or seller. 2. Take a sample from not less than two bags, and from one additional bag for every ten purchased; mix these samples carefully and take at least a pint of this mixed sample, put it into a fruit jar, seal, box and express to M. A. Scovell, Director, Lexington, Ky. 3. Take the sample in the presence of at least one witness, and have the witness sign the required certificate. 4. The certificate for free analysis to be sent *by mail* and should be in accordance with the law as given in Section 8.

If the sample is taken in accordance with the above directions it may be sent by express and the charges will be paid by the Station.

A good form of certificate is the following, and blank certificates will be sent free to any farmer requesting the same.

CERTIFICATE FOR FREE ANALYSIS.

.....190

M. A. SCOVELL, Director, Lexington, Ky.:

This is to certify that I am not a dealer in, or agent for the sale of any fertilizer, and that the fertilizer, a sample of which I have sent by express to you for free analysis was purchased by me.....190 for my own use and not for sale.

I further certify that the sample was taken at the time of purchase from at least 10 per cent. of the sacks or other packages comprising the whole lot purchased, and that it was taken as provided in Section 8 of the fertilizer law, in the following

described manner, to wit : .....

.....

.....

.....

.....

.....

.....

Upon receipt of the analysis from you, I agree to furnish you with a tag taken from one of the sacks sampled, the name and address of the firm or agent of whom the fertilizer was purchased, and the amount purchased.

(Signature) .....

(P. O. Address) .....

Signature of Witnesses :

.....

.....

Should, however, any farmer desire to take a sample and not have a blank certificate at hand, he may write one in full like the form above given, or take the sample in presence of seller and witness and so mark it that he can identify it subsequently in a certificate, and send it at once to the Experiment Station with the request that the station furnish form of certificate, such certificate to be filled out upon receipt covering the sample and properly signed by sender and witnesses and sent by return mail to the Station.

SECTION PROVIDING FOR FREE ANALYSIS.—The section of the Fertilizer Law, providing for the taking of samples for free analysis is as follows:

SEC. 8. Any person not a dealer in, or agent for the sale of any fertilizer who may purchase any commercial fertilizer in this State for his own use and not for sale, may take a sample of the same for analysis, which analysis shall be made by the said Experiment Station free of charge. Such samples for free analysis shall be taken by the purchaser in presence of the person, company or agent selling the fertilizer, from at least ten (10) per cent. of the sacks or other packages comprising the whole lot purchased, and shall be thoroughly mixed and at least one pound of the material after mixing must be put into a jar or can, securely sealed and marked in such a way as to surely identify the sample and show by whom it was sent, without giving the name of the fertilizer or the person from whom it was purchased, and must be forwarded to the Director of the Kentucky Agricultural Experiment Station, Lexington, Ky. The purchaser shall also send with the sample a certificate signed by himself and witness, or by two witnesses, stating that the sender has purchased the fertilizer for his own use and not for sale, and that the sample was taken in the manner prescribed in this Section. Provided, however, that if the person, company or agent shall refuse to witness the taking of the sample, then the sample may be taken at the time of the purchase in the manner already described in the presence of two witnesses who shall certify to the manner of taking the sample. The purchaser shall preserve the official label from one of the bags or other packages sampled to be sent to the Director after having received the report of analysis of the sample, and at the same time he shall furnish to the Director the name and address of the firm of whom the fertilizer was purchased and the amount purchased; and any person having sent a sample for free analysis, under the provisions of this Section, who shall, after having received the report of analysis of the same, refuse to furnish the required information, shall thereafter forfeit the privilege of free analysis of fertilizers under this Section. But if any sample shall have been submitted for free analysis without all the requirements of this Section having been complied with, the Director shall inquire into the case and may accept the sample for free analysis if he believes that it is a fair sample of the fertilizer as it was delivered to the purchaser.

Values Used.

In calculating the relative value per ton, the same values have been used as were used in our last bulletins, namely:

Soluble and reverted phosphoric acid in mixed fertilizers ..... 7¢ per lb.
Soluble and reverted phosphoric acid in plain acid and unacidulated phosphates..... 5¢ per lb.
Insoluble phosphoric acid in mixed fertilizers....2½¢ per lb.
Insoluble phosphoric acid in plain acid phosphates..... Nothing.
Phosphoric acid in fine bone ..... 4¢ per lb.
Phosphoric acid in medium bone..... 3¢ per lb.

Fine bone is all that passes through a sieve with meshes one-twenty-fifth inch square. Medium bone passes through a sieve with meshes one-sixth inch square, but does not include fine bone.

Nitrogen in all fertilizers.....17½¢ per lb.
Potash in all fertilizers, from sulphate..... 7¢ per lb.
Potash in all fertilizers, from muriate..... 6¢ per lb.

The term "Potash, from Muriate" does not indicate necessarily that the manufacturers used muriate of potash in furnishing the potash; they may have used sulphate of potash, or other salts of potash, but in all fertilizers where the term "Potash from Muriate" is used there is enough chlorine present to combine with the potash, either from salt in the tankage used, or the potash salts used, as muriate, kainit, carnallite, etc. As the objection to the use of muriate of potash arises from the chlorine present in this salt, it likewise follows that chlorine in a fertilizer is objectionable, whether put in with the potash or otherwise. The using of sulphate of potash where there is chlorine present in other ingredients of the fertilizer will not obviate the injurious effect of the chlorine, and therefore we take this method of showing chlorine present by designating the potash as "from muriate."

EXPLANATION OF THE TABLE.

In the table of analyses, following the name of each brand will be found the analysis of the sample furnished by the manufacturer at the time the fertilizer was entered for sale and which was accompanied by an affidavit giving the guaranteed analysis. This is the analysis that is marked "manufacturer" in the column headed "From Whom Obtained." If any other analyses of the same brand have been made, they will be found following this analysis. These samples have been collected by deputy inspectors or sent in by farmers. The manufacturer's guarantee is printed last in *italic* figures.

The figures in the table which are set in bold face type are those results which, in the judgment of the Director, were too low to be acceptable. Where samples of bone have been marked with (*) it indicates that the bone contains soluble phosphoric acid. This soluble phosphoric acid is an indication of either the addition of acid phosphate to the bone, (in which case it would not be a pure raw bone), or else that the bone containing this soluble phosphoric acid was not strictly a pure or high grade bone, but contained trashy materials, which carried with them the soluble phosphoric acid.

The names of the manufacturers are arranged in alphabetical order, and all the analyses of the same brand have been grouped together.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Abbott & Martin Rendering Co., Columbus, O.	
6377	Standard Phosphate.	Manufacturer
6498		Wm. E. Hancock, Cane Valley
6378	Ideal Grain Grower.	Manufacturer
6483		John L. Floyd, Nancy
6499		Wm. E. Hancock, Cane Valley
6379	Peerless Bone with Potash.	Manufacturer
6380	Tobacco and Potato Special.	Manufacturer
6500		Wm. E. Hancock, Cane Valley
6381	Render's Bone Meal.	Manufacturer
	A. D. Adair & McCarty Bros., Atlanta, Ga	See Furman Farm Imp. Co.
	The Armour Fertilizer Works, Chicago, Ill.	
6302	Bone Meal.	Manufacturer
6817		Forbes & Bro., Hopkinsville
6303	Acidulated Bone Meal	Manufacturer
6304	Raw Bone Meal	Manufacturer
6818		C. D. Chick, Beaver Dam
6305	Grain Grower.	Manufacturer
6306	Ammoniated Bone and Pot.	Manufacturer
6819		W. C. Moorman, Glendeane
6307	Tobacco Grower.	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Poasht,		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				9.83	1.77	11.60					$9.83	6377
				9.45	1.69	11.14					9.45	6498
				9.00		*10.00*					*9.00*	
				9.97	2.26	12.23	1.17	1.42		1.76	21.65	6378
				7.66	3.53	11.19	1.00	1.21	1.16		17.38	6483
				8.36	3.97	12.33	1.04	1.26	1.03		18.57	6499
				8.00		*9.00*	*0.82*	*1.00*	*1.00*		*15.77*	
				9.80	2.06	11.86	0.63	0.76		**2.05**	19.83	6379
				8.00		*9.00*	*0.41*	*0.50*	*2.50*		*16.14*	
				9.25	1.74	10.99	1.30	1.58	1.06	3.90	25.10	6380
				6.90	2.80	9.70	0.99	1.20	3.86		19.16	6500
				8.00		*9.00*	*0.82*	*1.00*	*4.00*		*19.37*	
18.01	5.38					23.39	2.26	2.74			25.55	6381
						20.00	*1.65*	*2.00*			*17.78*	
18.76	5.60					24.36	3.98	4.83			32.30	6302
21.25	4.05					25.30	2.85	3.46			29.4	6817
						24.00	*2.47*	*3.00*			*23.05*	
				17.98	4.00	21.98	3.07	3.70			37.85	6303
				11.00		*18.00*	*1.65*	*2.00*			*24.68*	
15.42	9.86					25.28	3.84	4.66			31.70	6304
20.89	4.90					25.79	3.65	4.43			32.43	6818
						22.00	*3.71*	*4.50*			*26.19*	
				9.08	3.83	12.91	2.23	2.71	0.86	1.94	26.19	6305
		6.00	*2.00*	*8.00*		*10.00*	*1.65*	*2.00*	*2.00*		*20.38*	
				8.92	2.76	11.68	3.40	4.13		2.31	29.00	6306
				8.39	3.97	12.36	2.92	3.54		2.54	27.5	6819
		4.00	*2.00*	*6.00*		*8.00*	*2.47*	*3.00*		*2.00*	*20.85*	
				9.78	2.03	11.81	2.02	2.45		5.00	28.78	6307
		6.00	*2.00*	*8.00*		*10.00*	*1.65*	*2.00*		*5.00*	*24.98*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Armour Fertilizer Works, Chicago, Ill.	
6308	Bone, Blood and Potash. .	Manufacturer ... .
6820		Forbes & Bro., Hopkinsville
6848		H. G. Hutchcraft, Paris.....
6309	Star Phosphate	Manufacturer .....
6310	White Burley & Black Tobacco	Manufacturer .....
6821		G. A. Wright, Jolly.....
6470	Phosphate and Potash.....	Manufacturer .....
	Peter Backer & Son, Troy, Ind.	
6503	Grower No. 1.....	Manufacturer .....
6504	Grower No. 2.....	Manufacturer .....
6610		A. L. Oelze, Cloverport .....
6505	Grower No. 7.....	Manufacturer ....
6506	Grower No. 8	Manufacturer .....
6507	Grower No. 9.....	Manufacturer .....
6570	Grower No. 3.....	Manufacturer .....
	Geo. S. Bartlett, successor to The Cin'ti Desiccating Co., Cin., O.	
6827	Indian Brand Ohio Valley Ph.	†Manufacturer .....
6830		J. W. Jordan, Tolesboro....
	Baugh & Sons Co., Norfolk, Va.	
6472	Baugh's Animal Bone and Potash Compound..... ..	Manufacturer ....
6619		Mason & Brakefield, Adairville
	Wm. Casler, Louisville, Ky.	See R. H. Hoskins

†Sample has not been analyzed.

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				9.27	1.96	11.23	4.35	5.28		7.29	$39.40	6308
				9.54	1.74	11.28	4.33	5.26	5.50	1.03	37.43	6820
				8.78	2.20	10.98	4.09	4.97	1.26	6.94	38.94	6848
		6.00	*2.00*	*8.00*		*10.00*	*4.12*	*5.00*		*7.00*	*36.42*	
				15.31	0.60	15.91					15.31	6309
		9.00	*3.00*	*12.00*		*16.00*					*12.00*	
				12.18	2.53	14.71	3.26	3.96		5.22	37.04	6310
				15.20	1.70	16.90	2.85	3.46		4.32	38.16	6821
		2.00	*6.00*	*8.00*		*10.00*	*2.88*	*3.50*		*4.00*	*27.88*	
				13.25	2.98	16.23				1.99	22.83	6470
		6.00	*4.00*	*10.00*		*12.00*				*2.00*	*17.80*	
				8.06	2.80	10.86	2.05	2.49			19.86	6503
		4.00	*2.00*	*6.00*		*10.00*	*2.00*	*2.43*			*17.40*	
				7.82	2.76	10.58	2.08	2.53	2.66		22.80	6504
				7.14	2.88	10.02	2.47	3.00	3.08		23.79	6610
		4.00	*2.00*	*6.00*		*10.00*	*2.00*	*2.43*	*3.00*		*21.00*	
8.69	3.21					**11.90**	3.50	4.25	2.95		24.67	6505
						15.00	*3.00*	*3.64*	*3.00*		*23.10*	
9.77	3.25					**13.02**	3.78	4.59			23.00	6506
						15.00	*3.00*	*3.64*			*19.50*	
12.65	13.70					26.35	3.17	3.85			29.44	6507
						20.00	*3.29*	*4.00*			*23.52*	
				8.10	2.71	10.81	1.94	2.36	5.23		25.77	6570
		4.00	*2.00*	*6.00*		*10.00*	*2.00*	*2.43*	*5.00*		*23.40*	
												6827
				7.72	2.21	**9.93**	1.91	2.32	**1.60**		20.53	6830
				8.00		*11.00*	*1.65*	*2.00*	*2.00*		*20.88*	
				8.40	1.82	10.22	1.89	2.29	2.53		22.33	6472
				8.55	1.71	10.26	1.79	2.17	2.35		21.92	6619
				8.00		*11.00*	*1.65*	*2.00*	*2.00*		*20.88*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Chicago Fertilizer Co., Chicago, Ill.	
6397	Mt. Pleasant Phosphate	Manufacturer
6398	Western Bone Black and Pot'h	Manufacturer
6611		R. P. Higgins & Co., Irvington
6625		C. C. Miller, Fordsville
6399	Bone, Blood and Potash	Manufacturer
6514		I. K. Miller, Campbellsville
6612		J. T. Jones, Ekron
6400	Standard Truck	Manufacturer
6515		I. K. Miller, Campbellsville
6401	Wheat Special	Manufacturer
6613		R. P. Higgins & Co., Irvington
6402	Blue Grass Tobacco Special	Manufacturer
6516		I. K. Miller, Campbellsville
6614		R. P. Higgins & Co., Irvington
6403	Chicago Bone Meal	Manufacturer
6615		C. C. Miller, Fordsville
	The Cleveland Dryer Co., Cleveland, Ohio.	
6456	Phospho Bone	Manufacturer
6634		Toncray & Gray, Tolesboro.
6457	Potato, Tobacco and General Crop Fertilizer	Manufacturer
6635		Leitchf'd Mer. Co., Leitchfield
6801		Toncray & Gray, Tolesboro.
6816		L. Green, Falls of Rough

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value Per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				10.05	1.80	11.85					$10.05	6397
				9.00		*10.00*					*9.00*	
				10.04	1.88	11.92	0.64	0.78		**2.05**	20.11	6398
				7.26	1.84	9.10	0.49	0.59	2.51		15.81	6611
				7.84	2.00	9.84	0.52	0.63	2.22		16 46	6625
				8.00		*9.00*	*0.41*	*0.50*		*2.50*	*16.64*	
				11.24	2.33	13.57	1.73	2.10		2.29	26.18	6399
				9.97	2.49	12.46	1.24	1.51	**1.33**		21.15	6514
				8 21	1.68	9.89	**0.96**	1.17	1.96		**18.04**	6612
				9.00		*10.00*	*1.23*	*1.50*		*2.00*	*20.21*	
				9.85	1.79	11.64	3.44	4.18	1.68	3.78	34.04	6400
				8.02	1.28	9.30	2.47	3.00		**3.43**	25.32	6515
				8.00		*9.00*	*2.47*	*3.00*		*4.00*	*25.92*	
				10.31	2.28	12.59	1.16	1.41		1.71	22.02	6401
				8.59	3.90	12.49	0.84	1.02	0.84		17.93	6613
				8.00		*9.00*	*0.82*	*1.00*		*1.00*	*15.97*	
				9.72	1.50	11.22	1.32	1.60	1.32	3.80	25.88	6402
				7.59	2.11	9.70	1.01	1.23	4.10		20.15	6516
				8.98	2.75	11.73	0.81	0.98	**2.40**	**0.71**	20.66	6614
				8.00		*9.00*	*0.82*	*1.00*		*4.00*	*20.17*	
19.94	3.52					23.46	2.21	2.68			25.80	6403
12.46	2.92					**15.38**	2.28	2.77			19.70	6615
						20.00	*1.65*	*2.00*			*17.78*	
				9.69	1.66	11.35	0.91	1.10	1.28		19.13	6456
				9.42	3.08	12.50	0.85	1.03	1.21		19.16	6634
				10.00			*0.82*	*1.00*	*1.00*		*18.07*	
				9.47	3.12	12.59	1.07	1.30	6.39		26.26	6457
				8.81	2.49	11.30	1.05	1.27	6.69		25.29	6635
				9 12	2.52	11.67	1.03	1.25	6.39		25.33	6801
				9.42	3.33	12.75	1.25	1.52	**5.02**		25.26	6816
				10.00			*1.03*	*1.25*	*6.00*		*24.81*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Cleveland Dryer Co., Cleveland, Ohio.	
6458	XXX Phosphate	Manufacturer
6636		Hiner & Gardner, Vanceburg
6459	Horsehead Phosphate	Manufacturer
6637		Toncray & Gray, Tolesboro..
6460	Square Bone	Manufacturer
6638		J. C. DeHaven, Hardinsburg.
6461	Superior Bone	Manufacturer
	Continental Fertilizer Co., Nashville, Tenn.	
6239	Bear Beef, Blood and Bone	Manufacturer
6240	Bear High Grade Dis. Bone	Manufacturer
6620		S. Terry & Co., Grayson Sps.
6241	Bear Special Tobacco Guano.	Manufacturer
6621		J. W. Teaff, Hardinsburg
6242	Bear Spec. Wheat & Corn Gro'r	Manufacturer
6519		Goodwin & Waddle, Somerset
6526	Bear Bone and Potash	Manufacturer
6650	Bear Potash Mixture	Manufacturer
	The Currie Fertilizer Co., Louisville, Ky.	
6367	Currie's Acid Phosphate	Manufacturer
6368	Currie's Alkaline Bone	Manufacturer

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.

Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value Per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				14.91	1.13	16.04					$14.91	6458
				14.26	2.42	16.68					14.26	6636
				14.00							*14.00*	
				9.97	1.01	10.98					9.97	6459
				10.72	1.66	12.38					10.72	6637
				10.00							*10.00*	
				11.18	7.93	19.11	2.03	2.46			26.73	6460
				8.66	10.45	19.11	2.18	2.65			24.98	6638
				6.00		*20.00*	*2.06*	*2.50*			*22.61*	
11.96	9.79					*21.75	2.54	3.08			24.33	6461
						20.00	*2.47*	*3.00*			*20.65*	
				12.48	1.69	14.17	1.84	2.23		2.78	28.65	6239
		6.00	*4.00*	*10.00*		*11.00*	*1.65*	*2.00*		*2.00*	*23.08*	
				14.09	1.01	15.10					14.09	6240
				15.34	1.16	16.50					15.34	6620
		8.00	*6.00*	*14.00*		*15.00*					*14.00*	
				12.40	1.75	14.15	1.87	2.27		2.63	28.47	6241
				10.29	1.52	11.81	1.95	2.37	1.40	0.77	24.76	6621
		6.00	*4.00*	*10.00*		*11.00*	*1.65*	*2.00*		*2.00*	*23.08*	
				11.86	0.74	12.60				2.39	20.32	6242
				11.27	1.27	12.54				1.95	19.15	6519
		8.00	*3.00*	*11.00*		*12.00*				*2.00*	*18.70*	
				13.13	0.81	13.94				1.02	20.22	6526
		9.00	*3.00*	*12.00*		*13.00*				*1.00*	*18.70*	
				11.09	1.23	12.32				2.29	19.36	6650
		8.00	*2.00*	*10.00*		*11.00*				*2.00*	*17.30*	
				13.45	3.56	17.01					13.45	6367
				13.50		*16.00*					*13.50*	
				11.18	3.10	14.28			1.47		18.96	6368
				10.00		*11.00*			*1.50*		*16.30*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Currie Fertilizer Co.	
6369	Currie's Corn and Wheat Spec	Manufacturer
6484		I. K. Miller, Campbellsville
6509		C. S. Brent, Lexington
6831		Leitchf'ld Mer. Co., Leitchf'ld
6858		J. B. Ross Sons, Madisonville
6370	Currie's Soluble Bone	Manufacturer
6832		W. A. Guenther & Sons, Owensboro
6859		A. Brooks, Robards
6371	Currie's Corn Grower	Manufacturer
6372	Currie's Tob. and Pot. Grower	Manufacturer
6487		Woodson Lewis, Greensburg
6508		C. S. Brent, Lexington
6567		J. W. Dalzell, Carlisle
6373	Currie's Golden Leaf Tobacco and Potato Grower	Manufacturer
6485		I. K. Miller, Campbellsville
6833		A. Brooks, Robards
6374	Currie's Climax Tobacco and Potato Grower	Manufacturer
6486		I. K. Miller, Campbellsville
6375	Currie's Corn and Oats Spec	Manufacturer
6376	Currie's Kentucky Phosphate	Manufacturer
6434	Currie's Wheat Grower	Manufacturer
6489	Currie's Raw Bone Meal	Manufacturer

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				10.63	3.01	13.64	0.71	0.86	0.82		$19.80	6369
				11.13	3.83	14.96	0.98	1.19	0.88		21.99	6484
				11.47	3.97	15.44	0.93	1.13	0.74		22.20	6509
				11.65	4.00	15.65	0.70	0.85	**0.52**		21.38	6831
				11.48	3.88	15.36	1.03	1.25	0.80		22.58	6858
				10.00		*12.50*	*0.62*	*0.75*	*1.00*		*18.62*	
				9.55	4.52	14.07	1.35	1.64		1.52	22.49	6370
				9.16	3.89	13.05	0.98	1.19		1.44	**20.22**	6832
				10.16	2.39	12 55	1.49	1.81	0.72	1.12	23.07	6859
				10.00		*12.00*	*1.23*	*1.50*		*1.50*	*21.41*	
				9.08	5.27	14.35	1.05	1.27		1.18	20.68	6371
				10.00		*12.50*	*1.23*	*1.50*		*1.50*	*21.66*	
				8.20	4.23	12.43	1.77	2.15	**1.62**	**4.69**	28.31	6372
				8.81	3.47	12.28	1.86	2.26	**1.32**	**3.83**	27.52	6487
				8.81	2.92	11.73	1.68	2.04	8.60		29.99	6508
				8.99	2.02	11 01	1.67	2.03	8.93		30.17	6567
				7.00		*9.00*	*1.65*	*2.00*		*8.00*	*27.78*	
				8.82	2.71	11.53	1.44	1.75	0.62	2.81	23.42	6373
				8.24	3.61	11.85	1.41	1.71	1.40	2.69	23.74	6485
				8.99	3.59	12.58	1.50	1.82	2.68	1.48	24.93	6833
				†*9.00*		*10.50*	*1.65*	*2.00*		*3.50*	*24.03*	
				†*8.00*		*12.50*	*1.65*	*2.00*	*2.10*	*1.40*	*23.71*	
				9.03	5.00	14.03	1.24	1.51		1.22	20.94	6374
				9.68	4.38	14.06	1.08	1.31		0.95	20.85	6486
				9.50		*12.00*	*0.82*	*1.00*		*1.00*	*18.82*	
				7.46	2.84	10.30	**1.05**	4.27	5.14		21.71	6375
				8.00		*10.00*	*1.65*	*2.00*	*3.00*		*22.18*	
				10.27	5.07	15.34	1.00	1.21		**0.98**	21.79	6376
				10.00		*12.50*	*1.03*	*1.25*		*1.50*	*20.96*	
				9.06	5.33	14.39	1.09	1.32		1.29	20.98	6434
				10.00		*12.50*	*1.23*	*1.50*		*1.50*	*21.66*	
8.58	14.01					22.59	4.20	5.10			29.97	6489
						19.00	*3.09*	*3.75*			*22.22*	

†The guaranteed analysis of this brand was changed March 27th from the first set of figures to the second.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Currie Fertilizer Co.	
6490	Currie's Fine Ground Raw Bone Meal	Manufacturer
6491	Currie's Butchertown Raw Bone Meal	Manufacturer
	Duncan & Bro., Lagrange, Ky.	
6825	Tiger Wheat Grower	Manufacturer
6826	Tiger Wheat Special	Manufacturer
	Furman Farm Improvement Co., Atlanta, Ga.	
6455	Furman High Grade Fertilizer	Manufacturer
6468	Furman Soluble Bone	Manufacturer
6482	Farish Furman Formula	Manufacturer
	Globe Fertilizer Co., Louisville, Ky.	
6327	Globe Special Tobac. Grower.	Manufacturer
6328	Globe Potato Grower	Manufacturer
6849		A. Button & Son, Louisville.
6329	Globe Soluble Vegeta. Grower	Manufacturer
6850		A. Button & Son, Louisville.
6330	Kentucky Standard Tobacco Grower	Manufacturer
6529		Durham Bros., Greensburg.
6331	Big Four Tobacco Grower	Manufacturer
6530		Durham Bros., Greensburg.
6332	Golden Harvest Bone Meal.	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				8.29	7.68	15.97	1.73	2.10			$21.51	6490
				8.00		*15.50*	*1.65*	*2.00*			*20.73*	
				10.77	5.81	16.58	1.75	2.12	1.61		26.05	6491
				10.00		*15.50*	*1.65*	*2.00*	*0.75*		*23.43*	
				10.11	1.97	12.08	0.91	1.10	0.78	1.75	21.72	6825
		7.00	*3.00*	*10.00*		*11.00*	*0.82*	*1.00*	*2.00*		*19.77*	
				10.94	4.49	15.43	0.90	1.09		2.05	23.59	6826
		5.00	*2.00*	*7.00*		*12.00*	*0.82*	*1.00*	*1.50*		*16.97*	
				9.11	3.38	12.49	1.88	2.28	2.33		23.82	6455
				10.00			*1.65*	*2.00*	*2.00*		*22.18*	
				9.94	1.14	11.08	1.16	1.41	2.28		21.29	6468
				10.00			*0.82*	*1.00*	*2.00*		*19.27*	
				11.33	1.25	12.58			1.75		18.59	6482
				10.00					*2.00*		*16.40*	
				9.06	1.14	10.20	2.38	2.89		10.76	36.64	6327
				8.00		*9.00*	*2.47*	*3.00*		*10.00*	*34.35*	
				9.26	1.84	11.10	3.24	3.93		4.62	31.69	6328
				9.47	2.09	11.56	3.21	3.90		4.12	31.32	6849
				8.00		*9.00*	*3.29*	*4.00*		*4.00*	*28.82*	
				9.23	1.91	11.14	2.18	2.65		3.32	26.16	6329
				8.32	3.07	11.39	2.53	3.07		3.19	26.52	6850
				8.00		*10.00*	*2.47*	*3.00*		*3.00*	*25.05*	
				9.60	2.85	12.45	2.92	3.54		3.34	29.77	6330
				9.87	2.83	12.70	2.33	2.83		3.02	27.63	6529
				8.00		*10.00*	*2.47*	*3.00*		*3.00*	*25.05*	
				9.12	2.09	11.21	2.10	2.55		2.43	24.57	6331
				10.05	3.17	13.22	1.63	1.98		2.16	24.39	6530
				8.00		*10.00*	*1.65*	*2.00*		*2.00*	*20.78*	
				10.98	1.77	12.75	2.75	3.34		0.81	27.02	6332
				10.00		*12.00*	*2.47*	*3.00*		*1.00*	*25.05*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Globe Fertilizer Co., Louisville, Ky.	
6333 6851	Globe Wheat Grower	Manufacturer A. Button & Son, Louisville
6334 6852	Eagle Corn & Wheat Grower	Manufacturer Smith & Cooper, Fordsville
6335 6531	Progress Corn & Wheat G'wer	Manufacturer J. W. Cloyd, Campbellsville
6336 6853	Globe Bone Dust	Manufacturer Wm. Fisher, Tip Top
6337 6532 6854 6877	Bone and Potash	Manufacturer J. W. Cloyd, Campbellsville Cochran & Baker, Marion A. Button & Son, Louisville
6884 6887	Globe Bone Meal	Manufacturer Hunt & Crutcher, Vine Grove
	Greer Machinery Co., Knoxville, Tenn.	
6430	Greer's Challenge	Manufacturer
6431 6533	Blood and Bone	Manufacturer G. K. Young, Gen Ag, Somerset
6432	Greer's Compound	Manufacturer
6433 6534	Greer's Dissolved Bone	Manufacturer G. K. Young, Gen Ag, Somerset
	The Hardy Packing Co., Chicago, Ill.	
6404	Crop Producer	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available	Insoluble.	Total.			From Muriate.	From Sulphate.		
				10.37	2.41	12.78	2.08	2.53		2.30	$26.23	6333
				11.02	1.41	12.43	2.13	2.59	2.91		27.09	6851
				9.00		*11.00*	*2.06*	*2.50*		*2.00*	*23.61*	
				10.47	2.41	12.88	2.06	2.50		2.21	26.17	6334
				9.44	3.67	13.11	1.98	2.40		2.59	25.62	6852
				9.00		*11.00*	*2.06*	*2.50*		*2.00*	*23.61*	
				10.52	3.08	13.60	2.27	2.76		0.97	25.58	6335
				9.13	4.96	14.09	2.13	2.59		0.91	23.99	6531
				9.00		*10.00*	*1.65*	*2.00*		*1.00*	*20.28*	
				10.20	3.49	13.69	1.45	1.76		0.89	22.36	6336
				7.31	1.62	**8.93**	1.52	1.85		0.81	**17.49**	6853
				9.00		*11.00*	*1.23*	*1.50*		*1.00*	*19.31*	
				11.30	1.93	13.13				0.99	18.18	6337
				11.90	2.24	14.14	0.34	0.41		0.73	19.99	6532
				10.25	1.20	11.45	0.40	0.49		1.16	17.97	6854
				11.41	2.48	13.89	0.34	0.41		0.84	19.58	6877
				11.00						*1.00*	*16.80*	
6.57	14.64					21.21	3.90	4.73			27.69	6884
9.93	11.66					21.59	3.64	4.42			27.68	6887
						20.00	*3.29*	*4.00*			*23.52*	
				9.72	1.38	11.10	1.85	2.25	4.60		26.30	6430
				10.00			*1.65*	*2.00*		*2.00*	*22.58*	
				7.84	1.19	9.03	2.00	2.43	4.84		24.39	6431
				7.57	3.39	10.96	1.72	2.09	2.39		21.19	6533
				8.00			*1.65*	*2.00*		*2.00*	*19.78*	
				11.98	1.02	13.00			2.42		20.18	6432
				12.00						*2.00*	*19.60*	
				14.26	0.93	15.19					14.26	6433
				14.98	0.96	15.94					14.98	6534
				15.00							*15.00*	
				10.15	2.58	12.73	1.15	1.40		1.78	22.02	6404
				8.00		*9.00*	*0.82*	*1.00*		*1.00*	*15.97*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Hardy Packing Co., Chicago, Ill.	
6405	Hardy's Wheat Grower	Manufacturer
6406	Garden Special	Manufacturer
6407	Southern Phosphate	Manufacturer
6408	Bone Meal	Manufacturer
6409	Hardy's Tobacco Special	Manufacturer
	R. H. Hoskins, Louisville, Ky.	
6568	Champion Raw Bone Meal	Manufacturer
	The Jarecki Chem Co., Sandusky O	
6435	Lake Erie Fish Guano	Manufacturer
6436	Number One Fish Guano	Manufacturer
6437	C. O. D. Phosphate	Manufacturer
6438	Fish and Potash Tobacco and Potato Food	Manufacturer
	J. B. Jones, Louisville, Ky.	
6282	Corn Grower	Manufacturer
6622		Jno. Heinz & Co., Louisville.
6283	Tobacco and Potato Grower	Manufacturer
6284	Jones' Bone Meal	Manufacturer
6285	Ammoniated Bone Meal	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value Per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				10.02	1.89	11.91	0.64	0.78		2.11	$20.17	6405
				8.00		*9.00*	*0.41*	*0.50*		*2.50*	*16.64*	
				10.44	1.62	12.06	1.31	1.59	1.32	3.64	26.70	6406
				8.00		*9.00*	*0.82*	*1.00*		*4.00*	*20.17*	
				10.16	1.69	11.85					10.16	6407
				9.00		*10.00*					*9.00*	
20.18	3.28					23.46	.27	2.76			26.06	6408
						20.00	*1.65*	*2.00*			*17.78*	
				10.00	2.01	12 01	3.42	4.15	1.64	3.68	34.10	6409
				8.00		*9.00*	*2.47*	*3.00*		*4.00*	*25.95*	
23.18						23.18	3.62	4.39			31.21	6568
						22.00	*3.29*	*4.00*			*24.72*	
				11 41	2.46	13.87	1.73	2.10	1.11		24.59	6435
				10.00		*11.00*	*1.64*	*1.99*		*1.00*	*21.64*	
				10.69	1.45	12.14	0.98	1.19	1.12		20.47	6436
				10.00		*11.00*	*0.86*	*1.04*		*1.00*	*18.91*	
				16.03	1.62	17.65					16.03	6437
				14.00		*15.00*					*14.00*	
				9.20	1.62	10.82	0.92	1.12	4.10		21.83	6438
				8.00		*9.00*	*0.86*	*1.04*		*4.00*	*20.31*	
				8.57	3.95	12.52	2.96	3.59		1.70	26.72	6282
				7.45	2.14	**9.59**	2.74	3.33		1.90	23.75	6622
				9.00		*11.00*	*2.47*	*3.00*		*1.50*	*24.35*	
				9.03	1.98	**11.01**	2.92	3 54		5.88	32.08	6283
				10.00		*12.00*	*2.88*	*3.50*		*5.50*	*32.78*	
15.83	5.28					*21.11	2.56	3.11			24.79	6284
						20.00	*2.47*	*3.00*			*20.65*	
11.72	1.02					*12.74	2.09	2.54			17.31	6285
						15.00	*2.06*	*2.50*			*16.21*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	J. B. Jones, Louisville, Ky.	
6286	Raw Bone Meal	Manufacturer
6287	Wheat Grower	Manufacturer
	The Jones Fertilizing Co., Cin. O.	
6410	Bone Meal	Manufacturer
6411	Ammoniated Bone Meal	Manufacturer
6412	Acidulated Bone	Manufacturer
6413	Bone and Potash	Manufacturer
6414	Tobacco and Potato Grower	Manufacturer
6641		T. E. Hedges, Rectorville
6808		J. B. Benjamin, Providence.
6415	Miami Valley Phosphate	Manufacturer
6642		J. B. Benjamin, Providence.
6416	Jones Reliable Phosphate	Manufacturer
6643		T. E. Hedges, Rectorville
6417	Jewel Phosphate	Manufactueer
6644		T. E. Hedges, Rectorville
6418	Acid Phosphate	Manufacturer
	The Loudenback Fertilizer Co., Urbana, Ohio.	
6421	Urbana Bone Phos. and Pot.	Manufacturer
6809		Winters & Everett, Maysville
6829		Markwell & Davis, Foxport.

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.													
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
12.21	9.21					21.42	3.59	4.36			$27.87	6286
						21.50	*3.50*	*4.25*			*25.15*	
				8.58	2.81	11.39	2.14	2.60		1.72	23.32	6287
				9.00		*11.00*	*1.70*	*2.06*		*2.00*	*22.35*	
18.28	5.46					*23.74	3.40	4.13			29.80	6410
						20.00	*3.29*	*4.00*			*23.52*	
				8.75	6.86	15.61	4.92	5.97			32.90	6411
				5.00		*15.00*	*4.12*	*5.00*			*26.42*	
				8.70	6.69	15.39	3.83	4.65			28.94	6412
				7.00		*14.50*	*3.29*	*4.00*			*25.07*	
				8.03	3.36	11.39	2.27	2.76		4.31	26.90	6413
				8.00		*10.00*	*1.65*	*2.00*		*4.00*	*23.58*	
				7.73	5.45	13.18	3.73	4.53	**0.76**	**3.72**	**32.73**	6414
				7.40	5.27	12.67	3.54	4.30		5.96	**33.73**	6641
				7.44	5.81	13.25	4.52	5.49	1.12	3.52	35.42	6808
				10.00		*12.00*	*3.71*	*4.50*		*5.00*	*34.99*	
				9.29	4.85	14.14	2.52	3.06		3.03	28.50	6415
				8.87	5.73	14.60	3.22	3.91		3.19	31.03	6642
				9.00		*13.00*	*2.47*	*3.00*		*2.75*	*27.10*	
				8.51	5.14	13.65	2.48	3.01		1.64	25.46	6416
				8.25	3.67	11.92	2.18	2.65		1.45	23.05	6643
				8.50		*10.00*	*1.23*	*1.50*		*1.25*	*18.71*	
				9.43	2.28	11.71	0.94	1.14			17.63	6417
				10.21	2.28	12.49	0.73	0.89			17.99	6644
				8.00		*10.00*	*0.82*	*1.00*			*15.07*	
				8.74	1.47	10.21					8.74	6418
				8.00		*10.00*					*8.00*	
				9.65	3.94	13.59	**0.77**	0.93	2.30		20.94	6421
				8.41	2.92	11.38	1.85	2.25		2.36	23.01	6809
				10.03	2.43	12.46	1.50	1.82	0.74	2.17	24.44	6829
				9.00			*1.23*	*1.50*	*1.00*	*1.00*	*19.51*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co., Louisville, Ky.	
6276	Bone and Potash	Manufacturer
6626		Stithton Lumber and Hardware Co., Stithton
6277	Pride Tobac. & Potato Grower	Manufacturer
6627		C. Wallis, Mayfield
6639		A. P. Brooks, Whitesville
6278	Eagle Phosphate	Manufacturer
6279	Dissolved Bone	Manufacturer
6549		G. C. Cundiff, Somerset
6349	Tiger Corn Grower	Manufacturer
6382	Corn Grower	Manufacturer
6550		G. C. Cundiff, Somerset
6566		Burke Bros., Junction City
6628		Stithton Lum. & H'dware Co.
6383	Corn and Wheat Grower	Manufacturer
6551		G. C. Cundiff, Somerset
6629		J. C. Ramsey & Son, Leitchfield
6640		C. R. Jackson, Kelsey
6384	Special for Tobacco, Potatoes and Corn	Manufacturer
6552		W. E. Ward & Co., Greensburg
6385	Soluble Bone	Manufacturer
6553		W. E. Ward & Co., Greensburg
6386	Potato and Tobacco Grower.	Manufacturer
6542		C. E. Smith, Keene
6396	Eagle Tobacco Grower	Manufacturer

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				10.52	1.51	12.03			2.27		$18.21	6276
				10.50	1.14	11.64				**0.75**	16.32	6626
		6.00	*4.00*	*10.00*		*11.00*			*2.00*		*16.90*	
				10.40	1.66	12.06			2.40		18.27	6277
				9.88	1.42	11.30			1.83		16.74	6627
				9.75	1.55	11.30			**1.43**		**16.15**	6639
		7.00	*3.00*	*10.00*		*12.00*			*2.00*		*17.40*	
				10.46	0.87	11.33					10.46	6278
		6.00	*4.00*	*10.00*		*11.00*					*10.00*	
				14.57	1.09	15.66					14.57	6279
				13.10	1.54	**14 64**					13.1(	6549
		8.00	*6.00*	*14.00*		*16.00*					*14.00*	
				10.91	1.20	12.11	0.73	0.89	2.25		21.13	6349
		7.00	*3.00*	*10.00*		*11.00*	*0.82*	*1.00*	*2.00*		*19.77*	
				10.04	1.15	11.19			1.92		16.94	6382
				10.81	1.24	12.05				**0.74**	16.79	6550
				10.33	1.54	11.87				**1.25**	16.9(	6566
				10.79	1.09	11.88				**1.15**	17.27	6628
		6.00	*4.00*	*10.00*		*11.00*			*2.00*		*16.90*	
				12.25	0.99	13.24			0.40		18.13	6383
				11.82	1.18	13.00			0.30		17.50	6551
				13.35	1.94	15.29			**0.09**		19.77	6629
				12.22	2.30	14.52			**0.18**		18.4(	6640
		7.00	*5.00*	*12.00*		*13.00*			*0.50*		*17.90*	
				9.08	1.04	10.12	0.79	0.96	1.70		18.04	6384
				7.94	0.96	8.90	0.92	1.12	1.73		16.90	6552
		5.00	*3.00*	*8.00*		*9.00*	*0.82*	*1.00*	*1.50*		*16.37*	
				8.88	1.07	9.95	0.77	0.93	1.56		17.54	6385
				8.66	0.82	9.48	0.87	1.06	1.41		17.55	6553
		5.00	*3.00*	*8.00*		*9.00*	*0.82*	*1.00*	*1.50*		*16.37*	
				8.01	0.93	8.94	1.56	1.89		4 73	23.76	6386
				9.30	1.75	11.05	1.70	2.06	0.94	3.19	25.45	6542
		5.00	*2.00*	*7.00*		*9.00*	*1.65*	*2.00*		*4.00*	*22.18*	
				9.59	0.81	10.40	2.15	2.61		5.98	29.74	6396
		6.00	*2.00*	*8.00*		*9.00*	*2.47*	*3.00*		*6.00*	*28.75*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co.	
6449	Bone Meal	Manufacturer
6630		J. C. Ramsey&Son, Leitchfield
6555	Special Wheat Grower	Manufacturer
6857	Eagle Guano	Manufacturer
	Meridian Fertilizer Factory, Meridian, Miss.	
6300	Meridian Home Mixture	Manufacturer
6554		Goodwin&Waddle, Somerset
6301	Merid'n Corn & Wheat Grower	Manufacturer
	Michigan Carbon Works, Detroit.	
6356	Homestead a Bone Black Fer.	Manufacturer
6556		J. R. Davis &Bro., C'pbellsville
6357	Homestead Tobacco Grower.	Manufacturer
6557		J. H. Thurman, Somerset
6358	Homestead Pot. & Tob. Fer.	Manufacturer
6359	Red Line Crop Grower	Manufacturer
6558		J. H. Thurman, Somerset
6360	Red Line Complete Manure	Manufacturer
6559		J.R.Davis & Bro., C'pbellsville
6361	Red Line Phos. with Potash.	Manufacturer
6362	Red Line Phosphate	Manufacturer
6363	Wolverine Ground Bone	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
20.40	8.33					*28.73	1.40	1.70			$26.22	6449
16.44	8.10					*24.54	1.13	1.37			21.97	6630
						20.00	*0.82*	*1.00*			*14.87*	
				8.94	1.18	10.12	0.28	1.00	2.08		18.48	6555
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*	*1.00*		*14.37*	
				11.62	2.25	13.87	**1.25**	1.52		2.84	25.76	6857
		6.00	*4.00*	*10.00*		*11.00*	*1.65*	*2.00*	*2.00*		*22.68*	
				11.66	1.09	12.75	2.79	3.39	2.15		29.22	6300
				9.31	1.87	11.18	2.87	3.48	2.36		26.85	6554
		7.00	*2.00*	*9.00*		*10.00*	*2.25*	*2.73*	*2.25*		*23.68*	
				11.80	1.07	12.87	2.76	3.35	2.13		29.28	6301
		7.00	*2.00*	*9.00*		*10.00*	*2.25*	*2.73*	*2.25*		*23.68*	
				8.20	0.96	9.16	2.01	2.44	2.11		21.53	6356
				9.18	0.91	10.09	2.14	2.60	2.41		23.69	6556
				8.00		*9.00*	*2.06*	*2.50*	*1.50*		*20.71*	
				10.99	0.23	11.22	2.84	3.45	3.59		29.76	6357
				10.28	0.54	10.82	3.25	3.95	3.96		30.79	6557
				10.00			*2.88*	*3.50*	*3.50*		*28.28*	
				8.83	0.82	9.65	2.19	2.66	3.20		24.28	6358
				8.00		*9.00*	*2.06*	*2.50*	*3.00*		*22.51*	
				7.87	1.29	9.16	1.90	2.31	2.24		21.01	6359
				7.40	1.47	8.87	1.90	2.31	1.73		19.83	6558
				8.00		*9.00*	*1.65*	*2.00*	*2.00*		*19.88*	
				7.00	1.33	8.33	1.05	1.27	1.04		15.40	6360
				8.20	1.38	9.58	1.11	1.35	1.12		17.40	6559
				7.00		*8.00*	*0.82*	*1.00*	*1.00*		*14.37*	
				11.05	1.55	12.60			1.81		18.42	6361
				10.00		*11.00*			*2.00*		*16.90*	
				13.20	2.80	16.00					13.20	6362
				14.00		*15.00*					*14.00*	
11.15	3.15					14.30	1.51	1.83			16.10	6363
						14.00	*1.65*	*2.00*			*14.18*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Michigan Carbon Works, Detroit	
6364	Desiccated Bone	Manufacturer
6860		McClanahan Bros., Franklin
	National Fert. Co., Nashville	
6471	Tobacco Grower	Manufacturer
6861		Cochran & Baker, Marion
6476	Tobacco Fertilizer	Manufacturer
6477	National Dissolved Bone	Manufacturer
6862		Wood & Mueller, Glasgow
6478	Corn Grower	Manufacturer
6539	Acid Phosphate	Manufacturer
6863		J. M. Porter, Beaver Dam
6540	Sadler's Formula	Manufacturer
6897	Wheat Grower	Manufacturer
6898		Wilson Bros., Adairville
	North-Western Fert. Co., Chicago	
6261	Horse Shoe Brand Corn and Wheat Grower	Manufacturer
6560		Woodson Lewis, Greensburg
6262	H. S. B. Raw Bone and Superphosphate Mixture	Manufacturer
6263	H. S. B. Fine Raw Bone	Manufacturer
6264	H. S. B. Acidulated Bone	Manufacturer
6265	H. S. B. Pure Ground Bone	Manufacturer
6865		Gus Young, Hopkinsville

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.													
Phosphoric Acid.										Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
22.46	8.74					31.20	1.44	1.75			$28.25	6364
26.64	4.34					30.98	1.61	1.95			29.55	6860
						25.00	*1.23*	*1.50*			*19.31*	
				11.39	1.48	12.87	1.62	1.97	3.03		26.00	6471
				11.65	1.02	12.67	1.87	2.27	2.71		26.62	6861
				10.00			*1.65*	*2.00*	*2.00*		*22.18*	
				10.61	0.88	11.49	2.03	2.46	6.64		30.37	6476
				10.00			*2.06*	*2.50*	*3.00*		*24.81*	
				13.38	1.18	14.56	0.93	1.13	2.17		25.18	6477
				13.30	1.39	14.69	0.99	1.20	1.58		24.69	6862
				10.00			*0.82*	*1.00*	*1.00*		*18.07*	
				13.30	1.23	14.53	0.95	1.15	2.07		25.05	6478
				10.00			*0.82*	*1.00*	*1.00*		*18.07*	
				15.62	1.06	16.68					15.62	6539
				14.56	1.28	15.84					14.56	6863
				14.00							*14.00*	
				13.29	1.75	15.04			4.68		25.11	6540
				12.00					*2.00*		*19.20*	
				11.03	1.51	12.54	1.35	1.64	2.85		24.35	6897
				11.74	1.94	13.68	1.07	1.30	1.74		23.25	6898
				10.00			*1.65*	*2.00*	*2.00*		*22.18*	
				8.33	1.15	9.48	2.03	2.46		1.97	22.11	6261
				8.97	2.57	11.54	2.13	2.59		2.35	24.60	6560
		5.00	*3.00*	*8.00*		*10.00*	*1.65*	*2.00*		*2.00*	*20.78*	
				8.67	4.99	13.66	2.78	3.37		0.67	25.31	6262
		4.00	*3.00*	*7.00*		*13.00*	*2.47*	*3.00*		*0.50*	*22.15*	
12.82	10.08					22.90	3.91	4.75			30.00	6263
						22.00	*3.29*	*4.00*			*24.72*	
				10.84	1.47	12.31	1.09	1.32			19.74	6264
		7.00	*3.00*	*10.00*		*12.00*	*0.82*	*1.00*			*17.87*	
19.64	2.18					21.82	2.55	3.10			25.95	6265
18.43	4.90					23.33	2.57	3.12			26.68	6865
						20.00	*2.47*	*3.00*			*20.65*	

TABLE OF ANALYSES.

Station Number	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	North-Western Fert. Co., Chicago	
6266	H. S. B. Chall'e Corn Grower	Manufacturer
6267	H. S. B. Success Corn Grower.	Manufacturer
6866		E. M. Gish, Central City
6268	H. S. B. Potato Grower	Manufacturer
6269	H. S. B. Acid. Bone and Potash	Manufacturer
6561		D. W. Gowdy, Campbellsville
6270	H. S. B. Tobacco Grower	Manufacturer
6445		O. M. Wilson, Howell
6271	H. S. B. Ky. Tobacco Grower	Manufacturer
6446		O. M. Wilson, Howell.,
6563		D. W. Gowdy, Campbellsville
6272	H. S. B. Dark Tobacco Grower	Manufacturer
6564		Woodson Lewis, Greensburg
6273	H. S. B. Bone and Potash	Manufacturer
6565		D. W. Gowdy, Campbellsville
6867		Barnes & Bro., Beaver Dam.
6888		Springfield & Ramsey, Sebree
6274	H. S. B. Cap Sheaf Wh't Gro'r	Manufacturer
6275	H. S. B. Quick Act'g Phosp'te	Manufacturer
6868		Barnes & Bro., Beaver Dam.
	The Ohio Farmers Fertilizer Co., Columbus, Ohio.	
6292	Acid Phosphate	Manufacturer
6520		Durham & Wilson, Gr'nsburg

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia	From Muriate.	From Sulphate.	Relative Value Per Ton.	Station Number.
				8.43	1.22	9.65	2.82	3.42		1.79	$24.79	6266
		5.00	*3.00*	*8.00*		*10.00*	*2.47*	*3.00*		*1.50*	*22.95*	
				7.65	0.81	8.46	1.26	1.53		1.18	17.18	6267
				7.31	1.89	9.20	1.24	1.51		1.19	17.19	6866
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*		*1.00*	*14.57*	
				8.57	1.34	9.91	3.77	4.58		**2.72**	29.68	6268
		5.00	*3.00*	*8.00*		*10.00*	*3.29*	*4.00*		*3.50*	*28.62*	
				10.80	1.43	12.23	1.09	1.32		1.09	21.19	6269
				10.64	2 01	12.65	1.02	1.24		0.89	20.73	6561
		7 00	*3.00*	*10.00*		*12 00*	*0.82*	*1.00*		*1.00*	*19.27*	
				8.63	1.23	9.86	3.78	4.59		**2.71**	29.72	6270
				8.93	1.66	10.59	3.50	4.25		4.15	31.39	6445
		5.00	*3.00*	*8.00*		*10.00*	*3.29*	*4.00*		*3.50*	*28.62*	
				8.73	1.16	9.89	2.84	3.45		1.74	25.18	6271
				8.97	2 38	11.35	2.10	2.55		1.97	23.86	6446
				9.36	3.07	12.43	2.97	3.61		2.16	28.06	6563
		5.00	*3.00*	*8.00*		*10.00*	*2.47*	*3.00*		*1.50*	*22.95*	
				7.72	0.93	8.65	1.29	1.57		1.17	17.44	6272
				8.12	1.82	9.94	1.20	1.46		1.08	17.99	6564
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*		*1.00*	*14.57*	
				10 43	1.52	11.95				1.86	17.96	6273
				10.67	1.51	12.18				**1.49**	17.79	6565
				10.65	1.34	11.99				**1.54**	17.74	6867
				10.25	2.12	12.37				2.05	18.28	6888
		7.00	*3.00*	*10.00*		*12.00*				*2.00*	*17.80*	
				7 79	0.86	8.65	1.26	1.53		1.12	17.32	6274
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*		*1.00*	*14.57*	
				10.09	1.82	11.91					10.09	6275
				8.27	3.61	11.88					**8.27**	6868
		8.00	*2.00*	*10.00*		*12.00*					*10.00*	
				9.81	1.69	11.50					9.81	6292
				8.43	2.25	10.68					8.43	6520
				9.00		*10.00*					*9.00*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Ohio Farmers Fertilizer Co.	
6293	General Crop Fish Guano....	Manufacturer.....
6521		Buchanan & Sanders, Campbellsville..
6603		J. W. Valentine, Rectorville...
6294	Corn, Oats and Wheat Fish Guano.....	Manufacturer.....
6522		Buchanan & Sanders ...
6604		Paducah Fert. & Imp. Co., Paducah..
6617		Winters & Everett, Maysville
6633		M. L. Crews & Son, Jolly....
6295	Tobacco Grower.....	Manufacturer.....
6523		Durham & Wilson, Greensburg
6605		Paducah Fert. & Imp. Co....
6296	Tobacco Special.....	Manufacturer ..
6606		Paducah Fert. & Imp. Co....
6618		G. W. & T. E. Elgin, Hopkinsv.
6297	Fine Ground Bone Meal.....	Manufacturer.....
6607		Paducah Fert. & Imp. Co....
6298	Soluble Bone and Potash....	Manufacturer.....
6524		Buchanan & Sanders ....
6420	Potato and Truck.....	Manufacturer.....
6608		Paducah Fert. & Imp. Co....
6873	Grain and Grass.....	Manufacturer.....
6874	Desiccated Bone Meal.....	Manufacturer.....
6875	Imperial Raw Bone.....	Manufacturer.....
6878		A. Weatherford & Son, Harned.....

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				9.87	2.44	12.31	1.16	1.41		1.86	$21.70	6293
				7.14	2.03	9.17	0.93	1.13	1.83		16.48	6521
				6.86	2.26	9.12	0.90	1.09	1.54		15.73	6603
				8.00		*9.00*	*0.82*	*1.00*		*1.00*	*15.97*	
				11.31	2.21	13.52	1.77	2.15		2.48	26.61	6294
				9.88	3.30	13.18	1.11	1.35	**1.34**		20.98	6522
				8.19	1.93	10.12	0.95	1.15	2.52		**18.79**	6604
				8.37	3.51	11.88	1.10	1.34	1.69		19.36	6617
				10.12	2.58	12.70	1.10	1.34	2.04		21.76	6633
				9.00		*10.00*	*1.23*	*1.50*		*2.00*	*20.21*	
				11.14	2.19	13.33	1.70	2.06		2.51	26.16	6295
				9.24	2.15	11.39	1.10	1.34	1.92		20.17	6523
				8.42	2.67	11.09	0.94	1.14	1.80		**18.58**	6605
				9.00		*10.00*	*1.23*	*1.50*		*2.00*	*20.21*	
				10.03	1.79	11.82	3.39	4.12	1.42	4.26	34.47	6296
				7.08	2.87	9.95	2.16	2.62	4.34		**24.12**	6606
				8.25	2.70	10.95	2.53	3.07		**3.31**	26.39	6618
				8.00		*9.00*	*2.47*	*3.00*		*4.00*	*25.95*	
21.09	2.88					23.97	2.31	2.80			26.69	6297
12.83	2.27					**15.10**	2.33	2.83			19.78	6607
						20.00	*1.65*	*2.00*			*17.78*	
				13.31	2.32	15.63				1.74	22.23	6298
				9.05	2.26	**11.31**			0.93		**14.92**	6524
				12.00		*13.00*			*1.00*		*18.50*	
				9.92	1.94	11.86	3.33	4.04	1.56	3.81	33.72	6420
				7.67	2.53	10.20	**2.08**	2.53		**2.59**	**22.92**	6608
				8.00		*9.00*	*2.47*	*3.00*		*4.00*	*25.95*	
				13.69	2.24	15.93				1.72	22.70	6873
				12.00		*15.00*			*1.00*		*18.50*	
18.26	4.56					*22.82	1.58	1.92			22.88	6874
						21.00	*1.65*	*2.00*			*18.38*	
9.76	10.15					19.91	3.43	4.16			25.91	6875
11.16	7.44					18.60	3.25	3.95			24.77	6878
						16.00	*3.29*	*4.00*			*21.12*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Packer's Fertilizer Association, Chicago, Ill.	
6856	Boar's Head Brand Chicago Bone Meal	Manufacturer
	Read Phosphate Co., Nashville.	
6338	Read's High Grade Tobacco Grower.	Manufacturer
6544		I. K. Miller, Campbellsville
6601		G. T. Wyatt, Olmstead
6869		J. McClain Stanley & Co., Henderson
6889		J. T. Powell, Paducah.
6339	Read's Blood & Bone Fertilizer No. 1.	Manufacturer
6870		J. T. Powell, Paducah.
6340	Read's Alkaline Bone.	Manufacturer
6341	Read's Farmers Spec. Manure	Manufacturer
6871		J. W. Bearce & Co., Bowling Green
6342	Read's XXX Dissolved Bone.	Manufacturer
6343	Read's Veg. Fruit & Vine Fert	Manufacturer
6344	Read's Wheat & Clover Gro'er	Manufacturer
6345	Read's Spec. Potash Mixture.	Manufacturer
6346	Read's Wheat Grower.	Manufacturer
6347	Read's Corn Grower Special.	Manufacturer
6545		I. K. Miller, Campbellsville.

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
17.27	2.35					*19.62	2.75	3.34			$24.86	6856
						20.00	*2.47*	*3.00*			*20.65*	
				9.18	1.55	10.73	1.94	2.36		4.18	26.27	6338
				7.67	2.07	9.74	1.72	2.09	4.00		22.60	6544
				7.25	1.16	8.41	1.43	1.74	4.95		21.68	6601
				7.04	4.13	11.17	1.78	2.16	3.88		22.82	6869
				9.84	1.88	11.72	1.60	1.94	**0.62**	**2.24**	24.20	6889
				8.00		*9.00*	*1.65*	*2.00*	*4.00*		*22.28*	
				8.69	2.41	11.10	1.66	2.02	1.92		21.49	6339
				8.48	4.08	12.56	1.96	2 38	2.24		23.46	6870
				8.00		*9.00*	*1.65*	*2.00*	*2.00*		*19.88*	
				9.82	1.62	11.44			2.52		17.58	6340
				10.00		*11.00*			*2.00*		*16.90*	
				11.33	2.44	13.77	1.05	1.27	2.87		24.20	6341
				10 45	1.05	11 50	0.88	1.07	2.84		21.65	6871
				10.00		*11.00*	*0.82*	*1.00*	*3.00*		*20.97*	
				13.39	3.68	17.07					13.39	6342
				13 00		*14.00*					*13.00*	
				8.00	1.47	9 47	1.74	2.11	**6.52**		25 85	6343
				6.00			*1.65*	*2.00*	*8.00*		*23.78*	
				10.98	2.76	13.74	0.84	1.02	**1 62**		21.63	6344
				10.00		*12 00*	*0.82*	*1.00*	*2 00*		*20.27*	
				10.44	1.39	11.83			**3.04**		18.97	6345
				10.00		*11.00*			*4.00*		*19.30*	
				10.60	1.91	12.51	1.49	1.81	2.49		24.01	6346
				10.00		*11.00*	*1.65*	*2.00*	*2.00*		*22.68*	
				10.76	2.90	13.66	0.94	1.14	0.95		20.94	6347
				9.05	2.44	11.49	0.94	1.14	1.55		19.04	6545
				10.00		*11.00*	*0.82*	*1.00*	*1.00*		*18.57*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Read Phosphate Co., Nashville, Tenn.	
6885	Fine Ground Bone	Manufacturer
	J. F. Singer & Co., Nashville, Tenn.	
6290	No. 2 Wheat Grower	Manufacturer
6291	Singer's Standard Bone	Manufacturer
	Standard Guano and Chemical M'f'g Co., New Orleans, La.	
6318	Standard Tobacco Fertilizer	Manufacturer
6429	Pure Raw Ground Bone	Manufacturer
6810		Mason & Brakefield, Adairv'e
	Swift & Co., Chicago, Ill.	
6288	Swift's Ammonia, Bone&Pot.	Manufacturer
6802		J. U. Rogers, Glasgow
6289	Swift's Bone Meal	Manufacturer
6803		J. U. Rogers, Glasgow
6502	Vegetable Grower	Manufacturer
6510	Potato & Tobacco Grower	Manufacturer
6536	Superphosphate	Manufacturer
6804		Leitchfield Mer.Co.Leitchfield
6537	Phosphate and Potash	Manufacturer
6538	Raw Bone Meal	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available	Insoluble.	Total.			From Muriate.	From Sulphate.		
11.19	8.10					19.29	2 26	2.74			$21.72	6885
						18.00	*2.06*	*2.50*			*18.01*	
				9.96	6.58	16.54	2.08	2.53		**0.81**	25.64	6290
				7.00		*13.00*	*1.65*	*2.00*		*2.00*	*21.38*	
8.17	12.78					20.95	4.01	4.87			28.25	6291
						20.00	*3.29*	*4.00*			*23.52*	
				9.14	0.38	9.52	2.24	2.72	2.18		23.45	6318
				8.00		*9.00*	*1.65*	*2.00*		*2.00*	*20.28*	
13.84	10.88					24.72	3.94	4.78			31.39	6429
16.98	4.79					21.77	3.89	4.72			30.07	6810
						20.00	*3.09*	*3.75*			*22.82*	
				10.82	2 11	12.93	2 33	2.83		2.73	28.19	6288
				11.47	5.48	16.95	1.77	2.15		2.17	28.04	6802
				8.00		*11.00*	*1.85*	*2.25*		*2.00*	*21.98*	
24.96	1.88					26.84	2.70	3 28			30.55	6289
23.68	2.34					26.02	2.92	3.54			30.56	6803
						25.00	*2.47*	*3.00*			*23.65*	
				9.36	0.73	10.09	3.56	4.32		10.05	40.00	6502
		5.00	*4.00*	*9.00*		*10.00*	*3.29*	*4.00*		*10.00*	*38.62*	
				10.93	0.88	11.81	3.74	4.54		5.46	36.47	6510
		6.00	*4.00*	*10.00*		*11.00*	*3.29*	*4.00*		*5.00*	*33.02*	
				9.57	5.18	14.75	2.89	3.51		2.22	29.22	6536
				9.58	4.25	13.83	2.58	3.13	1.89		26.84	6804
		5.00	*3.00*	*8.00*		*12.00*	*2.47*	*3.00*		*2.00*	*24.65*	
				14.29	0.90	15.19				1.63	22.74	6537
		8.00	*4.00*	*12.00*		*13.00*				*2.00*	*20.10*	
16.23	8.36					24.59	4.07	4.94			32.25	6538
						23.00	*3.71*	*4.50*			*26.79*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Swift & Co., Chicago, Ill.	
6834	Complete Fertilizer..	Manufacturer
6835	Diamond S Phosphate [S]	Manufacturer
6836	Ammoniated Bone and Potash	Manufacturer
6837	Bone and Potash	Manufacturer
6838	Pure Acid Phosphate.	Manufacturer
6839	Ammoniated Bone	Manufacturer
	Tandy Bros., Milton, Ky.	
6450	Tandy Bros. Wheat, Corn and Oat Grower	Manufacturer
6451	Tandy Bros. Ammoniated Bone with Potash	Manufacturer
6452	Tandy Bros. Acid Phosphate	Manufacturer
6453	Tandy Bros. Bone Meal	Manufacturer
	Tennessee Chemical Co., Nashville, Tenn.	
6233	Ox Alkaline Bone	Manufacturer
6234 6879	Ox Special Tobacco Guano	Manufacturer Broddus & Tandy, Hopkinsville
6235	Ox High Grade Dissolved Bone	Manufacturer

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.									Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.		
				8.79	3.79	12.58	1.08	1.31		1.68	$20.34	6834
		5.00	*3.00*	*8.00*		*11.00*	*1.03*	*1.25*		*1.00*	*17.71*	
				14.36	0.81	15.17					14.36	6835
		6.00	*4.00*	*10.00*		*11.00*					*10.00*	
3.54	1.50					**15.04**	4.92	5.97		3.24	33.49	6836
						16.00	*4.74*	*5.75*		*3.00*	*30.39*	
23.44	1.76					25.20	2.36	2.87		2.97	32.23	6837
						23.50	*2.47*	*3.00*		*3.00*	*26.95*	
				16.95	0.83	17.78					16.95	6838
		10.00	*6.00*	*16.00*		*17.00*					*16.00*	
13.31	2.73					**16.04**	5.50	6.68			31.54	6839
						17.00	*4.94*	*6.00*			*27.49*	
				9.10	4.00	13.10	2.25	2.73	1.00	1.69	26.19	6450
		6.00	*2.00*	*8.00*		*10.00*	*1.65*	*2.00*	*2.00*		*20.38*	
				8.74	3.07	11.81	3.32	4.03		2.21	28.49	6451
		4.00	*2.00*	*6.00*		*8.00*	*2.47*	*3.00*		*2.00*	*20.85*	
				18.05	1.68	19.73					18.05	6452
		9.00	*3.00*	*12.00*		*16.00*					*12.00*	
19.06	5.07					24.13	4.10	4.98			32.64	6453
						24.00	*2.47*	*3.00*			*23.05*	
				12.72	0.81	13.53				2.47	21.68	6233
		9.00	*3.00*	*12.00*		*13.00*				*2.00*	*20.10*	
				12.49	1.80	14.29	1.85	2.25		2.67	28.61	6234
				10.84	2.52	13.36	1.63	1.98	0.58	1.24	24.59	6879
		6.00	*4.00*	*10.00*		*11.00*	*1.65*	*2.00*		*2.00*	*23.08*	
				14.17	1.07	15.24					14.17	6235
		8.00	*6.00*	*14.00*		*15.00*					*14.00*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Tenn. Chemical Co., Nashville..	
6236	Ox Bone with Ammo. & Pot..	Manufacturer .....
6237	Ox Sp'c. Wheat & Corn Guano	Manufacturer .....
6880		H. D. Bourland, Madisonville
6238	Ox High Grade Ammo. Bone...	Manufacturer .....
6254	Ox Potash Mixture....	Manufacturer .....
6881		H. B. Phillips & Co., Owensb'o
6585	Ox Potash Formula.....	Manufacturer ....
6649	Ox Slaughter House Bone.....	Manufacturer ....
	S. W. Travers & Co., See Virginia Carolina Chemical Co.	
	Virginia-Carolina Chem. Co., S.W. Travers & Co., Branch, Richm'd	
6247	National Tobacco Fertilizer.	Manufacturer ....
6496		J. Will Dinning, Franklin....
6546		Buchanan & Sanders, Campbellsville .....
6248	Beef Blood & Bone Fertilizer.	Manufacturer .....
6547		Buchanan & Sanders, Campbellsville.. .....
6890		Payne & Co., Cloverport....
6249	Capital Bone Pot. Compound	Manufacturer .....
6497		J. Will Dinning, Franklin.....
6891		Pierce & Sons, Marion.....
6250	Capital Dissolved S. C. Bone.	Manufacturer ....
6251	Champ. Corn & Wh't Grow...	Manufacturer .....
6548		Buchanan & Sanders, Campbellsville.....

TABLE OF ANALYSES.

Pounds in the Hundred.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value Per Ton.	Station Number.
				12.03	1.30	13.33	1.13	1.37		1.64	$23.75	6236
		6.00	*4.00*	*10.00*		*11.00*	*0.82*	*1.00*		*1.00*	*18.77*	
				13.38	1.42	14.80	1.19	1.44		1.53	25.75	6237
				12.50	2.92	15.42	0.90	1.09	0.56	0 60	23.62	6880
		9.00	*3.00*	*12.00*		*13.00*	*0.82*	*1.00*		*1.00*	*21.57*	
				12.19	1.84	14.03	1.95	2.37		2.54	28.38	6238
		6.00	*4.00*	*10.00*		*11.00*	*1.65*	*2.00*		*2.00*	*23.08*	
				11.34	0.72	12.06				2.46	19.68	6254
				10.40	2.46	12.86				1.93	18.49	6881
		8.00	*2.00*	*10.00*		*11.06*				*2.00*	*17.30*	
				10.89	0.82	11.71				4.45	21.89	6585
		7.00	*3.00*	*10.00*		*11.00*				*4.00*	*20.10*	
				9.61	2.35	11.96	1.80	2.19		2.30	24.15	6649
		6.00	*2.00*	*8.00*		*9.00*	*1.65*	*2.00*		*2.00*	*20.28*	
				7.83	0.82	8.65	2.07	2.51	5.07		24.70	6247
				7.63	1.38	9.01	1.36	1.65	4.86		21.96	6496
				7.22	1.33	8.55	1.64	1.99	4.69		22.15	6546
		5.00	*2.00*	*7.00*		*8.00*	*1.65*	*2.00*	*4.00*		*20.88*	
				8.84	0.96	9.80	1.88	2.28	2.52		22.46	6248
				8.43	1.20	9.63	1.48	1.80	2.54		20.63	6547
				7.17	2.35	9.52	1.72	2.09	2.33		20.04	6890
		5.00	*2.00*	*7.00*		*8.00*	*1.65*	*2.00*	*2.00*		*18.48*	
				13.56	0.51	14.07			2.70		22.48	6249
				7.86	1.02	**8.88**			3.87		16.15	6497
				11.47	0.81	12.28			2.06		18.94	6891
		7.00	*3.00*	*10.00*		*11.00*			*2.00*		*16.90*	
				13.43	0.74	14.17					13.43	6250
		9.00	*3.00*	*12.00*		*13.00*					*12.00*	
				9.42	0.74	10.16	1.17	1.42	2.52		20.68	6251
				8.56	1.09	9.65	0.91	1.10	2.41		18.61	6548
		6.00	*2.00*	*8.00*		*9.00*	*0.82*	*1.00*	*2.00*		*16.97*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	The Walton Fertilizer Co., Cleveland, Ohio.	
6226	Special Dissolved Bone.	Manufacturer.....
6227	Diamond Cereala Sol'ble Bone	Manufacturer.....
6811		J. E. Woodson, Central City.
6228	Wheat and Grass Grower.....	Manufacturer.....
6229	Regal Tobacco Guano.....	Manufacturer.....
6812		J. E. Woodson, Central City.
6230	German Truck & Pot. Manure	Manufacturer.....
6813		Alvin Richey, Princeton.....
6822	Diamond Bone Black & Pot..	Manufacturer.....
	Wood & Stubbs, Louisville, Ky.	
6387	Acme Brand Wheat & Corn ..	Manufacturer.....
6388	Acme Brand Potato & Tobac.	Manufacturer.....
6389	Acme Br'd High Grade Veget.	Manufacturer.....
6390	Acme Brand Bone, Blood&Pot	Manufacturer.....
6391	Acme Brand Sol. Bone & Pot.	Manufacturer.....
6392	Wood & Stubbs L'n&Gar. Fer.	Manufacturer.....

ERRATUM:—Page 128, opposite Greer Machinery Co., in the first line of the table, seventh column, under "Potash, No. too low," should be "0" instead of "1."

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				12.78	0.95	13.73					$12.78	6226
				12.00							*12.00*	
				15.53	1.22	16.75	0.39	0.47			23.72	6227
				15.03	2.20	17.23	0.79	0.96			24.91	6811
				15.00			*0.41*	*0.50*			*22.44*	
				11.80	1.36	13.16	1.13	1.37		1.78	23.65	6228
				10.00			*0.82*	*1.00*		*1.00*	*18.27*	
				12.18	2.02	14.20	1.88	2.28		2.69	28.41	6229
				10.53	1.94	12.47	2.31	2.80		2.06	26.68	6812
				10.00			*1.65*	*2.00*		*2.00*	*22.58*	
				11.31	1.24	12.55	2.56	3.11		4.54	31.77	6230
				11.78	1.87	13.65	**2.09**	2.54	**0.98**	**2.04**	28.79	6813
				10.00			*2.47*	*3.00*		*4.00*	*28.25*	
				13.51	1.55	15.06				2.88	23.72	6822
				13.00						*3.00*	*22.40*	
				11.26	1.16	12.42	0.99	1.20		2.56	23.39	6387
				10.00			*0.82*	*1.00*	*2.00*		*19.27*	
				9.99	1.51	11.50	2.69	3.27		5.19	31.44	6388
				8.00			*2.47*	*3.00*		*5.00*	*26.85*	
				11.18	1.01	12.19	3.30	4.01		4.56	34.09	6389
				10.00			*3.29*	*4.00*		*4.00*	*31.12*	
				11.72	1.71	13.43	1.76	2.14		2.57	27.03	6390
				10.00			*1.65*	*2.00*	*2.00*		*22.18*	
				10.74	0.72	11.46				2.59	19.03	6391
				10.00					*2.00*		*16.40*	
				9.81	2.93	12.74	3.72	4.52	1.00	4.90	36.28	6392
				10.00			*3.29*	*4.00*		*4.00*	*31.12*	

August 12, 1900.

M. A. SCOVELL, DIRECTOR.

A. M. PETER, H. E. CURTIS, } Chemists.

KENTUCKY

AGRICULTURAL EXPERIMENT STATION

OF THE

State College of Kentucky

BULLETIN No. 89.

WHEAT.

1. Test of Varieties.
2. Test of Fertilizers.
3. Descriptions of Varieties.

LEXINGTON, KENTUCKY.

September, 1900.

KENTUCKY

Agricultural Experiment Station.

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ADDRESS:

KENTUCKY AGRICULTURAL EXPERIMENT STATION,

LEXINGTON, KY.

BULLETIN No. 89.

WHEAT.

I—Test of Varieties.

Thirty-six varieties were tested during the season of 1899 and 1900. Each variety was planted on one-twentieth of an acre plot in drills eight inches apart. The amount of seed sown was at the rate of six pecks per acre. All of the varieties were planted October 7. The stand was perfect and none of the wheat was winter killed. The wheat was planted on two separate acres, the fertility of which was not exactly the same, and in the table of comparative yields, corrections have been made to overcome as far as possible the unevenness of fertility. Each variety was harvested as soon as fully ripe.

Especial care was taken in determining the weight per bushel and a method was adopted which it is believed will yield much more uniform results than that used heretofore. A Fairbanks standard tester was used and the wheat was run into the measure through a funnel with opening ½-inch in diameter placed exactly 6 inches above the top of the measure. When full the measure was "struck" without jarring and balanced on the scale. Duplicate tests by this method gave practically identical results.

The following table gives the yield per acre of grain in bushels and straw in pounds, together with the weight per bushel:

Comparative Yield of Varieties.

Number.	Name.	Yield Per Acre.		Weight Per Bushel.
		Bush. Grain, 60 lb. per bu.	Lbs. Straw.	
1	Jones's Winter Fife	37.9	3690.	62¼
2	American Bronze	46.5	4072.5	62
3	Beech-wood Hybrid	47.2	4395 5	63¾
4	Pride of Genesee	42.4	4995.	62
5	Indiana Swamp	46.5	4522.5	64
6	Rice Wheat	39.6	4331.3	64
7	Jones's Bearded	40.7	4396.3	61
8	Pride	42.8	4562.	63
9	Kansas Mortgage Lifter	41.3	4835.3	65
10	Fultzo-Mediterranean	48.2	4308.8	62
11	Rudy	48.5	4388.5	63
12	Diamond Grit	47.1	5161.5	63½
13	Turkish Red	45.9	4443.8	65
14	Lancaster Red	49.9	5782.5	62½
15	Fulcaster	45.2	5563.8	63½
16	Harvest King	50.3	5082.8	63½
17	Fultz	52.2	5415.8	63½
18	Jersey Fultz	47.2	4707.	64
19	Extra Early Oakley	48.6	4396 7	64
20	Democrat	42.	4230.	62½
21	Early White Leader	40.2	2295.	60
22	Harvest Queen	49.5	2500.	60
23	Oatka Chief	43.9	2700.	61½
24	Longberry Amber	33.4	2175.8	61¾
25	Gold Coin	38.2	2047.5	61½
26	Early Genesee Giant	41.3	5586.4	62
27	Early Arcadian	37.1	1755.	60
28	Bearded Winter Fife	37.9	1833.8	61½
29	Gold Coin (?)	41.8	2210.	60¾
30	White-seeded Golden Cross	49.7	2722.5	61
31	Jones's Longberry No. 1	47.7	3118.5	62½
32	Long Amber	44.4	2673.	62
33	Dawson's Golden Chaff	46.5	2272.5	60¼
34	Pearl Prolific	46.5	2212.5	64½
35	Improved Rice Wheat	37.1	3217.5	64
36	Hungarian Wheat	36.5	2683.3	64

Character of Straw, Height and Time of Ripening.

Number.	Name.	Character of Straw.	Height of Plant.		When Fully Ripe.
			Feet.	Inches.	
1	Jones's Winter Fife	Good.	4	4	June 23
2	American Bronze	"	4	2	" 23
3	Beech-wood Hybrid	"	4	3	" 21
4	Pride of Genesee	"	4	10	" 23
5	Indiana Swamp	Weak.	4	5	" 19
6	Rice Wheat	Good.	4	5	" 19
7	Jones's Bearded	"	4	8	" 23
8	Pride	"	4	6	" 23
9	Kansas Mortgage Lifter	"	4	2	" 19
10	Fultzo-Mediterranean	"	4	0	" 19
11	Rudy	Very weak.	4	2	" 23
12	Diamond Grit	Good.	4	8	" 23
13	Turkish Red	Weak.	3	11	" 23
14	Lancaster Red	Good.	4	7	" 21
15	Fulcaster	Weak.	4	3	" 21
16	Harvest King	"	4	0	" 21
17	Fultz	Good.	4	5	" 19
18	Jersey Fultz	"	4	3	" 19
19	Extra Early Oakley	"	4	2	" 19
20	Democrat	"	4	3	" 19
21	Early White Leader	"	4	0	" 23
22	Harvest Queen	"	3	10	" 23
23	Oatka Chief	"	4	0	" 23
24	Longberry Amber	"	4	0	" 23
25	Gold Coin	"	3	6	" 23
26	Early Genesee Giant	"	3	5	" 19
27	Early Arcadian	"	3	5	" 23
28	Bearded Winter Fife	Very weak.	3	7	" 23
29	Gold Coin (?)	Good.	4	0	" 23
30	White-Seeded Golden Cross	"	3	8	" 23
31	Jone's Longberry No. 1	"	4	3	" 23
32	Long Amber	Very weak.	4	5	" 23
33	Dawson's Golden Chaff	Good.	4	1	" 23
34	Pearl Prolific	"	3	7	" 19
35	Improved Rice Wheat	"	3	10	" 19
36	Hungarian Wheat	Weak.	3	8	" 23

Milling Qualities.—Through the kindness of Mr. W. W. Patterson, of the Lexington Roller Mills, the different varieties of wheat were scored as to their milling qualities with the following results:

No. 13.—Very fine milling wheat, but too hard for our mills; No. 5.—98 per cent.; No. 11.—98 per cent.; No. 15.—

98 per cent.; No. 8.—98 per cent.; No. 16.—97 per cent.; No. 14.—96 per cent.; No. 34.—96 per cent.; No. 9.—94 per cent.; No. 3.—93 per cent.; No. 6.—92 per cent.; No. 17.—91 per cent.; No. 18.—91 per cent.; No. 34.—91 per cent.; No. 35.—91 per cent.; No. 12.—89 per cent. All of the other varieties were poor milling wheat.

The season was very favorable. To show something of its character a summary is given of the observations on temperature, rainfall and sunshine taken at the United States Weather Bureau Station on the College Campus.

Meteorological Summary.

Months, 1899-1900.	Per Ct. Sunshine.	Cloudiness.	Amount of Rainfall in Inches.	Temperature. Degrees.		
				Mean.	Highest.	Lowest.
July, 1899	77.	23.	0.97	77.	95.	53.
August	78.	22.	4.18	77.	95.	59.
September	78.	22.	1.90	68.	98.	53.
October	64.	36.	2.09	61.	84.	37.
November	43.	57.	1.70	48.	70.	32.
December	45.	55.	2.92	33.	62.	-1.
January, 1900	41.	59.	2.13	36.	62.	-1.
February	33.	62.	3.17	31.	68.	-4.
March	49.	51.	1.98	39.	67.	4.
April	65.	35.	1.23	55.	79.	26.
May	67.	33.	3.54	66.	91	36.
June	66.	34.	2.19	72.	89.	53.

2—Test of Fertilizers.

Mr. E. G. Austin, of Prentiss, Ohio Co., continued his experiments with fertilizers on land similar in character to that on which his former experiments were made, the results confirming the conclusion already reached that phosphates are needed upon the soil of that vicinity (coal measures). The application of acid phosphate produced a profitable increase in the yield of wheat, while the use of nitrate of soda or potash salts, either separately or in connection with phosphates, produced but little effect. The results reported by Mr. Austin are given in the following table, the yield being

Results Obtained with Fertilizers by Mr. Austin.

Number of Plot.	Fertilizer Used and Rate Per Acre.	Yield of Wheat, Bu. per Acre.	Value of Wheat @ 60c per bu.	Cost of Fertilizer per Acre.	Value of Wheat less cost of Fertilizer.
1	None	3⅓	$2.00	0	$2.00
2	Nitrate of Soda, 160 lbs	3½	2.10	$3.60	(1.50)*
3	Acid Phosphate, 320 lbs	15⅓	9.20	2.60	6.60
4	Muriate of Potash, 160 lbs	2 5-6	1.70	3.60	(1.90)*
5	None	3 1-6	1.90	0	1.90
6	Nitrate of Soda, 160 lbs. / Acid Phosphate, 320 lbs.	15	9.00	6.20	2.80
7	Nitrate of Soda, 160 lbs. / Muriate of Potash, 160 lbs.	3 5-6	2.30	7.20	(4.90)*
8	Acid Phosphate, 320 lbs. / Muriate of Potash, 160 lbs.	14½	8.70	6.20	2.50
9	Nitrate of Soda, 160 lbs. / Acid Phosphate, 320 lbs. / Muriate of Potash, 160 lbs.	17½	10.50	9.80	0.70
10	Bone Meal, 300 lbs	15½	9.30	4.50	4.80

*Less than cost of Fertilizer.

calculated in bushels of 60 pounds and its value at 60 cents a bushel. The cost of the fertilizer per acre is calculated at $45 per ton for nitrate of soda, $16 for acid phosphate, $45 for muriate of potash and $30 per ton for bone meal.

Mr. Austin's wheat was sown October 21st with a disc drill and the fertilizer was sown the next day by hand, great care being taken to get it evenly distributed. The wheat was up well on the plots within 10 days after sowing, and no difference was observed between the plots until the last of November, when plots 3, 6, 8, 9 and 10 began to show a better color and a much ranker growth than the others and this difference continued to increase until harvest time. Plots 1, 2, 4, 5 and 7 made but little growth of straw and very short, poorly filled heads of inferior wheat.

The results obtained by Mr. Austin in the past three seasons should be valuable to the farmers of Ohio county and to many others whose lands are situated upon the coal measures formation, both in Eastern and Western Kentucky. The experiments were made each year upon a different piece of ground, but always upon land of the same character and, Mr. Austin says, fairly representative of the land in that part of the State.

Mr. Austin's Results for Three Seasons.

Number of Plot.	Fertilizer Used Each Season and Rate Per Acre.	Yield of Wheat Per Acre in Bushels of 60 lbs.			
		1897-8	1898-9	1899-1900	Average.
1	None	3.9	6⅔	3⅓	4.6
2	Nitrate of Soda, 160 lbs	9.4	10 5-6	3½	7.9
3	Acid Phosphate, 320 lbs	15.3	11½	15⅓	14.0
4	Muriate of Potash, 160 lbs	6.4	8 5-6	2 5-6	6.0
5	None	7.6	7	3⅙	5.9
6	Nitrate of Soda, 160 lbs. + Acid Phosphate, 320 lbs.	19.6	15⅙	15.	16.6
7	Nitrate of Soda, 160 lbs. + Muriate of Potash, 160 lbs.	8.3	11⅓	3 5-6	7.8
8	Acid Phosphate, 320 lbs. + Muriate of Potash, 160 lbs.	16.2	14½	14½	15.4
9	Nitrate of Soda, 160 lbs. + Acid Phosphate, 320 lbs. + Muriate of Potash, 160 lbs.	20.7	12	17½	16.7
10	None	8.1	10⅙	.....	9.1
11	Floats, 400 lbs	.....	10½	.....	.....
12	Bone Meal, 160 and 300 lbs	.....	10⅓	15½	12.9

The figures show clearly the considerable increase resulting from the use of phosphates. They show also a slight but very evident increase from the use of nitrate of soda, which, while not enough to pay for the nitrate used, may be considered as indicating that these soils might be further improved by growing cow peas or clover upon them to increase the vegetable matter or humus they contain.

3—Descriptions of all the Varieties of Wheat Grown on the Farm.

BY H. GARMAN, ENTOMOLOGIST AND BOTANIST.

As a matter of convenience it has been thought best to bring together in this bulletin descriptions of all the varieties grown on the Experiment Farm. With the exception of 34, 35 and 36 which are described for the first time in this bulletin, all have been printed as here republished, in Bulletins 69, 77 and 83. The year in which the wheat described was harvested is added in parenthesis after each description.

It is recognized that these descriptions might be made more complete by the addition of facts with reference to the number of stalks produced by the plant, the height, and more definite statements with reference to the hardness of the seed. But all these characters vary widely in the same variety with soil, season, and climate, so that it is impossible to make a good description without comparing specimens grown at different times and places. This will be done at some future time when it becomes desirable to summarize the results of our observations on wheats. It is to be hoped that before such a summary is given some instrument will be invented, and generally adopted, for determining the relative hardness of the seeds. The chemical tests with reference to the constituents may answer well enough in the laboratory, but I believe that some more simple test, that will enable practical men to bring their judgment of wheats into comparison, is desirable.

No. 1. Jones's Winter Fife.

Beardless. Seeds white*. Spike long and slender, tapering slightly towards the upper end, flattened. Average length of four spikes, 5.125 inches ; greater diameter, 0.5 inch ; lesser diameter, 0.375. Glumes covered with a fine whitish, velvety pubescence. Empty glumes, with very short, blunt promi-

*The terms white and red are used in these descriptions as they are by millers and seedsmen. Strictly speaking, the white wheats are pale ochraceous, while red wheats, so-called, are generally of a light leather color.

nences at tips. Flowering glumes with claw-like tips, which become gradually longer towards the upper end of the spike, where a few become straight, sharp bristles about 0.25 inch long. Color of spike and stem, pale yellow. Average number of seeds from a spike, 86.75. Average weight of seeds from a spike, 3.2875 grams.

Rust on stem and blade frequent. (1897.)

No. 2. American Bronze.

Beardless. Seeds red. Spike very long and slender, the spikelets separated so that the axis of the spike can sometimes be seen between them, flattened, tapering towards both extremities. Average length of four spikes, 5.3125 inches; greater diameter, 0.625 inch; lesser diameter, 0.375 inch. Glumes not pubescent. Empty outer glumes with short, rounded tips, the keels on their backs more decided than in many other varieties. Flowering glumes, with claw-like tips, which increase in length towards the upper end of the spike, where a few become bristles one-half inch long. Color of spike and stem, pale yellow. Average number of seeds from one spike, 56.5. Average weight of seeds from one spike, 2.4 grams.

This wheat bears a general resemblance to No. 1, but the spike is more slender and the glumes without pubescence. Rust frequent. (1897.)

No. 3. Beech-wood Hybrid.

Beardless. Seeds red. Spike (head) not pubescent, tapering to the tip, at which are a few bristles one-half inch long and less. Length of spike 3 inches; diameters equal, about 0.37 inch. Color of spike umber-brown. Stem a trifle purplish. Average number of seeds from a spike, 25.25. Average weight of seeds from a spike, .975 gram. Weight of 10 cubic centimeters of seed, 7.8 grams.

Rust frequent on stem. This is a handsome wheat recognizable in the field by the rather slender brown heads, the spikelets being loosely placed on the axis. The wheat produced is among the best, the seeds being moderately hard, of a deep brown color, and rather above medium size. The

variety resembles very closely our number 16 (Harvest king) and may be the same.

The seed of this variety was received from the U. S. Department of Agriculture, and was grown in Ohio. (1899.)

No. 4. Pride of Genesee.

Heavily bearded. Seeds red. Spike long and slender, tapering to the upper end, flattened. Average length of four spikes, 5.81 inches; greater diameter, 0.62 inch; lesser diameter, 0.37 inch. Glumes pubescent. Empty glumes with a bristle at the tip varying from 0.25 to 0.62 inch in length. Flowering glumes with long bristles varying from 1 inch long at the base to more than 4 inches on the upper half of the spike. Color of spike and stem pale yellow. Average number of seeds from one spike, 79.5. Average weight of seeds from one spike, 2.95 grams.

A very striking variety, to be recognized by its shaggy beard and pubescent glumes. Rust frequent. (1897.)

No. 5. Indiana Swamp.

Bearded. Seeds red and large. Spike of medium size, rather slender and tapering, not pubescent, its bristles as much as 3 inches long. Length 3.05 inches; greater diameter 0.50 inch; lesser diameter 0.375 inch. Spike yellow. Stem slightly purple. Average number of seeds to a spike, 26. Average weight of seeds from a spike, 1.3 grams. Weight of 10 cubic centimeters of seeds, 7.8 grams.

Rust rare. A good wheat, with rather slender head, the chaff disposed to separate so as to show the seed in ripening. Seeds large and of good color. Seed obtained from J. A. Everitt, of Indianapolis, Indiana. (1899.)

No. 6. Rice Wheat.

Beardless. Seeds red and large. Spike not pubescent, rather small, tapering, with a few short bristles at tip. Length of spike, 2.5875 inches; diameters alike, .375 inch. Color of spike and stem, pale yellow. Seeds from a spike, 24.5. Weight of seeds from a spike, 1.3 gram. Weight of 10 cubic centimeters of seeds, 8.1 grams.

Rust rare. While lacking in showiness in the field, this variety possesses many desirable qualities, and judging by the fine appearance and quality of its seeds, I am disposed to rate it as the best wheat grown on the Experiment Farm this year. The head is somewhat insignificant in appearance, resembling in this respect Fultz and Extra early oakley (Nos. 17 and 19). The seed was obtained from G. V. Green, of Hopkinsville. (1899.)

No. 7. Jones's Bearded.

Bearded. Seeds white, but darker in tint than some other varities (Nos. 10 and 17, for example). Spike moderately stout, not flattened, enlarging at the upper end. Average length of four spikes, 4.53 inches; both diameters, 0.50 inch, but one of them enlarging to 0.62 inch near the tip. Glumes without pubescence. Empty glumes with tips produced into short bristles about 0.25 inch long. Flowering glumes armed with bristles from 1 to 3.87 inches long. General color of spike and stem yellow, but both glumes and stem with reddish tinge. Average number of seeds from a spike, 85.75. Average weight of seeds from a spike, 3.04 grams.

This variety bears a close resemblance to Oatka chief (No. 23), having the same reddish tinge and the spike of the same general shape. About the only differences apparent in the samples before me are the greater coarseness of No. 7 and the slightly greater average size. The seed of No. 7 is a little less plump and averages darker in color. All these differences might, however, be due to differences in the soil in which the two samples grew or to differences in seed planted. The wheats grown under these two numbers are certainly very closely related, if they are not one and the same. Rust rare. (1897.)

No. 8. Pride.

Heavily bearded. Seeds red. Spike long and slender, tapering gradually towards the tip, flattened. Average length of four spikes, 5.06 inches; greater diameter, 0.62 inch; lesser diameter, 0.37 inch. Glumes pubescent. Empty glumes with bristles ranging in length from 0.25 to 0.62 inch.

Flowering glumes with bristles ranging from 1 to 3.25 inches in length. Color of spike and stem pale yellow. Average number of seeds from a spike, 70.5. Average weight of seeds from one spike, 2.65 grams.

Probably identical with No. 4. I can see no difference of importance between the two samples. Rust abundant. (1897.)

No. 9. Kansas Mortgage Lifter.

Bearded. Seeds red and very large. Spike slender, tapering, not pubescent; average length 3.125 inches; greater diameter, 0.50 inch; lesser diameter, 0.375 inch. Chaff yellow. Stem purplish. Seeds from spike, 29. Weight of seeds from a spike, 1.3 gram. Weight of 10 cubic centimeters of seeds, 7.95 grams.

Rust frequent on the stems. The Mortgage lifter is a more showy wheat than No. 6, and might sell better because of the fine appearance of its very large seeds. It is not quite as hard as No. 6, and has this year been more affected with rust. It yielded more by weight than any other wheat grown on the farm.

The seed was obtained from Hon. G. V. Green, of Hopkinsville, a member of the Board of Trustees. (1899.)

No. 10. Fultzo-Mediterranean.

Beardless. Seeds red. Spike short and compact, sometimes a little widened at tip, not pubescent, spikelets crowded. Length of spike 2.3125 inches; diameters 0.50 and 0.37 inch. Color of spike yellow; of stem, purple. Number of seeds from a spike, 34.75. Weight of seeds from a spike, 1.275 gram. Weight of 10 cubic centimeters of seeds, 7.7 grams

Rust common. Seed obtained from J. A. Everitt, of Indianapolis, Indiana. (1899.)

No. 11. Rudy.

Strongly bearded. Seeds red and large. Spike rather large, the spikelets loosely placed, no pubescent. Length of spike 3 inches; diameters 0.50 and 0.375 inch. Color of spike and stem yellow. Seeds from a spike, 24.25. Weight

of seeds from a spike, 1.125 gram. Weight of 10 cubic centimeters of seed, 7.75 grams.

Rust frequent. This is a showy wheat, with large brown seeds, but ripened later than some of the preceding varieties Seed obtained from J. A. Everitt, of Indianapolis. (1899.)

No. 12. Diamond Grit.

Heavily bearded. Seeds red. Spike rather slight and short, tapering to the upper extremity. Average length of four spikes, 4.19 inches; both diameters about 0.37 inch. Glumes not pubescent. Empty outer glumes with a short acute bristle at tip. Flowering glumes varying in length from 1.25 inch to 3.50 inches. Color of spike pale yellow, of stem purplish. Average number of seeds from a spike, 60. Average weight of seeds from a spike, 2.2 grams.

Rust frequent. (1897.)

No. 13. Turkish Red.

Strongly bearded. Seeds red, small. Spike small and tapering decidedly to the tip, not pubescent, the spikelets somewhat loosely placed. Length of spike, 2.3125 inches; diameters 0.375 and 0.25 inch. Color of spike and stem pale yellow. Average number of seeds from a spike, 22. Average weight of seeds from a spike, 0.675 gram. Weight of 10 cubic centimeters of seeds, 8.25 grams.

Rust rare. This differs from all other varieties grown on the farm in the small size of its spikes, their noticeable contraction in diameter towards the tips, and the small size and extreme hardness of the seeds. Only No. 6 approaches it in the latter quality.

The seed was obtained from the U. S. Department of Agriculture. (1899.)

No. 14. Lancaster Red.

Bearded. Seeds red. Spike small, slender, somewhat flattened, tapering to upper end. Average length of four spikes, 4.34 inches; greater diameter, 0.50 inch; lesser diameter, 0.37 inch. Glumes not pubescent. Spines on outer glumes short, straight, acute, becoming as much as 0.50 inch in length towards the apex of the spike. Bristles on flower-

ing glumes ranging from 2.37 to 3.62 inches in length. Color of spike brown, of stem purplish. Average number of seeds from a spike, 49.25. Average weight of seeds from a spike, 1.95 gram.

The spike of this variety is very slight and small and tapers quite decidedly towards the tip. The glumes show a disposition to separate in the ripened head, so that the seed becomes visible. In the sample examined by me I find some spikes clothed with fine pubescence, while in every other respect they resemble closely the other spikes. It seems hardly probable that the same variety should vary to this extent, but it may be that the wheat from which the sample was grown was mixed. No rust. (1897.)

No. 15. Fulcaster.

Bearded. Seeds red. Spike of medium size, flattened, tapering, not pubescent. Length of spike, 3 inches; diameters 0.50 and 0.375 inch. Color of spike obscure yellow. Stem purplish. Seeds from a spike, 26.5. Weight of seeds from a spike, 1.2 gram. Weight of 10 cubic centimeters of seeds, 7.7 grams.

Rust frequent. A good wheat, of rather large size. The sample shows some evidence of mixing with No. 16, in occasional brown heads among the others.

The seed was sent to the Station by the U. S. Department of Agriculture.

No. 16. Harvest King.

Beardless. Seeds red, of medium size. Spike moderately large, but slender, flattened and tapering, not pubescent. Length of a spike 3 inches; diameter 0.50 and 0.375 inch. Color of chaff, umber-brown; of stem, yellow. Seeds from a spike, 31. Weight of seeds from a spike, 1.225 gram. Weight of 10 cubic centimeters of seeds, 6.65 grams.

Rust frequent. A rather handsome wheat, closely like No. 3 (Beech-wood hybrid), and possibly the same. Occasional pale heads interspersed among the sample indicate some crossing with No. 15, such heads even bearing occasional long bristles. Seed obtained from J. A. Everitt, Indianapolis. (1899.)

No. 17. Fultz.

Beardless. Seeds red. Spike rather small and slight, tapering, not pubescent. Average length 2.6875 inches, diameters, 0.375 and 0.375. Color of chaff and stem, yellow. Number of seeds from a spike, 33.5. Weight of seeds from a spike, 1.125 gram. Weight of 10 cubic centimeters of seeds, 8 grams.

Rust frequent. One of the best of the varieties grown, closely resembling in every respect the Rice wheat already described, but not so hard. Seed obtained from J. A. Everitt, Indianapolis. (1899.)

No. 18. Jersey Fultz.

Beardless. Seeds red. Spike small, tapering, the two diameters equal, about 0.375 inch. Length of spike, 3.6875 inches. Glumes not pubescent. Empty outer glumes terminating in a short blunt claw. Flowering glumes with a slightly longer claw-like tip, a few at the upper extremity sometimes three-fourths inch long. Color of spike and stem, yellow. Average number of seeds from a spike, 33.75. Average weight of seeds from a spike, 1.175 grams.

This wheat seems to me to be identical with No. 19. The size and character of the head is the same, but the seed of this is a little heavier. It was rated first, or among the first, by every practical man who saw it. It is the heaviest wheat grown on the farm. Rust rare. (1898.)

No. 19. Extra Early Oakley.

Beardless. Seeds red. Spike small, tapering, the two diameters equal, about 0.375 inch. Length of spike, 3.781 inches. Glumes not pubescent. Empty outer glumes terminating in short claws. Inner glumes with acute tips which in some cases reach a length of three-fourths inch at the extremities of spikes. Color of spike and stem, yellow. Average number of seeds from a spike, 43. Average weight of seeds from a spike, 1.55 gram.

This variety is in high favor in this section, and is always rated well by millers. It seems to me to be the same as No.

18, although its seeds do not weigh quite as much, bulk for bulk, and average a trifle larger. Rust rare. (1898.)

No. 20. Democrat.

Strongly bearded. Seeds white. Spike rather slender, of medium length, flattened, tapering decidedly to the upper extremity. Average length of four spikes, 4 43 inches. Glumes without pubescence. The empty outer glumes with short, claw-like tips at the base of the spike and at its upper extremity with bristles nearly 0.25 inch in length. Flowering glumes with bristles ranging in length from one to three inches. Color of spike and stem pale yellow. Average number of seeds from a spike, 51.75. Average weight of seeds from spike, 2 grams.

No rust. (1897.)

No. 21. Early White Leader.

Beardless. Seeds white. Spike long and slender, the spikelets becoming crowded at the upper end of the spike so that it is a little widened at the extremity. Average length of four spikes, 5.34 inches; greater diameter, 0.50 inch; lesser diameter at middle of spike, 0.37 inch, but widened to 0.50 inch at tip. Glumes not pubescent. Empty glumes with short, rounded tips. Flowering glumes with claw-like tips, a few at the extremity of the spike with the tips produced into short spines, as much as one-fourth inch long. Color of spike and stem pale yellow. Average number of seeds from one spike, 74.25. Average weight of seeds from one spike, 2.85 grams.

Closely resembles No. 2, but readily distinguished by its white seed and the slight enlargement of the tip of the spike. Rust very abundant. (1897.)

No. 22. Harvest Queen.

Beardless. Seeds white. Spike stout, and thickened at upper end, the spikelets crowded, not pubescent. Length of spike, 2.6875 inches; diameters 0.50 and from 0.37 to 0.50 inch. Color of chaff and stem yellow. Number of seeds from a spike, 36.5. Weight of seeds from a spike, 1.2 gram. Weight of 10 cubic centimeters of seeds, 7.6 grams.

Rust rare. The short, stout, whitish yellow head of this variety is characteristic. The seeds are large, but soft. Not to be recommended for this region, if judgment may be based on our sample. Seed obtained from J. A. Everitt, Indianapolis. (1899.)

No. 23. Oatka Chief.

Bearded. Seeds white. Spike short and thick, widened in one direction at the tip. Average length of four spikes, 4.44 inches; greater diameter, 0.50; lesser diameter, 0.37 inch, increasing to 0.50 inch at the tip. Glumes not pubescent. Empty glumes tipped with a short but decided bristle which reaches a length of about 0.25 inch at the upper end of the spike. Flowering glumes tipped with long bristles varying from 1.25 to 3.25 inches in length. General color of spike and stem yellow, but both with an evident reddish cast. Average number of seeds from a spike, 74. Average weight of seeds from one spike, 2.67 grams.

Rust rare. (1897.)

No. 24. Longberry Amber.

Beardless. Seeds white. Spike rather long and stout, flat, tapering, not pubescent. Length of spike, 3.3120 inches; diameters 0.50 and 0.375 inch. Color of stem and spike yellow. Number of seeds from a spike, 36.25. Weight of seeds from a spike, 1.123 gram. Weight of 10 cubic centimeters of seeds, 7.55 grams.

Rust very rare. This wheat was not well ripened in the sample, but I can see nothing in it calculated to place it in competition with such varieties as Fultz, Harvest king, Rice wheat, and others, for this region. Seed obtained from J. A. Everitt, Indianapolis. (1899.)

No. 25. Gold Coin.

Beardless. Seeds white. Spike of medium size, enlarging a little to the upper extremity. Average length of four spikes, 4.06 inches; greater diameter, 0.50 inch; lesser diameter, 0.37 inch below, increasing a little above. Glumes not pubescent. Empty outer glumes everywhere with rather short, blunt tips. Flowering glumes with claw-like tips at

base of spike which become gradually longer upward until at the upper end of the spike a few reach a length of one-half inch. Color of spike umber-brown, of stem purplish. Average number of seeds from a spike, 60. Average weight of seeds from a spike, 2.44 grams.

Rust rare. (1897.)

No. 26. Early Genesee Giant.

Strongly bearded, especially on the upper fourth of the spike. Seeds white. Spike short, thick, enlarging to the upper extremity, not flattened. Average length of four spikes, 3.18 inches; both diameters, 0.37 inch at base, one of them increasing to 0.62 inch at tip. Glumes not pubescent. Empty glumes with claw-like tips on the basal portion of the spike, these increasing in length towards the upper end, where some are nearly 0.25 inch in length. Flowering glumes with long bristles, varying from 0.37 inch in length at the base to 4 inches in length at the upper extremity of the spike. Color of spike umber-brown, of stem obscure lilac. Average number of seeds from a spike, 72.5. Average weight of seeds from a spike, 3.2 grams.

No rust. (1897.)

No. 27. Early Arcadian.

Beardless. Seeds white, rather short, plump. Spike short, thick, enlarging towards the upper extremity. Average length of four spikes, 3.37 inches; greater diameter, 0.50 inch; lesser diameter, 0.37 inch at base, but increasing to 0.75 inch at upper end. Glumes not pubescent. Empty outer glumes with short, blunt tips. Flowering glumes with claw-like tips, these increasing in length towards the upper extremity of the spike, where a few are nearly 0.50 inch in length. Color of spike umber-brown, this color being confined, however, to the exposed parts of the glumes, the covered portions being pale yellow. Stem pale yellow. Average number of seeds from a spike, 65. Average weight of seeds from a spike, 2.5 grams.

Very distinct from any of those described above in the short, thick, club like spikes, with brown glumes. Rust rare. (1897.)

No. 28. Bearded Winter Fife.

Bearded. Seeds white and plump. Spike rather small and slender, flattened, tapering to the upper extremity. Average length of four spikes, 4.80 inches; greater diameter, 0.50 inch; lesser diameter, 0.37 inch. Glumes finely pubescent. Empty outer glumes provided with short bristles ranging from about 0.12 to 0.37 inch in length, the longest being, as is common, at the upper end of the spike. Flowering glumes bearing bristles which gradually increase in length from the base to the upper end, ranging from 1 to 3.25 inches long. Color of spike and stem pale yellow. Average number of seeds from a spike, 61. Average weight of seeds from one spike, 2.57 grams.

Rust frequent. (1897.)

No. 29. Gold Coin (?).

Beardless. Seeds white. Spike rather small, enlarging slightly at tip; greater diameter, 0.50 inch; lesser diameter, 0.375 inch. Length, 3.935 inches. Not pubescent. A few bristles on inner glumes at tip of spike one-fourth inch long, the rest with short and mostly blunt tips. Color of spike, bronzy; of stem, purplish. Average number of seeds from a spike, 42.75. Average weight of seeds from a spike, 1.525 grams.

This variety was obtained from a local dealer in seeds, and was marked No. 6, but appears to be the same as No. 25, which has been grown at the Station for some time. It is not liked by the millers. Rust rare. (1897.)

No. 30. White-seeded Golden Cross.

Bearded. Seeds white. Spike short and thick, enlarging towards the upper extremity. Average length of four spikes, 3.19 inches; greater diameter, 0.50 inch; lesser diameter, 0.37 inch at base, increasing to 0.62 inch at upper extremity. Glumes not pubescent. Empty outer glumes with short, acute spine at tip. Flowering glumes tipped with bristles, about one inch long at base and as much as four inches in length at the upper extremity of the spike. Color of spike, umber-brown; of stem, purplish. Average number of seeds

from a spike, 63.5. Average weight of seeds from a spike, 2.85 grams.

Closely resembles Number 26 in every respect, but in the sample before me the length of spike averaging less. (1897.)

No. 31. Jones's Longberry, No. 1.

Strongly bearded. Seeds white. Spike rather large, not thickened at extremity, not pubescent. Length of spike, 3.1875 inches; diameters, 0.50 and 0.375 inch. Color of chaff umber-brown where exposed, pale where covered. Stem yellow. Seeds from a spike, 29.25. Weight of seeds from a spike, 1 gram. Weight of 10 cubic centimeters of seeds, 7.7 grams.

Rust rare. Perhaps the best of the three new white wheats. Seed obtained from J. A. Everitt, Indianapolis. (1899.)

No. 32. Long Amber.

Beardless. Seeds white. Spike long and slender, tapering to upper end, flattened. Average length of four spikes, 5.53 inches; greater diameter 0.50; lesser diameter, 0.37 inch. Glumes not pubescent. Empty glumes with short, rather blunt tips. Flowering glumes with short bristles, varying from 0.12 to 0.50 inch long, the latter being situated at the apex of the spike. Color of spike and stem pale yellow. Average number of seeds from a spike, 59.25. Average weight of seeds from one spike, 2.32 grams.

The spike of this wheat resembles No. 2 very closely and might be considered identical were it not for the color of the seeds. Rust frequent. (1897.)

No. 33. Dawson's Golden Chaff.

Beardless. Seeds white and plump. Spike rather small and slender, scarcely flattened, tapering to the upper extremity. Average length of four spikes, 3.81 inches; both diameters about 0.37 inch. Glumes not pubescent. Empty outer glumes with very short, blunt tips. Flowering glumes at base of spike with claw-like tips and at its apex with bristles which may in a few cases reach a length of 0.62 inch. Color of spike umber-brown, of the stem pale yellow. Average

number of seeds from a spike, 43.75. Average weight of seeds from one spike, 1.82 gram.

The seeds of this variety are exceptionally plump and light in color. No rust. (1897.)

No. 34. Pearl Prolific.

Beardless. Seeds red, of medium size. Length of spike 3.17 inch; greater diameter, 0.50 inch; lesser diameter, 0.21 inch. Color of spike umber-brown. Stem sometimes faintly purplish. Seeds from one spike, 32.83. Weight of seeds from one spike, 1.27 gram. Weight of 10 cubic centimeters of seeds, 7.85 grams. Height of mature plant about 42 inches. Red rust rare.

This variety is much like the next, and may be the same. Its yield was much better, however, and there are some differences between plants of the two now before me. They are so slight, however, as to be explainable as the result of difference in the seed planted, or in the soil of the two plots. The spike of this averages a little larger, and only a portion of the stems are of a purplish color, whereas in the next this color is quite a marked feature. The seed was obtained from Mr. C. D. Miller, of Hodgenville, Kentucky. (1900.)

No. 35. Improved Rice Wheat.

Beardless. Seeds red, of medium size. Length of spike, 3 inches; greater diameter, 0.375 inch; lesser diameter, 0.31 inch. Color of spike, umber-brown; of stem purplish. Seeds from one spike, 25.5. Weight of seeds from one spike, 0.92 gram. Weight of 10 cubic centimeters of seeds, 7.8 grams. Height of mature plant about 41 inches. Red rust rare.

While this variety resembles Rice wheat (No. 6), it presents in our plot differences that entitle it to the rank of a distinct variety. It is not as tall by about 9 inches, while the brown color of the outer chaff of the spike and the purple stem enable one to separate it readily. From No. 34 it is less readily distinguished, as already noted. The seed was obtained from Hon. G. V. Green, of Hopkinsville. (1900.)

No. 36. Hungarian Wheat.

Strongly bearded. Seeds red, of medium size, hard. Length of spike, 3.25 inches; greater diameter, 0.375 inch; lesser diameter, 0.32 inch. Spike and stem yellow when mature. Seeds from one spike, 27.3. Weight of seeds from one spike, 0.80 gram; weight of 10 cubic centimeters of seeds, 7.7 grams. Height of mature plant about 39 inches. Red rust not rare.

Judging by the character of the plant, its spike, and seeds, this variety is not as desirable for this region as either of the preceding. The long bristles of the spike render it more likely to lose its seeds in handling, and the spike itself is rather small and light of weight. Judging by our plants again, it is a little more subject to red rust. The results of such comparisons are justified by those obtained in the field, this variety yielding at the rate of only 36.48 bushels per acre, while the Improved rice wheat yielded at the rate of 37.12 bushels, and the Pearl prolific at the rate of 46.5 bushels per acre, but one must keep in mind in this connection the fact that poor seed may result in a poor stand and a consequent light yield per acre. The seeds planted were obtained from the United States Department of Agriculture. (1900.)

NOTE.—Since this bulletin was put into the hands of the printer information has come to the Station from the United States Department of Agriculture to the effect that flour made from No. 36 (Hungarian wheat) sells in the London market for from 80 cents to $1.00 per barrel more than the best American flours. Through an oversight this wheat is not included among those rated by Mr. Patterson (page 179). A sample just submitted to him is rated 93.

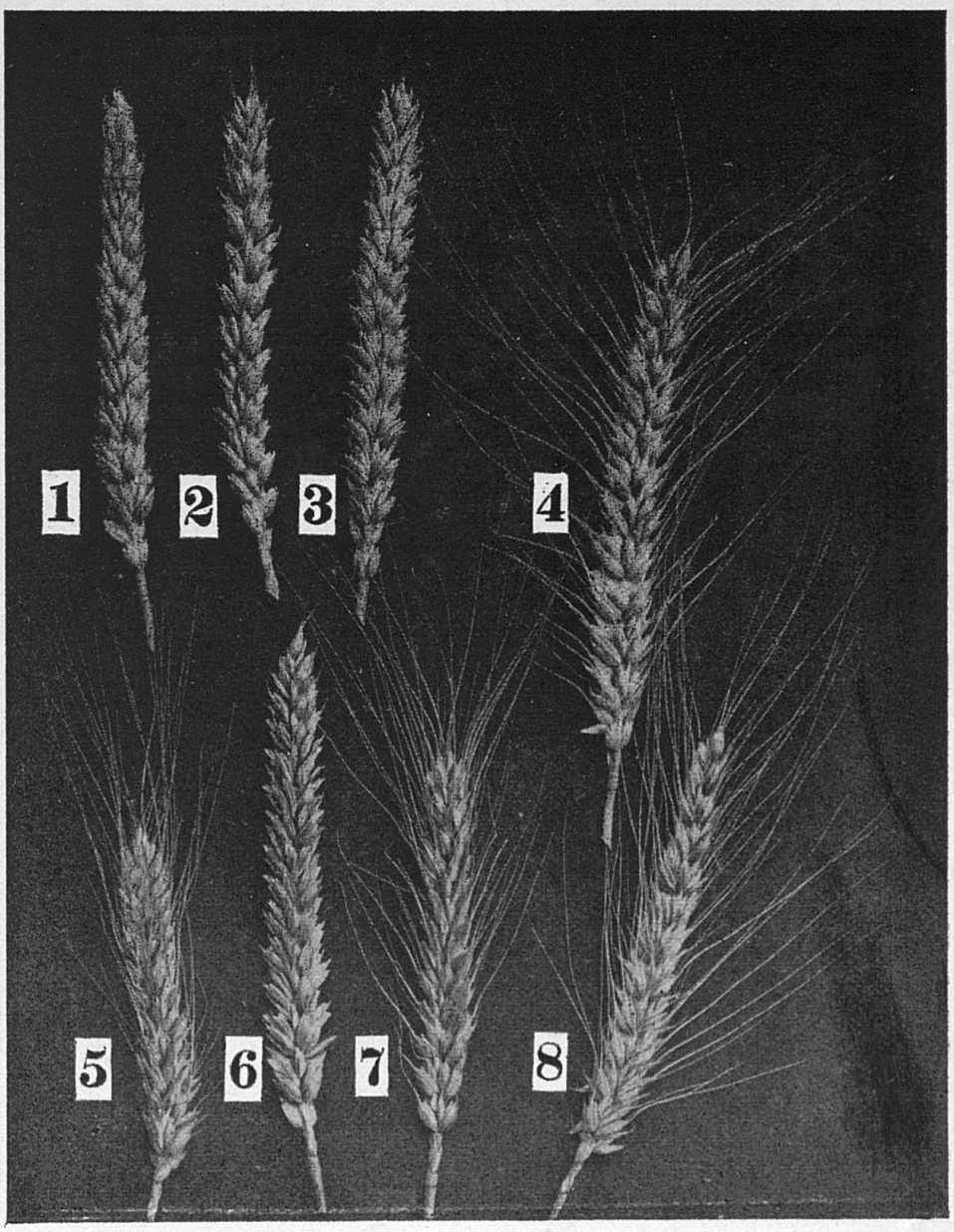

Plate I.—1. Jones's winter fife; 2, American bronze; 3, Early white leader; 4, Pride of Genesee; 5, Oatka chief; 6, Long amber; 7, Jones's bearded; 8, Pride. Reduced to about one-half natural size. Photographed by H. Garman.

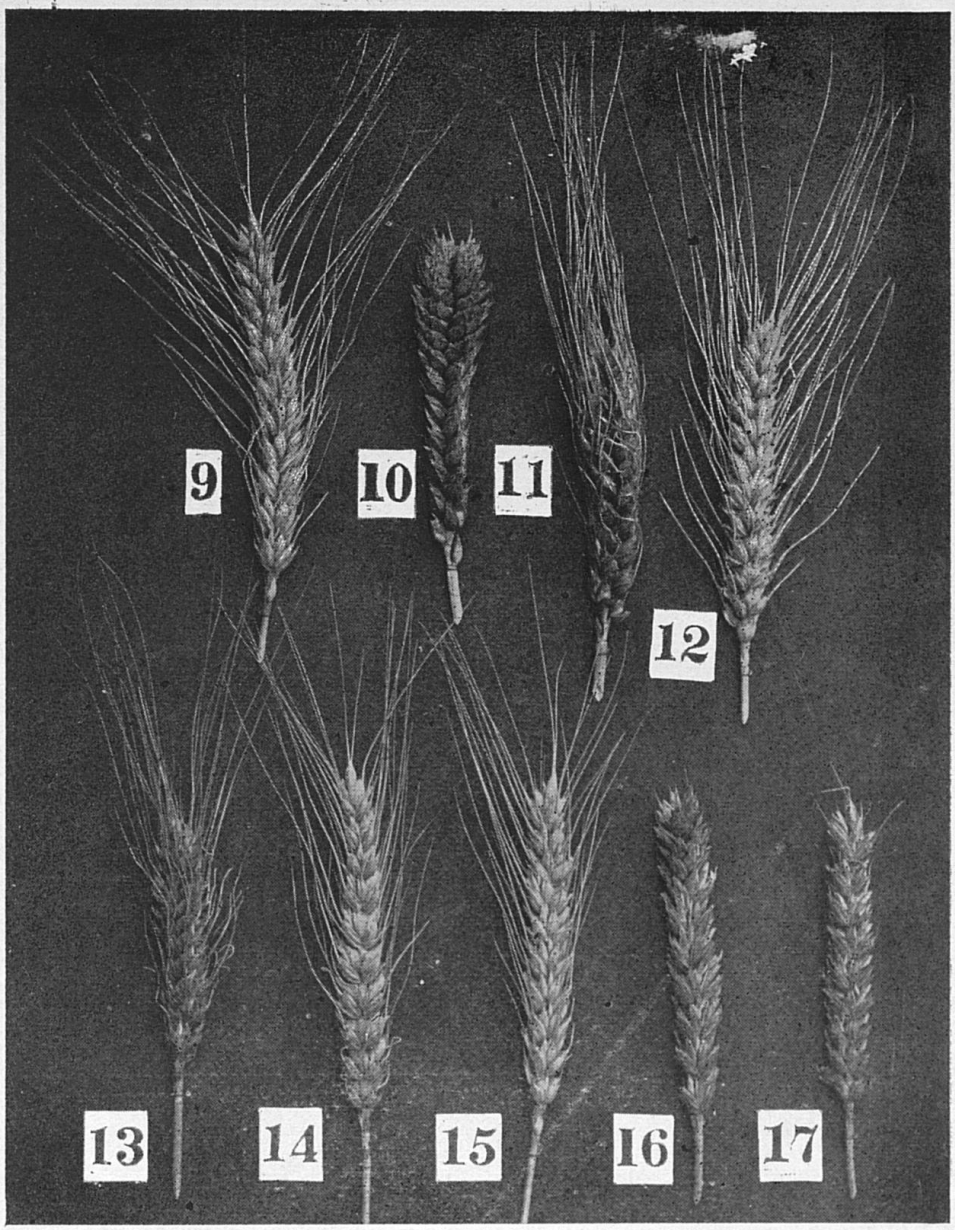

Plate II.—9, Bearded winter fife; 10, Early arcadian; 11, Early Genesee giant; 12, Diamond grit; 13, White seeded golden cross; 14, Lancaster red; 15, Democrat; 16, Gold coin; 17, Dawson's golden chaff. Reduced to about one-half natural size. Photographed by H. Garman.

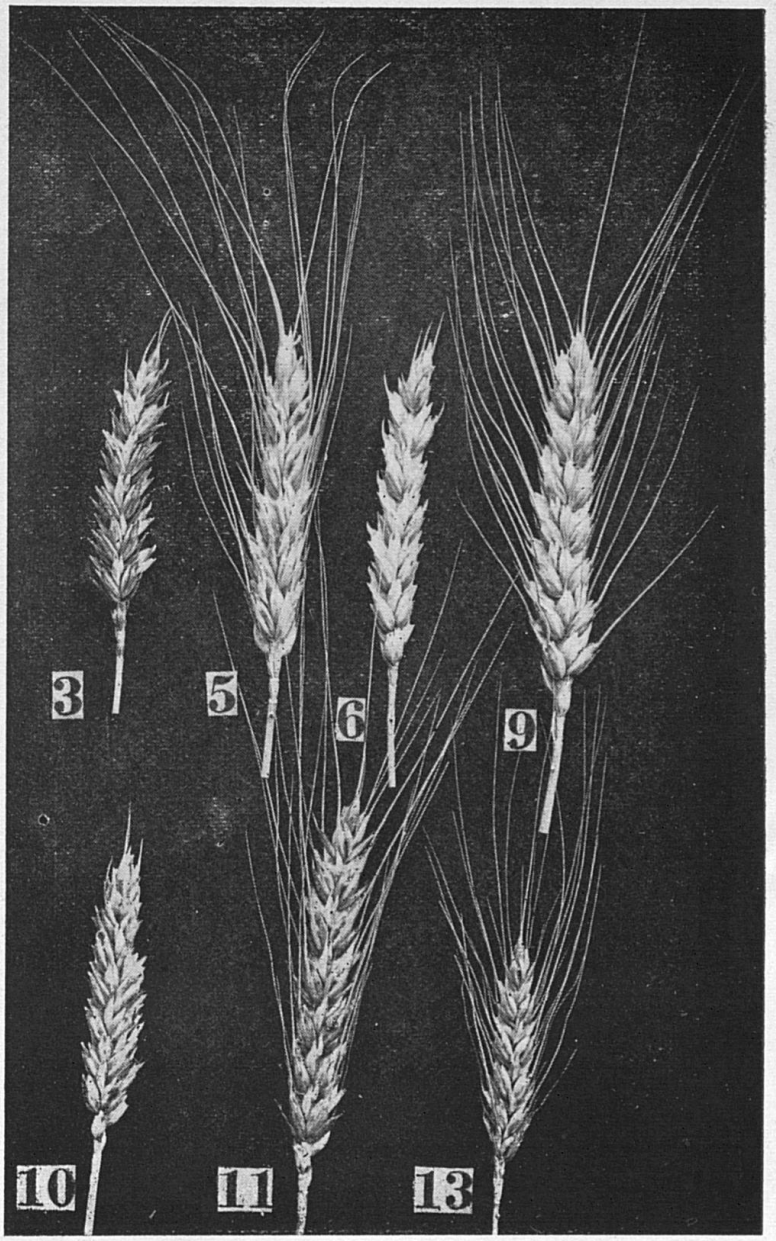

Plate III.—3, Beech-wood hybrid; 5, Indiana swamp; 6, Rice wheat; 9, Kansas mortgage lifter; 10, Fultzo-Mediterranean; 11, Rudy; 13, Turkish red. One-half natural size. Photographed by H. Garman.

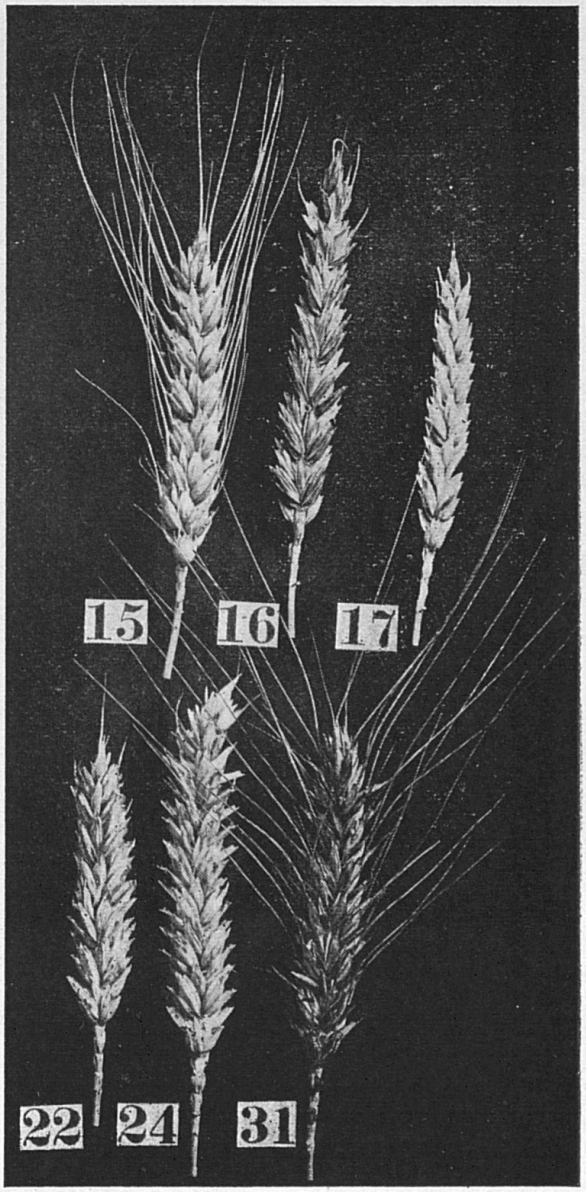

Plate IV.—15, Fulcaster; 16, Harvest king; 17, Fultz; 22, Harvest queen; 24, Longberry amber; 31, Jones's longberry, No. 1. One-half natural size. Photographed by H. Garman.

KENTUCKY

AGRICULTURAL EXPERIMENT STATION

OF THE

State College of Kentucky.

BULLETIN No. 90.

COMMERCIAL FERTILIZERS.

LEXINGTON, KENTUCKY.

December 31, 1900.

KENTUCKY
Agricultural Experiment Station.

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NOTICE.

The Bulletins of the Station will be mailed free to any citizen of Kentucky who sends his name and address to the Station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or of any failure to receive the Bulletins.

ADDRESS:

KENTUCKY AGRICULTURAL EXPERIMENT STATION,

LEXINGTON, KY.

Bulletin No. 90.

Analyses of Commercial Fertilizers.

Number of Brands. There were 246 different brands of commercial fertilizers registered during the year 1900. Of these, 138 were complete fertilizers, or fertilizers containing all three of the essential ingredients, namely: phosphoric acid, nitrogen and potash; 26 were acid phosphates; 9 contained a mixture of acid phosphate and nitrogen compounds only; 29 acid phosphates and potash salts only; and 44 were classed as bones or tankage.

Samples Collected and Analyzed. Five hundred and eight samples were collected by deputy inspectors or sent by farmers from various parts of the State and 255 were sent in by firms as official samples; of these samples 548 have been analyzed by the Station. Many of these analyses have already been published in Bulletin No. 88 and are not repeated here. The 215 samples not analyzed were duplicates collected by different deputy inspectors working in different places at the same time. In some instances as many as 6 or 7 samples of the same brand were collected.

Results of the Analyses. The results of the analyses show that of the 175 samples analyzed since August 12, 65, representing 48 brands and 19 firms, fell so far below the guaranteed analyses in phosphoric acid, nitrogen or potash, or any two, or all three of these ingredients, that they could not be accounted for by variations in sampling or analysis. Adding to these the 72 samples reported in Bulletin No. 88, we have 137 samples which fell so far below the guaranteed analyses that attention should be called to this fact. It is probable that in most cases variations can be accounted for by hurried or careless mixing at the factories, or gross mistakes in shipping one brand for another, but in several instances, the results show apparently a desire on the part of the manufacturer to guarantee more than the goods contain. Attention is called to the fact that, in at least one instance, unacidulated phosphate rock has been mixed with and sold as bone meal. (See foot note p. 226.) Such a mixture should not be sold as bone meal, and in the future tags will not be issued for bone meal fertilizers containing unacidulated rock phosphate.

The great majority of the manufacturers, however, have furnished in most instances fertilizers fully up to, and often better than the guarantee.

A careful examination of the table on p. 204 shows, however, that the fertilizers made by the following named firms have fallen below their minimum guarantees in so many instances that special attention should be called to them:

The Abbott & Martin Rendering Company.
*George S. Bartlett.
The Chicago Fertilizer Company.
The Hardy Packing Company.
The Ohio Farmers Fertilizer Company.

The table gives the manufacturers who have registered fertilizers in this State since August 12, or whose fertilizers have been sampled and analyzed since that date. It shows also the number of samples analyzed of each firm's fertilizers, and

*The tonnage tax paid by Mr. George S. Bartlett on each of these brands was the minimum allowable under the law, thus indicating but a small amount of fertilizer sold by him.

in how many of these samples there was a serious deficiency of either phosphoric acid, nitrogen or potash, and in how many the percentages of these constituents are such as to be acceptable, from the point of view of the buyer, either because they equal or exceed the percentage guaranteed by the manufacturer, or because a slight deficiency in one constituent is, in the Director's judgment, fully made up by an excess in one or both of the others. Under the heading, "Relative Value Per Ton," is shown in how many instances the "estimated value per ton," calculated from our analysis, equals or exceeds the value calculated from the manufacturer's minimum guaranteed analysis, and in how many it is too low, reasonable allowance having been made for unavoidable variations. This table should be carefully studied. It concisely reviews each firm, showing how the samples of fertilizers taken from various places in the State compare with what was guaranteed. In order, however, to see the amount of variations from the guaranteed analyses, this table should be studied in connection with the table of results of analyses. This table can be easily referred to, as the names of the firms are arranged in alphabetical order.

NAME OF MANUFACTURER.	No. of Samples Analyzed.	Phosphoric Acid.		Nitrogen.		Potash.		Relative Value per ton.	
		No. Acceptable.	No	No Acceptable.	No. too low.	No. Acceptable.	No. too low.	No. Acceptable.	No. too low.
The Abbott & Martin Rendering Co	7	2	5	6	0	3	1	5	2
The Armour Fertilizer Works	5	5	0	3	0	2	0	5	0
Peter Backer & Son	2	1	1	2	0	0	1	2	0
Geo. S. Bartlett	5	0	5	4	1	3	2	3	2
The Buckeye Phosphate Co	1	1	0	1	0	1	0	1	0
The Chicago Fertilizer Co	8	2	6	7	1	6	1	3	5
The Cleveland Dryer Co	4	4	0	2	0	1	0	4	0
Continental Fertilizer Co	3	3	0	1	0	1	1	3	0
The Currie Fertilizer Co	9	7	2	8	0	6	1	9	0
Duncan & Bro	1	1	0	1	0	1	0	1	0
Globe Fertilizer Co	8	8	0	7	0	7	0	8	0
Greer Machinery Co	1	1	0	0	0	1	0	1	0
The Hardy Packing Co	7	2	5	7	0	4	1	4	3
The Helm Milling Co	2	2	0	2	0	0	1	2	0

The Hardy Packing Co									
The Helm Milling Co	2	2	0	2	0	0	1	2	0
The Jarecki Chemical Co	2	1	1	2	0	2	0	2	0
J. B. Jones	5	2	3	5	0	2	0	5	0
The Jones Fertilizing Co	8	5	3	7	0	4	0	7	1
Louisville Fertilizer Co	20	17	3	9	0	8	3	19	1
P. B. Mathiason Manufacturing Co	2	2	0	2	0	0	0	2	0
Michigan Carbon Works	5	5	0	5	0	3	0	5	0
National Fertilizer Co	8	8	0	3	0	5	0	8	0
North-Western Fertilizing Co	9	8	1	6	0	4	1	7	2
The Ohio Farmers' Fertilizer Co	11	3	8	9	0	6	1	6	5
The E. Rauh & Sons Fertilizer Co	2	1	1	2	0	0	0	2	0
Read Phosphate Co	11	7	4	6	1	6	3	10	1
J. F. Singer & Co	3	3	0	3	0	1	0	3	0
Swift & Co	7	7	0	6	1	4	1	7	0
Tennessee Chemical Co	6	6	0	1	0	3	2	6	0
Virginia-Carolina Chemical Co	4	4	0	2	0	3	0	4	0
Wake Fertilizer Co	2	0	2	2	0	2	0	2	0
The Walton Fertilizer Co	1	1	0	1	0	1	0	1	0
[illegible] & Co	2	2	0	2	0	0	0	2	0

It is evident from the preceding table that while most of the fertilizers examined ran above the minimum guarantee, yet a thorough and careful inspection seems essential. It is hoped that farmers will generally take advantage of Section 8 of the fertilizer law, and when they purchase fertilizers, at least in quantity, that they will take a sample in accordance with Section 8 and send it to the Station for free analysis.

The essentials in taking a sample are: 1. Take it at the time of purchase, and if possible in the presence of agent or seller. 2. Take a sample from not less than two bags, and from one additional bag for every ten purchased; mix these samples carefully and take at least a pint of this mixed sample, put it into a fruit jar, seal, box and express to M. A. Scovell, Director, Lexington, Ky. 3. Take the sample in the presence of at least one witness, and have the witness sign the required certificate. 4. The certificate for free analysis to be sent *by mail* and should be in accordance with the law as given in Section 8.

If the sample is taken in accordance with the above directions it may be sent by express and the charges will be paid by the Station.

Form of Certificate. A good form of certificate is the following, and blank certificates will be sent free to any farmer requesting the same.

CERTIFICATE FOR FREE ANALYSIS.

....190

M. A. SCOVELL, Director, Lexington, Ky.:

This is to certify that I am not a dealer in, or agent for the sale of any fertilizer, and that the fertilizer, a sample of which I have sent by express to you for free analysis was purchased by me.....190 for my own use and not for sale.

I further certify that the sample was taken at the time of purchase from at least 10 per cent. of the sacks or other packages comprising the whole lot purchased, and that it was taken as provided in Section 8 of the fertilizer law, in the following

described manner, to wit: .....
.....
.....
.....
.....

Upon receipt of the analysis from you, I agree to furnish you with a tag taken from one of the sacks sampled, the name and address of the firm or agent of whom the fertilizer was purchased, and the amount purchased.

(Signature) .....
(P. O. Address) .....

Signature of Witnesses:

.....
.....

Should, however, any farmer desire to take a sample and not have a blank certificate at hand, he may write one in full like the form above given, or take the sample in presence of seller and witness and so mark it that he can indentify it subsequently in a certificate, and send it at once to the Experiment Station with the request that the station furnish form of certificate, such certificate to be filled out upon receipt covering the sample and properly signed by sender and witnesses and sent by return mail to the Station.

Section Providing for Free Analysis.—The section of the Fertilizer Law, providing for the taking of samples for free analysis is as follows:

SEC. 8. Any person not a dealer in, or agent for the sale of any fertilizer who may purchase any commercial fertilizer in this State for his own use and not for sale, may take a sample of the same for analysis, which analysis shall be made by the said Experiment Station free of charge. Such samples for free analysis shall be taken by the purchaser in presence of the person, company or agent selling the fertilizer, from at least ten (10) per cent. of the sacks or other packages comprising the whole lot purchased, and shall be thoroughly mixed and at least one pound of the material after mixing must be put into a jar or can, securely sealed and marked in such a way as to surely identify the sample and show by whom it was sent, without giving the name of the fertilizer or the person from whom it was purchased, and must be forwarded to the Director of the Kentucky Agricultural Experi-

ment Station, Lexington, Ky. The purchaser shall also send with the sample a certificate signed by himself and witness, or by two witnesses, stating that the sender has purchased the fertilizer for his own use and not for sale, and that the sample was taken in the manner prescribed in this Section. Provided, however, that if the person, company or agent shall refuse to witness the taking of the sample, then the sample may be taken at the time of the purchase in the manner already described in the presence of two witnesses who shall certify to the manner of taking the sample. The purchaser shall preserve the official label from one of the bags or other packages sampled to be sent to the Director after having received the report of analysis of the sample, and at the same time he shall furnish to the Director the name and address of the firm of whom the fertilizer was purchased and the amount purchased; and any person having sent a sample for free analysis, under the provisions of this Section, who shall, after having received the report of analysis of the same, refuse to furnish the required information, shall thereafter forfeit the privilege of free analysis of fertilizers under this Section. But if any sample shall have been submitted for free analysis without all the requirements of this Section having been complied with, the Director shall inquire into the case and may accept the sample for free analysis if he believes that it is a fair sample of the fertilizer as it was delivered to the purchaser.

Values Used.—In calculating the relative value per ton, the same values have been used as were used in our last bulletins, namely:

Soluble and reverted phosphoric acid in mixed fertilizers	7c per lb.
Soluble and reverted phosphoric acid in plain acid and unacidulated phosphates	5c per lb.
Insoluble phosphoric acid in mixed fertilizers	2½c per lb.
Insoluble phosphoric acid in plain acid phosphates	Nothing.
Phosphoric acid in fine bone	4c per lb.
Phosphoric acid in medium bone	3c per lb.

Fine bone is all that passes through a sieve with meshes one-twenty-fifth inch square. Medium bone passes through a sieve with meshes one-sixth inch square, but does not include fine bone.

Nitrogen in all fertilizers..... 17½c per lb.
Potash in all fertilizers, from sulphate..... 7c per lb.
Potash in all fertilizers, from muriate..... 6c per lb.

The term "Potash, from Muriate" does not indicate necessarily that the manufacturers used muriate of potash in furnishing the potash; they may have used sulphate of potash, or other salts of potash, but in all fertilizers where the term "Potash from Muriate" is used there is enough chlorine present to combine with the potash, either from salt in the tankage used, or the potash salts used, as muriate, kainit, carnallite, etc. As the objection to the use of muriate of potash arises from the chlorine present in this salt, it likewise follows that chlorine in a fertilizer is objectionable, whether put in with the potash or otherwise. The using of sulphate of potash where there is chlorine present in other ingredients of the fertilizer will not obviate the injurious effect of the chlorine, and therefore we take this method of showing chlorine present by designating the potash as "from muriate."

Explanation of the Table. In the table of analyses, under the column headed "From Whom Obtained," all samples marked "manufacturer" are those furnished by the manufacturer at the time the fertilizer was entered for sale. All other samples were collected by deputy inspectors or sent by farmers. The analysis guaranteed by the manufacturer follows the analyses of these other samples and is printed in *italic* figures.

The figures in the table which are set in bold face type are those results which, in the judgment of the Director, were too low to be acceptable. Where the total phosphoric acid in samples of bone is marked with (*) it indicates that the bone contains soluble phosphoric acid. This soluble phosphoric acid is an indication of either the addition of acid phosphate to the bone, in which case it would not be a pure raw bone, or else that the bone containing this soluble phosphoric acid was not strictly a pure or high grade bone, but contained trashy materials, which carried with them the soluble phosphoric acid.

The names of the manufacturers are arranged in alphabetical order, and all the analyses of the same brand have been grouped together.

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	The Abbott & Martin Rendering Co., Columbus, Ohio.	
7082	Standard Phosphate	J. W. Teaff, Hardinsburg
7083	Ideal Grain Grower	J. W. Teaff, Hardinsburg
7081	Peerless Bone with Potash	H. E. Lewis, Hodgenville
7397		J. W. Teaff, Hardinsburg
7092	Render's Bone Meal	J. W. Teaff, Hardinsburg
7398		H. E. Lewis, Hodgenville
7038	Bone, Meat and Blood Guano	Manufacturer
	The Armour Fertilizer Works, Chicago, Ill.	
7093	Bone Meal	Forbes & Bro., Hopkinsville
7094	Raw Bone Meal	W. C. & W. R. Moorman, Glendeane
7095	Grain Grower	Lebanon Carriage & Implement Co., Lebanon
7096	Star Phosphate	Gardner Warren Implement Co., Elizabethtown
7097	Phosphate and Potash	Franklin Hard. Co , Franklin
	Peter Backer & Son, Troy, Ind.	
7100	Grower No. 7	A. L. Oelze, Cloverport
7101	Grower No. 9	A. L. Oelze, Cloverport
	Geo. S. Bartlett, successor to Cincinnati Desiccating Co., Cincinnati, O.	
6827	Indian Brand Ohio Valley Phos	Manufacturer
7102		J. M. Abbott & Son, Sulphur

Table of Analyses.

Pounds in the Hundred.												
		Phosphoric Acid.							Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				7.70	1.97	9.67					**$7.70**	7082
				9 00		*10.00*					*9 00*	
				7.08	3.40	10 48	0.85	1.03	1.14		15.96	7083
				8.00		*9 00*	*0.82*	*1 00*	*1.00*		*15 77*	
				7.89	3.02	10.91	0.57	0 69	**1.25**		16.06	7081
				6.77	2.25	9.02	0.49	0.59	2.33		**15.13**	7397
				8 00		*9 00*	*0.41*	*0 50*	*2.50*		*16.14*	
13.01	3.88					**16.89**	2.98	3.62			23.17	7092
12.92	2.28					**15.20**	2.46	2.99			20.32	7398
						20.00	*1 65*	*2 00*			*17.78*	
				8 26	1.51	9.77	2.33	2.83	5 01		26 49	7038
		6 00	*2 00*	*8.00*		*10 00*	*0.82*	*1 00*	*4 00*		*19.87*	
22.15	3.31					25.46	2.78	3.37			29 44	7093
						24.00	*2 47*	*3.00*			*23.05*	
20.91	4.91					25.82	3.66	4.44			32.49	7094
						22 00	*3 71*	*4.50*			*26.19*	
				7 64	5.63	13.27	2 11	2.56	2.36		23.74	7095
		6.00	*2 00*	*8.00*		*10.00*	*1.65*	*2.00*	*2.00*		*20 38*	
				16.14	1.77	17.91					16 14	7096
		9 00	*3.00*	*12 00*		*16 00*					*12.00*	
				13.14	0.70	13.84			2.02		21.17	7097
		6 00	*4.00*	*10 00*		*12.00*				*2 00*	*17.80*	
8.84	3.11					**11.95**	3.45	4.19	**2 14**		23.59	7100
						15.00	*3 00*	*3 64*	*3 00*		*23.10*	
11.27	14.34					25.61	3.49	4 24			29.84	7101
						20.00	*3 29*	*4.00*			*23 52*	
				6 57	3.74	10.31	1.55	1.88	2.20		**19.14**	6827
				7.34	4.29	11.63	1.52	1.85	1.36	0.58	20.19	7102
				8.00		*11.00*	*1 65*	*2.00*	*2 00*		*20.88*	

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	Geo. S. Bartlett.	
7005	Indian Brand Gilead Phosphate..	Manufacturer.....
7029	Corn and Wheat Grower.....	Manufacturer.....
7103		J. M. Abbott & Son, Sulphur...
	The Buckeye Phosphate Co, Columbus, O.	
7000	Buckeye Spec Bl'd & Potash Mix.	Manufacturer.....
	The Chicago Fertilizer Co., Chicago, Ill.	
7106	Western Bone Black and Potash..	Kinkade Bros., Sonora .....
6995	Bone, Blood and Potash..... ...	Marian Hoover, East View .....
7107		R. D. Traughber, Adairvilie.....
7399		I.K.Miller &Son,Campbellsville
7108	Standard Truck.....	Kinkade Bros., Sonora .....
7109	Wheat Special	I.K Miller &Son,Campbellsville
7400		R. D. Traughber, Adairville.....
7110	Chicago Bone Meal	R. D. Traughber, Adairville.....
	The Cleveland Dryer Co., Cleveland, O.	
7127	Phospho Bone	D. C. Gray, Brandenburg.....
7128	XXX Phosphate.....	Irvington Milling Co, Irvington
7129	Horsehead Phosphate.....	Leitchfield Mer. Co, Leitchfield
7130	Square Bone.....	J. C. DeHaven, Hardinsburg....
	Continental Fertilizer Co., Nashville, Tenn.	
7131	Bear Beef, Blood and Bone.....	S. D. Chestnut, Trenton.. .....

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED.													
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				6 93	5 44	12.37	2.61	3.17		2.06	$24.44	7005
				9.00		*11.00*	*2 47*	*3 00*	*2 00*		*24.65*	
				8.43	3.98	12.41	3 21	3.90	3.49		29.22	7029
				7.52	4 93	12.45	2.44	2.96	1.64	1.27	25.29	7103
				9 00		*10 00*	*3 29*	*4 00*	*4.00*		*29 42*	
				7.60	1.60	9.20	1.65	2.00	7 25		25.92	7000
				8.00			*0 82*	*1 00*		*4.00*	*19 67*	
				5.45	2.20	7.65	0.63	0.76	3.25		14 84	7106
				8 00		*9.00*	*0 41*	*0 50*		*2 50*	*16.64*	
				7.98	2.28	10.26	1 41	1.71	2.04		19.70	6995
				7.98	2.43	10 41	1.10	1.34	1 34		17.85	7107
				7.33	2 26	9.59	1.39	1.69	2 07		18.74	7399
				9 00		*10 00*	*1.23*	*1.50*		*2.00*	*20.21*	
				7.71	2.87	10.58	1 98	2.40	3 62		23 50	7108
				8.00		*9 00*	*2.47*	*3 00*		*4.00*	*25.95*	
				7.01	2.97	9 98	0.59	0.72	1.14		14.74	7109
				7.82	3.25	11 07	0 74	0.90	0.98		16 3[illegible]	7400
				8.00		*9.00*	*0 82*	*1.00*		*1.00*	*15.97*	
12.96	2 47					15.43	2.30	2.79			19.90	7110
						20 00	*1.65*	*2.00*			*17.78*	
				9 16	4 95	14.11	1.29	1.57	1 48		21.60	7127
				10.00			*0 82*	*1 00*	*1 00*		*18.07*	
				15.80	1.57	17.37					15.80	7128
				14 00							*14.00*	
				9.63	2.65	12 28					9.63	7129
				10 00							*10 00*	
				6 77	13.88	20.65	3.02	3.67			26 99	7130
				6 00		*20.00*	*2 06*	*2.50*			*22 61*	
				11.66	0.77	12.43	1.52	1.85		2.04	24.89	7131
		6.00	4.00	*10.00*		*11.00*	*1.65*	*2.00*		*2.00*	*23.08*	

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	Continental Fertilizer Co.	
7132	Bear High Grade Dissolved Bone	C. O. Cruse, Owensboro.. .....
7133	Bear Spec. Wheat & Corn Grower	Watkins & Co., Elizabethtown..
	The Currie Fertilizer Co., Louisville, Ky.	
7111	Currie's Alkaline Bone.....	I.K. Miller &Son,Campbellsville
7112	Currie's Corn and Wheat Special	M. T. Crawford, Somerset.....
7113	Currie's Soluble Bone.....	I.K.Miller &Son,Campbellsville
7401		Young, Waller & Young, Morganfield ....
7114	Currie's Wheat Grower.....	Grigsby & Co., Bardstown.....
7115	Currie's Raw Bone Meal.....	R. C. Swinney, Beard.....
7116	Currie's Fine Ground Raw Bone Meal.....	Eldred & Co., Princeton.....
7117	Currie's Butchertown Raw Bone Meal.....	C. W. Quiggins, Elizabethtown
7402		J. M. Owens & Son, Shelbyville
	Duncan & Bro., Lagrange, Ky.	
7134	Tiger Wheat Special.....	Kalfus Hitt, Beard.....
	Globe Fertilizer Co , Louisville, Kentucky.	
7135	Globe Wheat Grower.....	W.H. Jernigan & Co ,Pembroke
7136	Eagle Corn and Wheat Grower...	J. F. Brandon & Bro., Benton...
7137	Progress Corn and Wheat Grower	J. W. Cloyd, Campbellsville.....

Table of Analyses.

Pounds in the Hundred.												
Phosphoric Acid.									Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia	From Muriate.	From Sulphate.	Relative Value per Ton.	Station Number.
				15.21	0.96	16.17					$15.21	7132
		8.00	*6 00*	*14 00*		*15.00*					*14.00*	
				11.33	1 02	12 35				1.61	18.62	7133
		8.00	*3.00*	*11.00*		*12.00*				*2.00*	*18.70*	
				11.01	2.81	13.82			1.63		18.78	7111
				10.00		*11.00*			*1.50*		*16.30*	
				10.16	4.36	14.52	0.97	1.18	0.89		20.87	7112
				10.00		*12 50*	*0 62*	*0.75*	*1.00*		*18 62*	
				10.26	1.97	12.23	1.20	1.46		1.14	21.15	7113
				10.84	1.97	12.81	1.25	1.52		1.52	22.68	7401
				10.00		*12.00*	*1.23*	*1.50*		*1.50*	*21.41*	
				10.59	3.24	13.83	1.49	1.81		1.48	23.74	7114
				10.00		*12.50*	*1.23*	*1.50*		*1.50*	*21.66*	
11.59	11.13					22.72	3.76	4.56			29.11	7115
						19.00	*3 09*	*3.75*			*22.22*	
				7.51	11.07	18.58	1.98	2 40			22.98	7116
				8.00		*15.50*	*1.65*	*2.00*			*20.73*	
				7.47	9.70	17.17	2.16	2.62	1 08		24.17	7117
				7.82	9.81	17.63	1.51	1.83	1.15		22.53	7402
				10.00		*15.50*	*1.65*	*2.00*	*0.75*		*23.43*	
				10.18	3.43	13.61	0.86	1.04	0.92	1.24	21.82	7134
		5.00	*2.00*	*7.00*		*12.00*	*0.82*	*1.00*	*1.50*		*16.97*	
				8.91	1.62	10.53	2.26	2.74		2.11	24.14	7135
				9.00		*11.00*	*2.06*	*2.50*		*2.00*	*23.61*	
				10.50	2.17	12.67	1.77	2.15		2.42	25.38	7136
				9.00		*11.00*	*2.06*	*2.50*		*2.00*	*23.61*	
				10.21	2.07	12.28	1.84	2.23		0.79	22.88	7137
				9.00		*10.00*	*1.65*	*2.00*		*1.00*	*20.28*	

TABLE OF ANALYSES.

Sttaion Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	Globe Fertilizer Co.	
7138	Globe Bone Dust	Langdon Bros., Science Hill
7139		Langdon Bros., Science Hill
7140	Bone and Potash	J. W. Cloyd, Campbellsville
7141	Globe Bone Meal	Hunt & Crutcher, Vine Grove
7014	Phosphate of Potash	Manufacturer
	Greer Machinery Co., Knoxville, Tennessee.	
7018	Farmers' Compound	Manufacturer
	The Hardy Packing Co., Chicago, Illinois.	
7142	Crop Producer	M. H. Williams, Sonora
7403		Brady & Campbell, Stithton
7058	Hardy's Wheat Grower	R. H. Franklin, Coy
7098		J. D. Hill, Franklin X Roads
7172		A. J. Holbert, Franklin X Roads
7143	Bone Meal	Brady & Campbell, Stithton
7171		A. J. Holbert, Franklin X Roads
	The Helm Milling Co., Birmingham, Ala.	
7019	Helm's Pure Bone Meal	Manufacturer
7020	Helm's Bone & Tobacco Stems.	Manufacturer
	The Jarecki Chemical Co., Sandusky, Ohio.	
7147	Lake Erie Fish Guano	Jno. Whitworth, Caneyville
7148	Number One Fish Guano	Jno. Whitworth, Caneyville

Table of Analyses.

Pounds in the Hundred.												
Phosphoric Acid.								Potash.				
In Fine Bone	In Medium Bone.	Soluble.	Reverted	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per ton.	Station Number.
				8.88	3.98	12.86	1.64	1.99		0.89	$21.41	7138
				10.36	2.01	12 37	1.19	1.44		0.91	20 95	7139
				9.00		*11.00*	*1.23*	*1.50*		*1.00*	*19.31*	
				10.75	1.05	11.80	0.36	0.44		1.16	18.46	7140
				11.00						*1.00*	*16.80*	
4.93	16.49					21.42	4.13	5.01			28.29	7141
						20.00	*3.29*	*4.00*			*23.52*	
				9.12	0.91	10.03				4.02	18.86	7014
				9.00						*4.00*	*18.20*	
				13.65	5.59	19.24			2.18		24.53	7018
				10.00					*2.00*		*16.40*	
				6.80	3.70	10.50	0.88	1.07	1.12		15.79	7142
				6.16	3.04	9.20	0.58	0.70	1.07		**13.45**	7403
				8 00		*9.00*	*0.82*	*1.00*		*1.00*	*15.97*	
				7.39	1.97	9.36	0.40	0.49	2.41		**15.63**	7058
				7.10	1.36	**8.46**	0.56	0.68	2.41		**15.47**	7098
				7.98	1.56	9.54	0.51	0.62	**1.73**		15.82	7172
				8.00		*9.00*	*0.41*	*0.50*		*2.50*	*16.64*	
16.53	3.63					20.16	2.10	2.55			22.75	7143
13.23	2.71					**15.94**	2.75	3.34			21.84	7171
						20.00	*1.65*	*2.00*			*17.78*	
10.71	11.14					21.85	3.05	3.70			25.93	7019
						21.00	*2.64*	*3.20*			*21.84*	
7.03	2.74					9.77	2.26	2.74		**2.21**	18.26	7020
						8.00	*1.65*	*2.00*	*5.00*		*16.58*	
				8.60	3.20	11.80	1.77	2.15	1.52		21.66	7147
				10.00		*11.00*	*1.64*	*1.99*		*1.00*	*21.64*	
				9.62	3.62	13.24	0.78	0.95	1.29		19.56	7148
				10.00		*11 00*	*0.86*	*1.04*		*1.00*	*18.91*	

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	J. B. Jones, Louisville, Ky.	
7149	Jones' Bone Meal	I.K.Miller &Son,Campbellsville
7150	Ammoniated Bone Meal	I.K.Miller &Son,Campbellsville
7054	Raw Bone Meal	J. W. Swinney, Beard
7151	Wheat Grower	I.K.Miller &Son,Campbellsville
7404		E. J. Clore, O'Bannon
	The Jones Fertilizing Co., Cincinnati, Ohio.	
7155	Bone Meal	Orr, Gill & Co., Allensville
7156	Ammoniated Bone Meal	S. L. Thomas, Hodgenville
7157	Miami Valley Phosphate	J. B. Benjamin, Providence
7405		Green & Dycus, Benton
7158	Jones Reliable Phosphate	Orr, Gill & Co., Allensville
7406		Green & Dycus, Benton
7045	Jewel Phosphate	J. W. Riley, Olmstead
7159	Acid Phosphate	Orr, Gill & Co., Allensville
	Louisville Fertilizer Co., Louisville, Ky.	
7160	Bone and Potash	Forbes & Bro., Hopkinsville
7407		Crowell & Nunn Co., Blackford
7161	Eagle Phosphate	S. P. Simpson, Murray
7408		Lee Grissom, Columbia
7105	Corn Grower	J. G. Walden, East Wood

TABLE OF ANALYSES.

POUNDS IN THE HUNDRED												
Phosphoric Acid.									Potash.		Relative Value per Ton	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate		
16.83	5.92					*22.75	2.73	3.31			$26.57	7149
						20.00	*2.47*	*3.00*			*20.65*	
10.76	1.47					*12.23	2.70	3.28			18.94	7150
						15.00	*2.06*	*2.50*			*16.21*	
15.60	8.04					23.64	3.48	4.22			29.48	7054
						21.50	*3.50*	*4.25*			*25.15*	
				7.45	3.07	10.52	2.62	3.18		2.31	24.37	7151
				7.55	3.38	10.93	2.74	3.33		1.95	24.58	7404
				9.00		*11.00*	*1.70*	*2.06*		*2.00*	*22.35*	
15.43	7.60					*23.03	3 35	4.07			28.63	7155
						20.00	*3.29*	*4.00*			*23.52*	
				7.22	8.34	15.56	4.70	5.71			30.73	7156
				5.00		*15.00*	*4.12*	*5.00*			*26.42*	
				8.15	5.12	13.27	2.79	3.39		3.72	28.95	7157
				8.60	5.19	13.79	2.79	3.39		3.42	29.20	7405
				9.00		*13.00*	*2.47*	*3.00*		*2.75*	*27.10*	
				6.24	3.48	9.72	1.82	2.21		1.55	19.02	7158
				7.78	2.83	10.61	1.93	2.34		1.48	21.14	7406
				8.50		*10.00*	*1.23*	*1.50*		*1.25*	*18.71*	
				8.58	2.19	10.77	0.78	0.95			15.84	7045
				8.00		*10.00*	*0.82*	*1.00*			*15.07*	
				6.63	3.68	10.31					6.63	7159
				8.00		*10.00*					*8.00*	
				10.36	2.33	12.69			1.51		17.48	7160
				9.71	2.00	11.71			2.28		17.33	7407
		6.00	*4.00*	*10.00*		*11.00*			*2.00*		*16 90*	
				9.53	2.51	12.04					9 53	7161
				9.75	2.48	12.23					9.75	7408
		6.00	*4.00*	*10.00*		*11.00*					*10.00*	
				11.22	1 62	12.84				1.31	18.35	7105
		6,00	*4.00*	*10.00*		*11.00*			*2.00*		*16.90*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.
	Louisville Fertilizer Co.	
7162	Corn and Wheat Grower	J. W. Gilbert & Sons, Owensboro
7409		N. J. Eastham, Somerset
7163	Soluble Bone	Duncan & Bro., Lagrange
7050	Bone Meal	Geo. Harned, Custer
7146	Special Wheat Grower	L. D. Stringer, Pulaski
7164		S. P. Simpson, Murray
7044	Eagle Guano	G. T. Wyatt, Olmstead
6915	Raw Bone Meal	Manufacturer
7165		Duncan & Bro., Lagrange
6916	Gross Special	Manufacturer
7068		A. J. Gross, Holt
7002	Dissolved Bone No. 2	Manufacturer
7069		E. M. Jones, Newstead
7070		R. T. Stowe, Newstead
7071		J. W. Riley, Newstead
	P. B. Mathiason Manufacturing Co., St. Louis, Mo.	
6917	Increscent Brand Pure Raw Bone Meal	Manufacturer
7184		N. Meguiar, Franklin
	Michigan Carbon Works, Detroit, Mich.	
7180	Homestead A Bone Black Fer.	Gregory & Son, Cloverport
7181	Red Line Complete Manure	S. R. Boyd, Kelsey
7410		C. E. Owen, Madisonville
7182	Wolverine Ground Bone	L. C. Goering, Hawesville

Table of Analyses.

Pounds in the Hundred														
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				9.94	3.84	13.78			0.37		$16.28	7162
				12.22	1.98	14.20			**0.13**		18.26	7409
		7.00	*5.00*	*12.00*		*13.00*			*0.50*		*17.90*	
				8.34	1.56	9.90	0.85	1.03		1.79	17.95	7163
		5.00	*3.00*	*8.00*		*9.00*	*0.82*	*1.00*	*1.50*		*16.37*	
20.80	9.34					*30.14	0.67	0.81			24.59	7050
						20.00	*0.82*	*1.00*			*14.87*	
				9 42	1.88	11.30	0.68	0.83		1.12	18.08	7146
				9.85	1.22	11.07	0.67	0.81		1.15	18.36	7164
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*	*1.00*		*14.37*	
				10.84	1.11	11.95	1.56	1.89		2.21	24.29	7044
		6.00	*4.00*	*10.00*		*11.00*	*1 65*	*2.00*	*2.00*		*22.68*	
12.36	5.81					*18 17	3.23	3.92			24.69	6915
10.61	7.68					*18 29	2.68	3.25			22.48	7165
						20.00	*2.47*	*3.00*			*20.65*	
				8.85	0.90	9.75	1.44	1.75		4.93	24.78	6916
				9.21	1.28	10.49	1.43	1.74		4.85	25.33	7068
		4.00	*3.00*	*7.00*		*8.00*	*1.23*	*1.50*		*5.00*	*21.61*	
				17.63	1.43	19.06					17.63	7002
				16.78	1.85	18.63					16.78	7069
				16.16	1.98	18.14					16.16	7070
				17 07	2.12	19.19					17.07	7071
				16.00		*17.00*					*16.00*	
17.03	5.38					22.41	3.41	4.14			28.79	6917
16.14	5.10					21.24	3.91	4.75			29.66	7184
						22.00	*3.29*	*4.00*			*24.72*	
				8.75	1.32	10 07	2.24	2.72	1.74		22.84	7180
				8.00		*9.00*	*2.06*	*2.50*	*1.50*		*20.71*	
				6.29	2 65	8.94	0.98	1.19	1.24		15.06	7181
				7.22	2.21	9.43	1.00	1.21	0.93		15.84	7410
				7.00		*8.00*	*0.82*	*1.00*	*1.00*		*14.37*	
12.42	2.73					15.15	1.83	2.22			17.99	7182
						14.00	*1.65*	*2.00*			*14.18*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	Michigan Carbon Works.	
7183	Desiccated Bone	Forbes & Bro., Hopkinsville
	National Fertilizer Co., Nashville, Tenn.	
7185	National Dissolved Bone	J. M. Porter, Beaver Dam
7186	Acid Phosphate	E. S. Duiguid & Co., Murray
7187	Sadler's Formula	A. C. McElroy, Bowling Green
6996	Acid Phosphate	Manufacturer
6997	Tennessee Guano	Manufacturer
6998	Acid Phosphate with Potash	Manufacturer
7026	Twentieth Century Guano	Manufacturer
7027	Bone Meal	Manufacturer
	North-Western Fertilizing Co., Chicago, Ill.	
7188	Horse Shoe Brand Corn & Wheat Grower	Dickey & Co., Glasgow
7055	H. S. B. Fine Raw Bone	C. A. MacGill, Sonora
7040	H. S. B. Pure Ground Bone	H. S. & G. Morgan, Whites Sta.
7047		C. R. Adams, Howell
7189	H. S. B. Acidulated Bone & Pot.	D. W. Gowdy, Campbellsville
7041	H S. B. Bone and Potash	J. J. Moore, Whites Station
7048		C. R. Adams, Howell

Table of Analyses.

Pounds in the Hundred.													
Phosphoric Acid.										Potash.			
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	From Muriate.	From Sulphate.	Relative Value per ton.	Station Number.
23.74	8.78					32.52	1.35	1.64			$28.99	7183
						25.00	*1.23*	*1.50*			*19.31*	
				11.96	3.63	15.59	0.89	1.08	0.70		22 52	7185
				10.00			*0.82*	*1.00*	*1.00*		*18.07*	
				15.16	3.77	18.93					15.16	7186
				14.00							*14.00*	
				12.60	3.71	16.31			2.04		21 95	7187
				12.00					*2.00*		*19.20*	
				15.46	1.38	16.84					15.46	6996
				12.00							*12.00*	
				11.01	1.30	12.31	1.92	2.33	3.79		27.33	6997
				8.00			*1.65*	*2.00*	*2.00*		*19 38*	
				11.32	3.29	14.61			3.59		21.81	6998
				10.00					*2.00*		*16.40*	
				12.22	0.91	13.13			8.76		28 08	7026
				12.00					*4.00*		*21.60*	
10.09	13.37					23.46	4.00	4.86			30.09	7027
						20.00	*2.47*	*3.00*			*20.65*	
				7.53	3.88	11.41	1.78	2.16	1.80		20.87	7188
		5.00	*3.00*	*8.00*		*10 00*	*1.65*	*2.00*		*2.00*	*20.78*	
13.15	10.75					23.90	3.64	4.42			29.71	7055
						22.00	*3.29*	*4.00*			*24 72*	
16.11	5.08					21.19	2.57	3.12			24.94	7040
15.82	7.80					23.62	2.36	2.87			25.60	7047
						20.00	*2.47*	*3.00*			*20.65*	
				11.01	3.20	14.21	0.99	1.20	0.85		21.50	7189
		7.00	*3.00*	*10.00*		*12 00*	*0.82*	*1.00*		*1.00*	*19.27*	
				9.92	1.48	11.40			1.73		16.71	7041
				10.37	1.41	11.78			1.28		16.77	7048
		7.00	*3.00*	*10.00*		*12 00*				*2.00*	*17.80*	

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	North Western Fertilizing Co.	
7190	H. S. B. Cap Sheaf Wheat Grower	Hook, Miller & Co, Hardinsburg
7191	H.S.B Quick Acting Phosphate	S. R. Boyd, Kelsey
	The Ohio Farmers' Fertilizer Co., Columbus, O.	
7194	Acid Phosphate	Buchanan & Sanders, Campbellsville
7195	General Crop Fish Guano	Buchanan & Sanders, Campbellsville
7411		Overstreet & Goldsborough, Lagrange
7196	Corn, Oats & Wheat Fish Guano	Paducah Fer. & Imp. Co., Paducah
7412		B. D. Brown, West Point
7197	Tobacco Grower	J. W. Starks, Hardin
7198	Fine Ground Bone Meal	Buchanan & Sanders, Campbellsville
7413		B. D. Brown, West Point
7052	Grain and Grass	J. W. Hardin, Finchville
7199	Imperial Raw Bone	Overstreet & Goldsborough, Lagrange
7017	Ammoniated Bone & Potash	Manufacturer
	The E. Rauh & Sons Fertilizer Co., Indianapolis, Ind.	
6994	Raw Bone	Manufacturer
7386		D. E. Patterson, Hodgenville
	Read Phosphate Co., Nashville, Tenn.	
7201	Read's High Grade Tob. Grower	Schroeder & Langston, Murray

Table of Analyses.

Pounds in the Hundred.												
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				8.46	2.80	11.26	1.25	1.52	1.41		$19.31	7190
		4.00	*3.00*	*7.00*		*8.00*	*0.82*	*1.00*		*1.00*	*14.57*	
				9.19	2.71	11.90					9.19	7191
		8.00	*2.00*	*10.00*		*12.00*					*10.00*	
				. 31	2.78	10.09					**7.31**	7194
				9 00		*10.00*					*9.00*	
				6.71	2.87	9.58	0.78	0.95	2.52		16.58	7195
				8.56	1.18	9.74	1.00	1.21	1.65		18.05	7411
				8.00		*9.00*	*0.82*	*1.00*		*1.00*	*15.97*	
				6.31	2.20	**8.51**	1.19	1.44	1.91		**16.39**	7196
				6.92	1.37	**8.29**	1.54	1.87	2.28		**18.51**	7412
				9.00		*10.00*	*1.23*	*1.50*		*2.00*	*20.21*	
				7.28	3.13	10.41	1.22	1.48	**0.84**		**17.04**	7197
				9.00		*10.00*	*1 23*	*1.50*		*2.00*	*20.21*	
12.81	3.41					**16.22**	2.61	3 17			21.44	7198
12.53	3.54					**16.07**	2.84	3.45			21.98	7413
						20.00	*1.65*	*2.00*			*17.78*	
				8.70	2.94	**11.64**			1.96		**16.00**	7052
				12.00		*13.00*			*1.00*		*18.50*	
11.35	9.30					20.65	3.55	4.31			27.09	7199
						16.00	*3.29*	*4.00*			*21.12*	
				8.11	1.75	9.86	1.84	2.23	1.12	6.79	29.52	7017
		6.00	*2.00*	*8.00*		*10.00*	*0.82*	*1.00*	*4.00*		*19.87*	
10.93	9.31					**20 24**	2.76	3.35			23.99	6994
13.99	7.53					*21.52	3.21	3 90			26.95	7386
						22.00	*2.88*	*3 50*			*23.28*	
				11.51	1.62	13.13	1.05	1.27		**2.24**	23.74	7201
				8.00		*9.00*	*1.65*	*2 00*	*4.00*		*22.28*	

*Contains Soluble Phosphoric Acid.

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF BRAND.	From Whom Obtained.
	Read Phosphate Co.	
7202	Read's Blood & Bone Fer. No. 1..	Lebanon Carriage & Imp. Co., Lebanon .....
7203	Read's Alkaline Bone	Lebanon Carriage & Imp. Co., Lebanon..... .....
7414		A. A. Winfree, Casky.....
7204	Read's Farmers' Spec. Manure...	I.K. Miller &Son, Campbellsville
7205	Read's XXX Dissolved Bone.....	Woodson Lewis, Greensburg....
7206	Read's Wheat & Clover Grower..	D. H. Hatten, Franklin.....
7415		R. S. Bandy, Irvington.....
7207	Read's Special Potash Mixture...	Bland & Highbaugh, Sonora....
7208	Read's Wheat Grower.....	Bland & Highbaugh, Sonora....
7209	*Fine Ground Bone	Bland & Highbaugh, Sonora....
	J. F. Singer & Co., Nashville, Tenn.	
7021	Singer's Pure RawHard B'n Meal	Manufacturer.....
7022	Singer's Standard Bone Meal	Manufacturer.....
7023	Singer's Special Wheat Grower..	Manufacturer..... .....
	Swift & Co., Chicago, Ill.	
7051	Swift's Ammonia Bone & Potash	G. W. Pottinger, Auburn.....
7056		Wm. Black, Franklin .....
7042	Swift's Bone Meal.....	S. W. Waller, Franklin.....

*Contains unacidulated rock phosphate.

Table of Analyses.

Pounds in the Hundred.													
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				7.53	1.91	9.44	1.60	1.94	2.19		$19.73	7202
				8.00		*9.00*	*1.65*	*2.00*	*2.00*		*19.88*	
				11.27	2.46	13.73			**1.23**		18.49	7203
				9.21	1.77	10.98			1.82		15.96	7414
				10.00		*11.00*			*2.00*		*16.90*	
				9.60	2.07	11.67	0.87	1.06	3.10		21.25	7204
				10.00		*11.00*	*0.82*	*1.00*	*3.00*		*20.97*	
				12.04	2.30	14.34					12.04	7205
				13.00		*14.00*					*13.00*	
				9 29	2.19	11.48	1.05	1.27	1.76		19.90	7206
				10.51	3.34	13.85	0.94	1.14	2.02		22.09	7415
				10.00		*12.00*	*0.82*	*1.00*	*2.00*		*20.27*	
				8.98	2.46	11.44			**1.97**		**16.16**	7207
				10.00		*11.00*			*4.00*		*19.30*	
				9.61	2.76	12.37	1.63	1.98	2.87		23.98	7208
				10.00		*11.00*	*1.65*	*2.00*	*2.00*		*22.68*	
12.45	8.30					20.75	2.50	3.04			23.69	7209
						18.00	*2.06*	*2.50*			*18.01*	
14.14	6.66					20.80	3.78	4.59			28.54	7021
						20.61	*3.29*	*4.00*			*23.89*	
13.29	7.15					20.44	3.76	4.56			28.08	7022
						18.00	*2.47*	*3.00*			*19.45*	
				6.79	9.52	16.31	1.82	2.21		1.75	23.09	7023
				7.00			*1.65*	*2.00*		*2.00*	*18.38*	
				9.30	4.35	13.65	1.76	2.14	1.12	1.02	24.13	7051
				8.40	1.41	9.81	2.00	2.43	0.78	1.15	22 02	7056
				8.00		*11.00*	*1.85*	*2.25*		*2.00*	*21.98*	
24.44	1.56					26.00	2.90	3.52			30.64	7042
						25.00	*2.47*	*3.00*			*23.65*	

TABLE OF ANALYSES.

Station Number.	NAME AND ADDRESS OF MANUFACTURER AND NAME OF PRAND.	From Whom Obtained.
	Swift & Co.	
7057	Superphosphate.....	I. B. Payne, Hardinsburg.....
7072		Arthur Goodman, Harned.....
7387	Raw Bone Meal.....	B. F. Beard & Co, Hardinsburg
7388	Complete Fertilizer	C. P. Clarke & Co., Owensboro
	Tennessee Chemical Co., Nashville, Tenn.	
7389	Ox Alkaline Bone.....	J. J. Ramsey & Son, Shelbyville
7099	Ox High Grade Dissolved Bone	J. D. Hill, Franklin X Roads...
7390	Ox Spec. Wheat & Corn Guano	Leitchfield Mer. Co, Leitchfield
7073	Ox Potash Mixture.....	D. N. Combs, Habit.....
7418		Depp & Holman, Glasgow.....
7391	Ox Potash Formula.....	Oveson & Burba Co, Hodgenville
	S. W. Travers & Co (see Virginia-Carolina Chemical Co.)	**Virginia-Carolina Chemical Co., S W. Travers & Co., Branch, Richmond, Va.**
7043	Beef, Blood & Bone Fertilizer....	S. W. Waller, Franklin .....
7392	Capital Bone Potash Compound	J. M. Rose, Pembroke.....
7393	Capital Dissolved S. C. Bone	Lee Hart, Big Clifty.....
7394	Champion Corn & Wheat Grower	J. B. Benjamin, Providence.....
	Wake Fertilizer Co., Adairville, Ky.	
7015	Old Kentucky Wheat Grower.....	Manufacturer.....
7395		Manufacturer's Warehouse.....

Table of Analyses.

Pounds in the Hundred.													
Phosphoric Acid.							Nitrogen.	Equivalent to Ammonia.	Potash.		Relative Value per Ton.	Station Number.
In Fine Bone.	In Medium Bone.	Soluble.	Reverted.	Available.	Insoluble.	Total.			From Muriate.	From Sulphate.		
				9.37	6 05	15.42	1.84	2.23	0.60	0.90	$24.57	7057
				8.54	2.00	10.54	2.66	3.23	88	1.00	24.73	7072
		5.00	*2.00*	*8.00*		*12.00*	*2.47*	*3.00*		*2.00*	*24.65*	
11.24	13.73					24.97	3.93	4.77			30.99	7387
						23.00	*3.71*	*4.50*			*26.79*	
				9.82	3.38	13.20	1.09	1.32		1.25	20.98	7388
		5.00	*3.00*	*8.00*		*11.00*	*1.03*	*1.25*		*1.00*	*17.71*	
				12.83	1.05	13.88				1.69	20.86	7389
		9.00	*3.00*	*12.00*		*13.00*				*2.00*	*20.10*	
				15.04	1.92	16.96					15.04	7099
		8.00	*6.00*	*14.00*		*15.00*					*14.00*	
				12.24	1.92	14.16	0.95	1.15		1.41	23.40	7390
		9.00	*3.00*	*12.00*		*13.00*	*0.82*	*1.00*		*1.00*	*21.57*	
				14.36	1.18	15.54			1.46		22.44	7073
				11.62	0.69	12.31				2.18	19.67	7418
		8.00	*2.00*	*10.00*		*11.00*				*2.00*	*17.30*	
				11.37	1.22	12.59				3.41	21.30	7391
		7.00	*3.00*	*10.00*		*11.00*				*4.00*	*20.10*	
				8.57	1.75	10.32	1.84	2.23	2.17		21.92	7043
		5.00	*2.00*	*7.00*		*8.00*	*1.65*	*2.00*	*2.00*		*18.48*	
				10.65	1.91	12.56			1.88		18.13	7392
		7.00	*3.00*	*10.00*		*11.00*			*2.00*		*16.90*	
				12.60	1.14	13.74					12.60	7393
		9.00	*3.00*	*12.00*		*13.00*					*12.00*	
				8 64	1.30	9.94	1.42	1.72	2.29		20.47	7394
		6.00	*2.00*	*8.00*		*9.00*	*0.82*	*1.00*	*2.00*		*16.97*	
				7.71	3.01	10.72	2.30	2.79		4.67	26.89	7015
				6.83	3.61	10.44	2 63	3.19		5.16	27.80	7395
				9.00			*2.00*	*2.43*		*4.50*	*25.90*	

Table of Analyses.

Station Number.	Name and Address of Manufacturer and Name of Brand.	From Whom Obtained.	Pounds in the Hundred. Phosphoric Acid. In Fine Bone.	In Medium Bone.	Available.	Insoluble.	Total.	Nitrogen.	Equivalent to Ammonia.	Potash from Sulphate.	Relative Value per Ton.	Station Number.
	The Walton Fertilizer Co., Cleveland, Ohio.											
7396	Wheat & Grass Grower.....	B. N. A. Simpson, So. Union....			10.44	1.87	12.31	0.86	1.04	0.89	$19.82	7396
					10.00			*0.82*	*1.00*	*1.00*	*18.27*	
	Wood, Stubbs & Co., Louisville, Kentucky.											
6899	Acme Brand Pure Raw Bone Meal	Manufacturer.....	20.96	6.26			27.22	3.39	4.12		32.40	6899
							23.00	*3.71*	*4.50*		*26.79*	
6900	Acme B'd Pure St'med Bone Meal	Manufacturer.....	25.92	3.20			29.12	1.74	2.11		28.75	6900
							28.00	*2.06*	*2.50*		*24.01*	

December 31, 1900.

M. A. SCOVELL, Director.
A. M. PETER, H. E. CURTIS, } Chemists.

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