TWELFTH ANNUAL REPORT

OF THE

Ohio State Board of Agriculture,

WITH AN

ABSTRACT OF THE PROCEEDINGS

OF THE

COUNTY AGRICULTURAL SOCIETIES,

TO THE

GENERAL ASSEMBLY OF OHIO:

FOR THE YEAR 1857.

COLUMBUS:
RICHARD NEVINS, STATE PRINTER.
1858.

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ALEX. WADDLE, JOHN M. MILLIKIN, JOHN K. GREEN.

JOHN H. KLIPPART, *Cor. Sec'y*, Columbus.

PREFACE.

During the session of the Legislature of 1857–58, it was deemed expedient to revise the law regulating public printing, more particularly with a view to authorize the publication of public documents in a larger sized type. So far as the publication of the Agricultural Reports were concerned, the committees on Printing, from both branches of the Legislature, selected from among the various Agricultural Reports of the several States submitted to them, a Report of Massachusetts as a model in type, size, and style of binding, for the future Reports of Ohio. The present volume is printed on the same sized type, and is of the same form as that of Massachusetts; but the latter contains 736 pages only, while this contains 824.

The larger number of pages in the present Report is to be attributed to the fact that it was impossible to estimate precisely the amount which the manuscript would make. Several articles, which were prepared with great care, were necessarily postponed; among the more important of these is an elaborate essay on the "Climatology of the State of Ohio," embracing all the results of records made in the State so far as they could be obtained, either in manuscript from the observers themselves, or from publications; also an essay on the "Influence of Forests upon Climate;" the "*Natural History of Fishes in Ohio;*" a catalogue of indigenous plants in Franklin and Fairfield counties; together with other papers of more or less importance, contributed by gentlemen whose competency and scientific attainments are undoubted.

The essay on the origin, varieties, diseases, &c., of wheat, has extended to a much greater length than was originally contemplated, partially in consequence of the detailed description and history of the varieties grown in Ohio, and partially in consequence of the extended descriptions of insects, &c., which affect the wheat plant. The entire essay partakes necessarily more of the character of a compilation than an original composition; and in defense of any views therein advanced, the writer can only say that he invariably was guided by what he considered the best and most reliable authorities. Among the authorities consulted were the agricultural periodicals generally, published in the United States; the Agricultural Reports of the several States, together with those of England, Scotland, and the several States of Continental Europe. Of standard works, MORTON's Encyclopedia of Agriculture; LIEBIG's Agricultural Chemistry; STOECKHARDT's Chemistry, and Chemical Field Lectures; ABEL's Aus der Natur; METZGER's Europaisch Cerealen; KONIG's Nuetzlichsten Getreidenarten, and Futter and Wiesenkreuter; FITCH's Noxious Insects; BAZIN sur le Cecidomyie tritici; UNGER's Botanische Briefe; MOLESCHOTT's Kreislauf des Lebens, and Physiologie des Stoffwaechsels; LOUDON's Encyclopedia of Agriculture; THAER's Principles of Agriculture; C. W. JOHNSTON's American Farmer's Encyclopedia of Agriculture; English Encyclopedia of Natural History; CARPENTER's Vegetable Physiology; Journal d'Agriculture Pratique; Revue Horticole; Le Bon Jardinier; Entomologische Zeitung (Stettin); Memoires Academie de Metz; Mittheilung der Russischen Oekonomische Gesellschaft zu St. Petersburg; together with others of less note.

JOHN H. KLIPPART.

STATE AGRICULTURAL ROOMS, Columbus, O., Oct., 1858.

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PRESIDENT'S REPORT.

To the General Assembly of the State of Ohio:

I regret that in communicating to the Legislature the condition of the agriculture of the State, I cannot make a more favorable report. But the two last years have been so unfavorable to the prospects of the farmer in the production of his crops, followed as they have been by the late sudden and extraordinary revulsion in the financial world, that it is cause of gratitude that they are not followed by general disaster and ruin.

The drought of 1856 was so severe and long continued as to cut short all our productions, (an unusual occurrence where the crops and their periods of maturing are so diversified, as in this State,) which has been followed by the destruction of our greatest staple, Indian Corn, which though promising a large yield has been so seriously injured by the severe frosts of autumn, and the extreme wet weather, which has succeeded, as not only to render a very large portion of it unmerchantable, but to cause great quantities of it to rot in the fields, and very serious apprehensions are entertained that the injury is so great as to cause a deficiency of seed for the coming crop.

The drought of 1854 was perhaps more severe than that of 1856, but, it was at a time when the wars in Europe created a demand for our productions at higher prices, and was followed by a year of abundant harvests, which also met with remunerating prices, and the farmer might with some propriety look forward to the sale of his crops to relieve him from the embarrassment which the failure of the previous year occasioned.

The returns of the township assessors since 1850, furnishing a condensed view of the production of our great agricultural staples, Wheat and Indian Corn, are annexed, and are worthy of consideration:

Year.	Wheat.			Corn.		
	Acres.	Bushels.	Average per acre.	Acres.	Bushels.	Average per acre.
1850	1,658,106	28,769,139	17½	1,537,947	56,619,608	37
1851	1,657,253	25,309,225	15¼	1,664,429	61,171,282	36
1852	1,624,715	22,962,774	14	1,730,188	58,165,517	34
1853	1,421,826	17,118,311	12	1,836,493	73,436,090	40
1854	1,475,935	11,819,110	8	1,927,337	52,171,551	26
1855	1,407,773	19,569,320	13	2,205,282	87,587,434	40
1856	1,478,164	15,333,837	10	2,084,893	57,802,515	27

From this it will be seen that the average production of wheat per acre is about 13 bushels, and of corn 34 bushels, and that there has been a gradual diminution of the amount of land cultivated in wheat and an increase in the amount cultivated in corn, suggesting that in a large portion of the State corn is considered a more certain crop and less liable to fluctuation in price, and the fact is apparent that the average product per acre of wheat is diminishing, to remedy which, should be the earnest consideration of the farmer.

An efficient system of drainage is suggested as a remedy; hitherto our efforts in this line have been confined to draining overflowed or swamp lands, by open ditches, but all our upland clay soils would, if properly underdrained, be better prepared to withstand the extremes of either wet or drought, and thus produce better crops.

Having referred to the returns of the assessors as furnishing valuable statistical information, permit me to suggest that it is highly important that the information they furnish should be obtained and published at a much earlier period. The returns for 1856 have been but recently published, whilst the crop has long since been consumed, and a large part of that of 1857 sent forward to market. If it were possible to furnish the information by the 1st of January in each year, of the products of the past year, the farmer would be apprized of the state of the market, and be on an equality with the produce dealer.

The crops of grass and oats, the past year were very good, and that of potatoes remarkably fine.

The value of our dairy products according to the national census, in 1840, was $1,848,869, and in 1850, 34,449,379 pounds of butter, and 20,819,542 pounds of cheese were made in the State.

The high prices which animal food of all kinds has brought (and is likely to bring for some time to come) has made stock growing a very remunerative branch of our farming, and taking into consideration the facilities which it affords for fertilizing the soil perhaps the most profitable. Ohio ranks in this branch as in grain growing, among the first in the Union, and it is gratifying to record that the strenuous efforts made by her farmers to improve the quality of their stock have been highly successful. In 1856 we shipped to New York 43,501 head of cattle for beef. It is highly probable that a large number of these were forced on that market by the great scarcity of food, as in 1857, with a better price, we sent forward but 30,001.

Wool is another of our staple productions; the number of sheep in 1857 being 3,215,639, valued at $5,357,275. I respectfully renew the recommendations of my predecessors for the protection of this interest by the imposition of a tax on dogs.

Considerable attention has been given the past year to the cultivation of a new plant (Sorghum), and although the season was not the most favorable for its production, it has been well ascertained that syrup of a good quality may be cheaply made from it, its value as a sugar producing plant is still doubtful.

During the last harvest a trial of Reaping and Mowing Machines took place, under the direction of the Board, at Hamilton, at which sixteen machines were fully tested, all of which showed their capacity for harvesting grain and grass by horse power. The report of the awarding com mittee will be found among the papers herewith submitted, to which I refer for full details.

I should do injustice to the feelings of all the members of the Board did I not embrace this opportunity of tendering to the members of that committee the thanks of the Board for the faithful and efficient manner in which they discharged their duties.

The eighth annual fair was held at Cincinnati, on the 15th, 16th, 17th and 18th days of September, 1857, and was attended by a very large concourse of exhibitors and spectators. The amount of premiums offered amounted to six thousand dollars, besides 500 medals and diplomas, which were so distributed as to encourage every improvement connected with agriculture and the mechanical arts.

Fencing is a great tax on farmers, and is annually increasing as the supply of timber suitable for the purpose is diminishing. The estimate may appear large to those who have not investigated the subject but I am convinced that eighty millions of dollars is under rather, than above the actual amount invested in this State, in fences on farms.

When Ohio was comparatively a wilderness, whose *range* was the great pasture ground of all the stock, there may have been some propriety in enacting that unless a crop was well protected the owner could not recover damages for its destruction. Now the wilderness has given way to productive fields, and there is no longer a necessity for compelling all the inhabitants of a township to fence against the stock of a single individual who may be so reckless of his own interest or his neighbor's rights as to turn it on the highway. If he chooses to grow stock he should be required to fence *in*, instead of requiring the neighbors to fence it *out*.

So urgent has this matter become that in many portions of the State it has been attempted to substitute hedges—but so long as the law of inclosures remains as it is, their success is not very probable. To make a good hedge it should be frequently closely trimmed at which times it affords a very slight protection to the crop enclosed.

I deem it my duty to call the attention of the Legislature to the discriminations, made in the rates of freight charged by many of railroad companies of the State, on produce passing over their roads, as one which, exercised as it has been for some time past, deserves the serious attention of those whose duty it is to protect the rights and interests of the people of Ohio.

The difference in the tariffs of through and local freight, is so great that it operates as a discrimination against the produce of this State, and in favor of those of our neighboring States, Kentucky and Indiana. Thus, when cattle could be shipped from Cincinnati to Buffalo, N. Y., for $75 per car, the price from Columbus was $80 per car. I have been imformed that the same discrimination has been made on other articles of produce, and in some instances shippers have proposed to pay freight on their produce from Cincinnati and ship from points nearer, to the place of destination, and been refused. One of my predecessors justly characterized this as "a tremendous power by which not only the price of produce in different places might be affected, but the value of lands enhanced or depressed, at the will of those having the control of these corporations.

I beg leave to refer to the report of the Treasurer of the Board for a detailed statement of the receipts and expenditures, and to that of the Corresponding Secretary for an abstract of the proceedings of the several county societies, as well as a general view of the condition of agriculture throughout the State.

Respectfully submitted,

A. WADDLE,

Pres. O. S. B. of Agriculture.

TREASURER'S ACCOUNT.

RECEIPTS.

1856.		
Dec. 3, balance on hand per settlement		$6,838 25
1857.		
From Dr. Sprague, balance due from him as per account		74 59
May 2, from Treasurer of State		3,643 20
Dec. 4, L. English, for tents rented to J. M. Kinney		125 00
Receipts of Cincinnati Fair:		
Admission tickets	$16,894 75	
Entry	685 00	
	$17,579 75	
Less counterfeit money received at the Fair	49 00	
		17,530 75
Received Cincinnati subscription		3,000 00
Received Burnett & Guille, for refreshment stands		500 00
Received B. Stedman, sale of Cleveland lumber		1,587 10
		$33,298 89

EXPENDITURES.

1856.	
Dec. 3, order to Hughes & Beebe, furniture for office	$5 75
" 3, paid Ohio State Journal Company, printing	76 75
" 19, expenses of Board at December meeting	130 35
Expense for Columbian Hall for Convention	30 00
1857.	
Jan. 5, H. W. Derby, rent to date	37 50
" 17, Kilbourn, Kuhns & Co., hardware	4 16
" 23, J S. Abbott	9 95
Expenses of Board at January meeting	138 50
March 28, Executive Committee	3,000 00
April 16, H. W. Derby, rent to date	37 50
" 27, Middleton, Wallace & Co., for diplomas	47 25
" 27, O. S. Journal Company, printing	42 20
" 30, Jacob Hare, rent of lot to store lumber	15 00
May 4, J. Geary & Son, subscription to City Fact	6 00
June 22, Advertising in Indiana Farmer	6 00
" 24, C. Clark & Co., printing premium list	200 00
July 1, H. W. Derby, rent to date	37 50

1857.	
July 28, advertising reaping and mowing trial in Iowa Farmer	$9 00
" 28, " " " " " Rural New Yorker	36 75
C. Clark & Co., balance on printing premium list, &c	209 00
R. Nevins, job printing	3 50
S. D Harris, advertising reaping and mowing trial	22 80
Aug. 5, Executive Committee	1,000 00
" 14, Ohio Statesman, subscription	6 00
Sept. 5, Executive Committee	1,000 00
Oct 3, Follett, Foster & Co., printing tickets, &c	174 85
" 14, J. Zettler, storage of tents	27 00
Executive Committee	6,178 00
" 14, Clerk hire and contingent expenses of Secretary's office at Cincinnati	685 53
Nov. 2, Moore, Wilstach, Keys & Co , for printing cards	261 54
" 4, P. F. Conrad, for ribbons	3 00
" 5, Blynn & Baldwin, gold medals for reaper and mower trial	145 46
" 5, Brotherlin & Halm, chest for Secretary and Treasurer	20 00
A. Jones, hardware	3 25
C. Clark & Co., printing posters	155 00
Nov. 28, Middleton, Wallace & Co., diplomas	125 00
Dec. 5, English Herd Book, 3 vols	17 79
Teams, grain, grass, &c., at Hamilton Reaping and Mowing Trial	96 75
Expenses of Board at Hamilton	117 65
Executive Committeee	4,708 00
Postage, telegraphing, express, drayage, &c., during the year	308 79
Binding Reports	442 90
Stationery	200 74
J. H. Klippart, salary	1,500 00
Premiums of 1856	1,263 79
Premiums of 1857	3,392 00
	$26,369 50
Balance on hand	6,929 39
	$33,298 89

We have examined the foregoing account, compared it with the vouchers, and found it correct and that there is a balance in the hands of the Treasurer of six thousand nine hundred twenty-nine and 39-100 dollars at this date.

ABEL KRUM,
B. STEDMAN. } *Auditing Committee.*

December 8, 1857.

REPORT OF THE CORRESPONDING SECRETARY.

To the Honorable, the General Assembly of the State of Ohio:

In compliance with the seventh section of an act entitled "an act for the encouragement of Agriculture," passed February 28, 1846, it becomes my duty, on behalf of the State Board of Agriculture, to report to your honorable body "the general condition of agriculture throughout the State," to be "accompanied by such recommendations as, in the opinion of the Board, may be deemed interesting or useful."

It is a task of no small magnitude to report upon the general condition of agriculture, because there never has been an agricultural survey of the State, which could serve as a standard of comparison, neither is there a district or region with which we are sufficiently well acquainted, to serve as a model where agriculture is conducted upon such principles as to receive from science and the intelligent agriculturists, the greatest benefits which, in the present condition of science, might be conferred upon agriculture.

In the absence of the standards of comparison just intimated, the only course left is to describe the condition without any reference whatever to any artificial standard of perfection or excellence; but when comparisons are made, they must be made with reference to the early condition of agriculture in the State, which is sufficiently well known to be comprehended by all.

From the peculiar geological formation of the State, agriculture is naturally diversified, and conducted in conformity with the predominating characteristics of the respective regions of the State, into dairy, grain, and stock farming. The land surface of Ohio consists of soil which either already is in an excellent state of cultivation, or can be made so at an inconsiderable expense. The superficies of the State (for which I am partially indebted to the Commissioner of Statistics) is as follows:

Surface of Ohio, including Lake Erie to the boundary line...	42,500	square miles.
Land surface, as returned by the U. S. Land Office.........	39,964	"
Land in acres	25,576,960	acres.
" occupied or attached to farms	19,800,000	"
" actually cultivated................................	11,583,731	"
" " " consists of plow land	6,526,161	"
" " " " meadow land	3,705,810	"

Orchards, gardens and yards	800,000	acres.
Roads and public improvements	424,000	"
Town lots	27,760	"
Land unoccupied and uncultivated, consists of woodlands	13,479,310	"
Of this there belongs woodlands to farms in cultivation	8,540,000	"
Wild lands belonging to non-residents	4,939,310	"
Land owners, exclusive of owners of town lots	277,000	
On the first of April, 1857, there were government lands	38,180	"
Average amount of land held by each person, about	86	"

The annexed table, exhibiting the amount of land returned for taxation from each county in the State to the Auditor of State, also the amount of arable or plow land, the amount of meadow land and of woodland, is compiled from authenic data in the office of Auditor of State:

COUNTIES 1853.	Acres of land.	Valuation of land.	DESCRIPTION AND AMOUNT OF TAXABLE LANDS IN 1853.			AVERAGE VALUATION PER ACRE.		
			Arable or plow land. Acres.	Meadow or pasture land. Acres.	Unculti-vated or wood land. Acres.	Under appraisement and equalization of 1846.	Under appraisement of 1853.	Increase p. cent. on each acre.
Adams	288,466	$2,624,798	98,542	28,949	160,975	$7 44	$9 98	34
Allen	241,702	2,023,144	57,447	7,723	176,538	4 25	8 70	104
Ashland	267,319	4,159,982	136,319	26,134	104,866	13 21	16 98	28
Ashtabula	442,663	4,631,133	33 926	185,749	222,988	8 25	12 04	45
Athens	306,099	1,870,575	51,883	49,618	204 598	3 71	6 69	80
Auglaize	238,997	1,898,999	41,176	10,244	187,577	....	8 41	..
Belmont	333,013	7,166,284	142,195	54,964	135,854	15 41	23 65	53
Brown	311,354	4,947,102	105,183	46,452	159,819	12 01	17 88	48
Butler	292,191	10,782,939	154,985	36,535	100,671	24 84	41 00	65
Carroll	250,492	3,653,662	150,378	15,088	85,026	8 62	15 50	79
Champaign	270,029	6,104,644	102,761	55,125	112,143	12 40	24 80	100
Clark	248,668	5,457,477	101,546	48,342	98,780	17 61	25 01	42
Clermont	280,460	5,544,614	......	......	......	16 49	23 48	42
Clinton	258 520	4,749,394	73,454	59,978	125,088	12 34	20 24	64
Columbiana	337,728	6,415,022	145,264	58,992	133,473	14 98	20 85	39
Coshocton	350,586	4,320,281	167,120	13,966	169,500	10 75	13 39	24
Crawford	253,304	4,041,481	126,234	12,536	114,535	9 47	16 95	79
Cuyahoga	279,339	9,927,903	39,375	125,592	114,371	14 81	38 96	163
Darke	371,053	4,211,858	97,721	22,469	250,863	6 64	12 42	87
Defiance	241,058	1,179,693	27,643	5,522	207,893	4 01	5 19	29
Delaware	283,925	4,108,632	76,058	51,179	156,688	9 19	15 85	72
Erie	156,388	3,997,976	53,674	45,799	56,915	13 35	28 26	111
Fairfield	317 407	7,654,679	171,827	19,808	125,772	15 31	26 26	71
Fayette	252,180	5,140,980	58,898	62,278	131,004	8 54	21 14	147
Franklin	334,383	10,130 934	113,963	56,213	164,207	17 05	32 40	90
Fulton	250,959	482,502	44,667	5,434	200,848	....	2 51	..
Gallia	276,312	1,834,777	64,033	30,686	181 592	4 74	7 26	53
Geauga	255,730	3,771,921	21,929	143,444	90,357	9 45	17 29	82
Greene	256,095	7,321,109	107,705	34,389	115,255	20 04	32 33	61
Guernsey	321,862	3,195,611	132,489	38,860	150 513	9 10	10 61	16
Hamilton	250,121	19,446,700	116,369	45,629	88,123	41 62	78 89	89
Hancock	333,595	3,239,681	77,366	24,265	231,964	5 10	10 39	103
Hardin	292,768	2,068,679	36,055	12,268	244,455	3 40	7 31	115
Harrison	253,858	4,418,617	100,143	59,817	93,898	12 07	18 50	53
Henry	208,133	....	12,151	3,275	191,687	2 81	3 50	28

COUNTIES. 1853.	Acres of land.	Valuation of land.	DESCRIPTION AND AMOUNT OF TAXABLE LANDS IN 1853.			AVERAGE VALUATION PER ACRE.		
			Arable or plow land.	Meadow or pasture land.	Uncultivated or wood land.	Under appraisement and equalization of 1846.	Under appraisement of 1853.	Increase p. cent. on each acre.
			Acres.	Acres.	Acres.			
Highland...	338,391	$5,627,606	144 479	33,209	160.703	$11 33	$18 24	60
Hocking....	247,546	1,697,503	71,069	13,506	162,971	3 75	7 41	97
Holmes.....	264,945	3,601,373	144,154	25,567	95,224	9 20	14 73	60
Huron	313,450	6,363,938	61,977	96,189	155,284	12 23	22 82	86
Jackson....	235,102	....	......	......	......	4 20	6 18	47
Jefferson ...	257,117	4,487,038	130,208	19,933	106,976	17 32	19 41	12
Knox	390,058	5,274,320	145,786	39,570	131,729	11 81	14 53	23
Lake.......	144,687	3,086,138	33,002	60,940	50,745	13 19	23 95	81
Lawrence...	239,916	....	27,723	4,963	158,509	5 40	6 60	22
Licking	429,619	8,857,910	195,872	52,029	181,718	14 17	22 36	57
Logan	292,320	3,993,012	72 329	39,884	180,107	8 55	15 07	76
Lorain	305,828	4,941,555	34,347	129,342	142,139	9 89	18 44	86
Lucas......	200,482	1,692,137	25,547	12,901	162,023	4 07	9 12	124
Madison....	283,612	4,366,904	38,823	120,659	124,070	8 58	16 14	88
Mahoning ..	265,264	6,361,049	76,874	92,290	96,100	16 18	26 61	64
Marion.....	251,602	4,034,286	51,488	72,134	127,980	7 68	16 90	120
Medina	265,439	5,713,239	94,694	93,905	76,840	11 40	24 44	114
Meigs......	260,416	2,128,169	61,473	9,403	189,540	5 25	8 99	71
Mercer	270,143	....	......	......	......	4 55	5 91	20
Miami	254,142	6,364,833	121,978	11,442	120,722	16 52	28 34	71
Monroe.....	284,976	2,329,345	119,166	9,236	166,574	5 65	8 91	57
Montgomery	286,713	9,620,173	162,172	20,485	104,056	23 64	37 08	56
Morgan	259,636	3,057,304	98,266	25,737	133,598	9 43	12 95	37
Morrow	251,517	3,979,957	93,185	40,135	118,197	....	17 01	..
Muskingum.	419,134	8,177,234	214,920	14,610	189,604	14 09	20 36	44
Noble......	254,926	2,377,206	78,235	51,816	124,875	....	9 71	..
Ottawa.....	155,642	960,929	8,623	2,767	144,247	2 26	6 90	205
Paulding...	135,159	496,245	6,024	1,386	127,749	2 60	3 77	44
Perry	256,713	2,951,909	104,032	50,796	101,885	10 49	12 21	16
Pickaway ..	311,059	7,054,457	100,956	66,879	143,224	17 75	23 72	33
Pike	191,143	1,368 072	42,633	23,934	124,576	8 35	7 71	..
Portage	315,987	6,550,636	81,013	132,070	102,904	13 45	24 35	81
Preble	268,255	5,691.715	142,234	4,401	123,619	16 29	23 89	46
Putnam	244,544	1,178,617	26,119	10,103	208,322	3 53	5 00	41
Richland...	312,724	4,370,029	148,593	38,958	125,173	12 14	15 91	31
Ross	392,896	6,972,811	153,016	51,941	187,939	16 15	18 89	16
Sandusky ..	255,399	2,181,382	62,848	29,500	163,051	6 57	9 32	42
Scioto......	260,931	1,831,572	46,559	20,060	194,212	8 65	8 00	..
Seneca	344,817	5,413,939	144,940	28,233	171,644	12 28	17 12	39
Shelby	241,784	2,942,967	64,065	11,995	165,724	8 49	13 14	54
Stark	357,725	7,690,689	216,757	26,423	114,544	17 19	24 41	41
Summit	261,417	6,288,573	116,663	62,726	82,028	16 10	29 11	80
Trumbull...	397,204	6 073,040	56,587	182,942	155,717	12 68	17 33	36
Tuscarawas	356,124	5,091,135	181,391	21,075	153,658	10 70	16 20	51
Union......	269,471	2,800,935	39,938	44,422	185,111	4 77	10 92	128
Van Wert...	233,291	1,032,488	19,219	3,285	1,353	2 08	4 60	121
Vinton	241,038	1,398,923	35,409	28,256	177,373	....	6 03	..
Warren	252,947	6,946,711	113,492	38,552	100,903	22 60	31 10	37
Washington	376,920	3,088,805	61,648	61,427	253,445	5 75	9 00	56
Wayne	343,089	6,018,145	169,785	22,030	151,274	13 09	19 36	47
Williams ...	260,228	1,072,204	62,555	1,220	196,452	3 03	4 35	43
Wood	347,086	1,957,675	34,686	8,734	302,001	2 83	5 93	109
Wyandotte .	254,124	2,645,608	45,498	48,621	254,125	6 17	10 87	76
Total	24,811,455	382,725,323				$13 86	$17 21	

The Western Reserve, embracing a tract of about eight millions three hundred thousand acres, is in general better adapted to grazing and dairying than to the growth of cereals; consequently we do not find a solitary county within the original limits of the Reserve, which, in 1856, produced one hundred thousand bushels of wheat, nor with the exception of Erie and Huron counties, that has, during the same period, produced half a million bushels of corn.

But the cereals are by no means neglected on the Reserve; Geauga county producing in 1856 the least of any of the Reserve counties; it then produced 26,426 bushels of wheat, and 126,259 bushels of corn.

The year 1856 may, perhaps, be considered a year of rather less than average productiveness so far as cereals are concerned. Taking the products of 1856 as a basis, the estimates will be within the truth, which, after all, is perhaps the safest course to be pursued. In 1856 Butler was the only county in the State that produced more than 600,000 bushels of wheat; Montgomery the only one that produced over 500,000, and under 600,000; Greene, Stark and Preble each over 400,000, and under 500,000. In 1850 Stark produced over 1,000,000 bushels.

The following 11 counties produced each over 300,000, and under 400,000, viz: Brown, Champaign, Clark, Darke, Fairfield, Highland, Miami, Muskingum, Ross, Warren and Washington. The following 15 counties produced each over 200,000, and under 300,000, viz: Adams, Belmont, Clermont, Clinton, Franklin, Hamilton, Licking, Monroe, Morgan, Perry, Pickaway, Richland, Seneca, Tuscarawas and Wayne. From this it appears that there are four counties only in the Northern half of the State that produced over 200,000 bushels of wheat in 1856. Paulding county produced the smallest quantity, viz: 8,337 bushels.

During the year just closed the most bounteous crops have rewarded the toil of the cultivators of the soil throughout the State. All the cereal crops—being the kind of crops for which Ohio occupies a proud position, and for which she ranks among the first States in the Union—have yielded more than ordinarily abundant. They were remarkably free from disease, whether by destructive insects or other extraneous causes. In several counties the midge (*Cecidomyia tritici*) made its appearance, but the depredations caused by it were less severe than in former years. But in the Province of Canada this scourge was terribly destructive during the past year, destroying at least one third of their crop or about 8,000,000 bushels.

The most important crop in the State is the wheat crop; the extent of its culture is indicated in the following exhibit compiled from authentic sources:

WHEAT.

The following Tables exhibit the number of acres in each county in the State, cultivated in Wheat during the years 1850, '51, '52, '53, '54, '55, *and* '56; *also, the average yield of bushels per acre.*

COUNTIES.	ACRES SOWN.							AVERAGE YIELD OF BUSHELS PER ACRE.					
	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1850.	1851.	1852.	1853.	1854.	1855.
Adams	.....	15,972	20,183	18,901	23,140	22,968	26,891	...	9.3	12.7	10.1	9.7	11.72
Allen	14,872	15,560	14,054	12,820	10,333	5,788	6,801	15.5	19.2	10.6	9.1	2.5	14.95
Ashland	32,382	30,613	29,430	23,847	21,413	15,937	19,620	19.5	18.7	16.0	8.7	3.0	11.62
Ashtabula	.....	4,301	2,236	4,865	5,728	9,513	6,369	...	17.6	17.3	15.4	12.4	17.71
Athens	17,468	15,843	17,125	12,961	16,043	18,929	19,195	12.6	12.3	12.2	11.4	10.4	13.41
Auglaize	9,721	10,900	12,226	10,950	11,084	6,482	7,624	14.3	14.8	10.6	8.8	3.3	13.37
Belmont	39,189	38,106	34,738	33,331	34,918	35,514	32,893	17.0	14.7	14.6	11.8	9.1	15.64
Brown	24,980	20,320	20,891	25,058	24,859	26,491	48,407	14.4	10.2	11.8	12.2	9.9	11.98
Butler	31,131	26,242	24,947	24,804	29,278	31,294	40,145	17.0	14.3	15.9	14.8	13.5	14.30
Carroll	34,915	29,412	27,934	21,014	22,695	23,677	22,674	16.5	14.5	11.6	7.4	7.0	15.04
Champaign	34,542	32,676	33,607	30,157	28,657	23,896	26,182	19.2	18.3	15.9	13.6	4.3	14.98
Clark	24,488	25,030	24,018	24,249	25,021	24,520	25,775	20.0	17.8	17.5	16.2	9.9	16.05
Clermont	.....	21,484	17,671	17,665	18,912	19,965	22,653	...	9.4	14.0	13.4	9.2	18.98
Clinton	17,626	17,562	16,773	14,045	15,882	18,701	21,153	16.2	11.4	12.8	14.1	11.0	15.11
Columbiana	35,721	29,909	28,829	25,854	23,423	23,015	23,755	16.9	15.3	13.5	10.2	5.3	11.47
Coshocton	47,811	37,437	37,388	35,980	35,607	23,515	22,812	18.0	13.8	15.9	9.3	5.8	7.84
Crawford	21,599	20,164	18,029	15,073	10,627	8,006	9,939	18.9	15.4	7.1	11.0	1.7	11.92
Cuyahoga	6,711	7,337	3,175	4,149	3,405	3,720	3,039	14.5	17.0	15.2	12.4	5.4	12.64
Darke	.....	24,217	20,919	24,139	22,224	27,416	29,651	...	15.4	15.5	12.2	8.1	13.51
Defiance	6,583	6,076	6,725	6,243	5,466	3,107	3,100	14.3	13.6	12.5	11.4	3.3	9.71
Delaware	.....	12,075	11,445	8,857	9,267	9,255	9,749	...	14.5	11.1	12.2	9.9	13.34
Erie	12,578	11,142	9,789	7,731	6,998	3,740½	3,990	23.6	19.2	16.6	15.9	4.4	13.34
Fairfield	39,472	37,643	36,579	34,011	36,464	33,651	32,104	17.4	16.1	15.5	13.8	9.4	11.99
Fayette	9,961	9,502	8,380	6,686	9,375	10,175	10,732	15.1	12.5	13.4	16.1	9.6	18.27
Franklin	16,071	17,710	17,590	12,457	15,979	16,713½	18,197	18.3	15.5	17.6	14.5	12.9	15.89
Fulton	8,117	8,360	8,668	7,025	8,207	5,654	3,305	15.7	16.5	13.6	15.2	6.0	8.27
Gallia	13,986	13,391	14,372	14,787	18,024	19,433	22,883	8.9	9.3	10.9	9.9	9.8	13.03
Geauga	4,336	3,757	3,563	2,688	3,140	4,889	3,479	13.7	16.2	15.3	13.6	12.7	18.74

WHEAT—*Continued.*

COUNTIES.	ACRES SOWN.							AVERAGE YIELD OF BUSHELS PER ACRE.					
	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1850.	1851.	1852.	1853.	1854.	1855.
Greene	28,550	24,618	24,209	23,806	23,410	24,948	27,987	20.1	15.7	18 2	15.7	16.3	15.43
Guernsey	35,402	28,523	29,766	23 410	26,233	26,927	24,717	15 9	12.8	12.5	9.1	8.4	10.90
Hamilton*	.....	6,365	6,076	3,495	9,869	10,417¾	13,723	...	12.4	15.1	15.2	14.0	15.27
Hancock	23,451	24,488	22,080	17,884	16,399	6,845	8,839	15.1	14 6	6 6	9.5	9	14 52
Hardin	6,024	8,179	6,153	3,756	2,232	2,284¼	2,840	14 6	12.0	5.9	11 1	4.1	15.86
Harrison	31,415	27,466	24,795	21,293	21,792	18,034	18,317	16.9	15.6	12.8	8.0	5.4	12.45
Henry	.....	1,849	2,265	1,772	586	.....	941	...	14.0	11.7	12.1	2.1	....
Highland	38,394	32,967	30,465	27 509	31,671	34,714	35 590	12.9	9.2	11.7	10.4	9.0	12.79
Hocking	17,939	16,503	17,026	15,603	16,211	18,446	19,221	12 2	11.0	11.2	11.4	10.2	12.81
Holmes	33,704	26,875	26,875	23,509	26,237	17,906	18,976	19.0	15.8	15.8	8.8	4.5	7.37
Huron	21,882	18,770	17,981	13,856	11,155	6,077	6,593	20.1	17.6	12.9	12.4	1.6	10.99
Jackson	10,423	12,141	11,847	11,387	13,415	14,461	15,233	9.1	7.7	9.8	9.8	9.8	10.43
Jefferson	35 062	29,540	28,975	19,401	24,618	21,835	20,493	17.5	15.8	12.0	9.7	6.7	12 84
Knox	39,936	28,627	35,886	21,875	19,497	12,328	13,091	19.0	15.6	14.0	5.3	2.3	8 94
Lake	5,183	5,761	5,506	4,474	4,571	5,123	4,589	15.8	17.5	15.4	14 5	8.4	17.04
Lawrence	2,959	2,030	2,123	2,128	3,528	5,205	7,796	8.7	7 4	7.5	11.4	10 5	13.75
Licking	48,187	39,921	40,610	31,943	31,796	22,771	24,388	17 6	13.4	12.4	9.1	6.7	10.59
Logan	39,525	24,271	25,640	20,208	19,758	12,483	14,964	20 1	15.5	14.3	13.1	2.0	15.32
Lorain	11,555	11,156	9,076	6,519	3,767	1,517	2,174	17.8	17.3	11.7	12 2	3.3	8.70
Lucas	.....	4,289	4,085	3,878	3,221	1,056¾	1,099	...	19.3	12 9	14.4	3 1	9.50
Madison	4,019	5,763	5,359	4,039	5,119	6,258	6,121	16.0	14.7	14.4	14.9	10.0	17.98
Mahoning	16,731	16,563	13,777	12,575	13.582	12,037	12,327	19.4	17.7	15.4	11.4	5.4	15.21
Marion	8,294	8,031	6,777	4,960	3,612	5,056	5,767	17.4	13.4	10.4	13.9	7.2	15.72
Medina	17,698	15,619	13,961	11,263	8,721	10,274	10,707	19 7	19.1	18.1	13.8	4 8	13.25
Meigs	.....	12,117	13 253	11,705	14,873	16,940	17,995	...	11.7	12 5	12.3	12.7	13 06
Mercer	8,272	11,479	10,528	10,632	11,789	10,167	9,865	14.5	17.7	12.2	11.3	6.0	13.67
Miami	26,563	26,218	25,298	25,300	24,414	27,127	24,024	21.2	17 8	16.5	14.5	8.8	22 85
Monroe	24,131	19 434	20,485	18,294	20,599	24,895	22,770	12.4	11.9	10.6	10.1	9.7	14 82
Montgomery	36,094	32,128	28,000	28,182	28,768	26,434	33,628	21 8	17.6	17.7	16 5	13.2	15.47
Morgan	42,578	28,280	29,497	26,730	27 578	27,797	35,071	15.5	15 3	14.1	12.2	11 0	13 95
Morrow	19,389	17,100	15,602	9,071	6,801	4,612	6,663	18.7	14 4	6.7	8.6	3.1	12.52
Muskingum	58,649	50,244	53,740	45,668	46,727	41,511	41,544	17.0	15.0	14.9	10.7	8.6	11.61

Noble	.....	19,461	20,749	15,984	17,226	20,538	18,226	...	13.2	11.1	10.9	10.2	15.05
Ottawa	3,309	2,933	2,766	2,634	2,652	1,429½	1,268	19.7	17.9	16.0	15.3	5.0	10.62
Paulding	1,389	1,174	1,401	1,411	480	212½	816	14.1	11.8	12.3	13.1	.6	10.53
Perry	34,766	31,008	31,378	26,769	27,944	26,111	27,042	15.4	13.3	13.4	10.9	7.6	12.18
Pickaway	20,152	19,425	18,399	13,511	18,025	22,969	22,995	16.8	15.2	14.7	15.8	13.2	15.53
Pike	6,001	6,124	6,413	6,306	7,058	8,060	7,686	8.7	7.4	9.4	8.8	9.0	9.83
Portage	14,664	12,951	11,466	9,313	9,859	12,563	10,863	17.4	17.9	16.8	14.2	9.4	20.08
Preble	28,172	26,452	23,919	25,279	25,350	26,825	30,655	16.7	14.2	14.2	11.8	8.7	16.01
Putnam	7,432	8,471	7,444	7,810	5,290	2,165	3,340	12.9	15.0	9.3	8.9	.7	12.54
Richland	41,219	35,080	35,167	26,306	22,526	15,873	21,075	19.2	15.8	13.3	9.2	2.0	13.14
Ross	25,832	25,320	24,637	21,533	24,294	28,580	28,897	13.8	11.7	13.2	13.6	12.1	15.34
Sandusky	17,193	13,684	14,759	13,288	14,376	7,872	6,194	19.2	17.8	14.2	14.6	1.5	9.54
Scioto	.....	3,254	3,577	5,451	6,867	8,389	8,563	...	8.9	10.6	11.2	10.6	11.79
Seneca	40,895	40,160	34,443	32,070	33,078	17,064	20,168	20.4	18.0	12.4	12.6	.7	10.08
Shelby	13,960	15,675	15,831	16,346	15,252	11,875	12,312	17.1	16.5	12.2	13.4	4.1	12.90
Stark	53,407	47,864	44,504	41,471	43,369	45,804	41,212	20.0	18.6	21.5	14.8	11.3	20.15
Summit	23,728	21,599	20,831	19,098	16,841	20,007	19,894	20.4	19.2	22.0	17.0	10.2	20.81
Trumbull	10,718	11,667	10,346	8,246	8,123	10,421	8,021	17.7	17.6	15.1	12.5	8.8	16.52
Tuscarawas	49,077	41,378	43,924	36,227	39,175	38,740	36,054	17.9	15.8	15.2	12.1	8.0	12.62
Union	5,836	8,502	8,346	6,285	4,947	5,932	7,429	17.6	14.4	11.0	11.3	7.8	14.10
Van Wert	4,481	5,519	5,405	5,553	4,404	3,617	2,701	13.5	14.3	11.4	10.7	5.5	12.83
Vinton	8,287	8,660	8,957	8,079	9,120	9,928½	10,768	9.3	9.6	9.7	9.7	9.5	10.58
Warren	25,990	24,258	23,327	19,450	20,885	24,997	25,675	17.2	13.4	15.8	15.4	14.2	13.54
Washington	21,236	19,037	19,370	18,111	21,396	27,798	29,717	12.4	11.8	12.5	12.2	11.4	13.42
Wayne	.....	43,805	43,568	38,006	38,304	33,364	32,479	...	18.9	20.3	12.6	5.6	12.79
Williams	.....	8,241	9,744	10,346	10,446	8,498	4,572	...	12.7	14.0	13.6	6.4	8.59
Wood	.....	5,580	5,014	3,945	3,314	1,417	2,393	...	15.8	10.3	10.5	.9	13.85
Wyandotte	.....	9,914	.....	6,436	6,614	5,136	5,980	...	14.2	...	12.6	3.5	15.61
Total	1,658,106	1,657,252	1,624,715	1,421,826	1,475,935	1,407,773	1,478,164	17.3	15.2	14.1	12.0	8.0	13.81

* Only seven townships made report

BUSHELS OF WHEAT GATHERED.

Counties.	1850.	1851.	1852.	1853.	1854.	1855.	1856.
Adams	....	149,140	258,057	191,096	225,895	269,006	284 695
Allen	231,277	299,426	147,494	116,680	26,532	86,579	56,935
Ashland	633 996	573,176	473,331	206,815	65,826	184 990	176,338
Ashtabula	....	75,905	38 685	75,102	71,531	168,532	54,779
Athens	221,369	196,008	209,653	148,424	167,762	253,999	190,087
Auglaize	139,788	162,361	130,403	96 615	37,254	86,050	70,408
Belmont	667,311	563,467	508,430	394,852	320,965	555 548	375,538
Brown	360,093	207,820	256,456	316,721	246,373	317,400	321,380
Butler	529,390	377,738	397,625	367,030	396,266	447,813	636,861
Carroll	577,235	427,714	325,131	155,132	159,718	356,129	106 142
Champaign	665,873	600,641	535,510	410,294	125,156	354,136	331,322
Clark	491,954	447,319	421,963	393,433	249,519	393 714	357,430
Clermont	....	203,498	248,257	236,824	175,478	378 928	271,901
Clinton	288 995	201,445	216,209	198,581	175,076	282,585	281,449
Columbiana	606,261	459,887	390,791	264,293	126,258	363,996	146,080
Coshocton	862,809	519,094	597,310	333,999	207,611	184 367	173,754
Crawford	409,643	310,843	128,812	165,135	18,669	95,505	138,023
Cuyahoga	97,966	125,357	48,290	51,669	18,651	47,123	31,285
Darke	....	373,939	324,958	293,593	181,786	370,478	313,528
Defiance	94,207	83,009	84,124	71,151	18,213	30,484	29,550
Delaware	....	175,767	127,800	107,665	92,509	123 537	119,863
Erie	297,587	214,194	162,814	122,810	31,149	50,599	50,025
Fairfield	690,089	609,724	569,323	469,004	343,058	403,808	596,923
Fayette	149,564	119,480	113,124	107,672	90,549	185,889	151,409
Franklin	294.162	275,781	309,784	180,862	206,362	265,760	251.928
Fulton	127,795	139 055	118,179	118,644	49,611	46,807	24,224
Gallia	125,433	124,931	156,763	145,086	177,272	253,330	73,219
Geauga	59,528	61,040	54,675	36 615	40,148	91,661	26,426
Green	576,258	388,195	442,598	373,257	383,785	385 126	423,000
Guernsey	564,787	367,592	372,222	213,246	221,689	293,643	187,780
Hamilton	....	79,264	92,110	53,214	138,829	159,133	213,441
Hancock	355,051	359,520	146,928	169,820	16,229	99,452	94,989
Hardin	88,469	98,808	36,852	41,834	9,259	36,230	30,021
Harrison	532,778	430,645	318,174	168,305	119,109	224,610	132,600
Henry	....	25 959	26,670	21,423	1,277	....	10,877
Highland	495,392	304,201	358,726	285 073	285,937	444,172	383,093
Hocking	220,437	182 061	100,950	177,678	166,835	236,526	180,974
Holmes	640,459	426,114	426,114	207,721	119,141	132,161	150,482
Huron	441.604	331,428	232,581	171,703	18,086	66,817	80,159
Jackson	94,861	94,163	116,469	111,303	132,570	150 963	103.061
Jefferson	616,180	469,401	349,589	188,703	165 521	280,398	147,711
Knox	762,267	446,645	505,377	116,771	45,590	110.318	120,206
Lake	82,286	100,889	85,329	65,102	38,713	87,310	48,721
Lawrence	25,959	15,186	16,067	24,347	27,247	71,605	76,607
Licking	849,116	537,270	507,326	290,855	214.574	241,200	239,360
Logan	795,542	378,290	372,639	266,205	39,731	191,360	166,644
Lorain	206,301	193,307	106 916	79,345	12,635	13,204	26,751
Lucas	....	83,189	52,736	55,779	10,057	10 041	11,857
Madison	64,610	83,257	77,640	60,183	51,627	112,531	67,096
Mahoning	325,497	294,396	212,340	142,748	73,997	187,315	90,657
Marion	144,832	108,204	70,825	69,189	26,175	79,541	72,729
Medina	350 303	299,015	253,849	155,910	42,331	136 162	88,076
Meigs	128,593	142,645	166.392	144,023	189,261	221,393	185,899
Mercer	120,099	203,749	128 905	120,352	71,554	138,984	69 902
Miami	565,565	467,555	419.909	366,360	216,131	620,083	330,550
Monroe	301,219	232 770	217 500	185,229	199,901	369,157	207,894
Montgomery	788,784	566,952	497,870	464,437	381,373	409,384	502,210
Morgan	661,104	435,282	416.080	326,514	305,070	387,005	295,362
Morrow	364,432	246,995	104.766	77,820	21,361	57,742	79,584
Muskingum	1,003,096	754,619	801,975	489,377	403,774	482,042	352,362
Noble	....	257,286	230,533	175,071	177,275	309,033	165.529
Ottawa	65,411	52,702	44,352	40,398	13,297	15,179	14,622

BUSHELS OF WHEAT GATHERED—*Continued.*

COUNTIES.	1850	1851.	1852.	1853.	1854.	1855.	1856.
Paulding....	19,588	13,858	17,304	18,470	314	2,243	8,337
Perry	537,900	413,694	421,286	292,164	214,733	318 507	238,712
Pickaway ...	338,829	295,964	274,257	213,168	238,807	356,764	277,816
Pike	52,596	45,708	60,641	55,727	64,115	79,276	62,438
Portage	255,402	232,563	193,375	132,555	92,769	252,297	94,189
Preble	471,605	376,561	341,896	298,298	222,490	429,681	443,516
Putnam	96,368	127,328	69,798	69,352	3,837	27,158	30,695
Richland ...	795,213	557,059	470,643	242,977	45 669	208,723	247,321
Ross........	359,046	296,430	327,603	291 990	295,613	438,440	374,166
Sandusky ...	330,344	244,822	210,466	193,656	22,018	75,163	71,424
Scioto	....	29,117	38,188	60,967	73,288	98,956	82,703
Seneca	836,824	725,513	428,052	402 987	26,270	172,035	245,850
Shelby	239,820	243,110	194,501	219,956	63,456	153 294	127,841
Stark	1,071,177	892,233	956,513	612,256	493,066	923,102	433,214
Summit	485,404	415,890	460,132	324,882	173,073	416,398	197,821
Trumbull ...	190,017	205,464	156,411	103,117	71,497	172,173	61,637
Tuscarawas .	883,071	656,172	669,131	437,223	316,793	489,238	222,327
Union	103,202	122,826	92 601	70,701	38,759	84,553	80,276
Van Wert ...	60,604	78,950	61,734	59,467	24,318	46,424	22,325
Vinton	77,244	83,900	87,470	78,809	87,538	105,097	81,547
Warren	447,042	325,118	369,311	299,048	297,954	338,574	398,599
Washington .	264,316	224,800	243,681	222 594	245,949	373,107	318 600
Wayne	....	832,059	885,510	478,560	217,381	426,746	273,395
Williams....	....	105,272	136,416	140,643	67,648	73,009	34,195
Wood	....	88,274	52,111	41,669	3,164	19,626	29,093
Wyandotte ..	....	141,226	....	80,963	23,453	80,193	83,383
Total..	28,769,139	25,309,225	22,962,774	17,118,311	11,819,110	19,569,320	15,333,837

The wheat crop of 1857 has been variously estimated by competent persons to be from 25,000,000 to 28,000,000 bushels. The crop was greater in area and more prolific than that of the preceding year. From the preceding statistical table, it will be seen that the wheat crop has gradually been decreasing, not only in the area devoted to it, but in the quantity produced per acre. The crop of 1850 was sown on 1,658,106 acres, yielding upward of seventeen bushels per acre, on an average, throughout the State. In 1855, there were more than 250,000 acres less in wheat, producing less than fourteen bushels per acre. In 1854, the average production was less than eight and a half bushels per acre, owing to the depredations committed by the red weevil, or midge (Cecidomyia tritici) in some portions of the State, and to freezing out, or winter-killing in other portions. The next year, (1855) however, almost 70,000 acres *less* (than in 1854) produced about seven and a half million bushels *more* of wheat. The farmers of Ohio are seriously asking the question: "Shall we continue the culture of wheat, or shall we abandon it, and if it is abandoned, what shall be substituted for it?

If the wheat cultivators of Ohio had practised a general system of underdraining their clayey soils, and had thoroughly understood the natural history of the midge, a loss of nearly ten million bushels of wheat in 1854 could have been avoided. Owing to the depredations of the midge and other insects, and owing, also, to "winter-killing," or "freezing out," the farmers of Ohio have lost nearly twenty million bushels of wheat during the five years last past. From 1850 to 1853, both inclusive, the crops averaged 14.6 bushels per acre; the crop of 1854 then *should have been* 21,548,651 bushels, instead of which, it was 11,819,110 bushels only, being a decrease from the average aggregete of 9,729,541. The crop of 1856 was less than the average from 1850 to 1853 by 6,247,357; the losses attributable to destructive insects, want of underdraining, &c., may be stated as follows:

1853	3,640,348	bushels.
1854	9,729,541	"
1856	6,247,357	"
Total	19,617,246	

Or about 14 per cent. of the entire amount produced from 1850 to 1856, both inclusive, or 30 per cent. of the amount produced during the four years from 1853 to 1856.

There is no industrial pursuit in the State other than that of agriculture which could sustain such extensive lossess without seriously embarrassing, not only those immediately concerned, but the entire industrial community.

Notwithstanding the average as well as the aggregate of the corn crop varies considerable, yet such extreme variations are not as observable in it as in the wheat crop. Wheat is liable to be winter-killed, then to be attacked by the Hessian fly, then by the *Vibrio tritici*, then by the midge, the thrips, and a host of other insects, then by rust, and last, though perhaps not least, it is liable to be smutted, whilst the only cause to which a short crop of corn, can, as a general thing, be traced, is the unfavorableness of the season.

Were losses of similar amounts to occur in any other department of life, there is no doubt that legislative aid would be invoked to prevent a similar recurrence. Are the ravages and depredations of the "midge" and "fly" beyond legislative control? It is the conviction of the writer that as much may be done, and as happy a result consummated from legislative action, with regard to destructive insects, as in former days with regard to the depredations of bears and wolves. These insects just referred to, are as much, and no more, beyond legislative control than is ignorance. By a judicious system of common schools, the legislature of Ohio has very much improved the mental condition of society, and equally so may it modify or entirely prevent, the ravages of the weevil or midge.

The French Bureau of Agriculture appointed a Mons. BAZIN to study the Natural History of the Midge, and report to the Bureau the best method of avoiding the effects or entirely annihilating the insect. After several years of close observation and diligent investigation, he made a report, in which he details his observations and in which he demonstrates that the ravages of the insect may be avoided. The writer has translated this report from the French into English, and has made it a part of this report. The weevil is, however, very much decreasing throughout the State. The cause of this disappearance is fully explained in Mons. BAZIN'S report.

The State of New York has appointed a State Entomologist, (Dr. ASA FITCH), who has already published two invaluable reports, which have proved to be of inestimable value to the agriculturists and horticulturists of that State. Were the insects of Ohio identical with those of New York, the reports of the entomologist of that State would answer for this latitude and longitude as well as for those where the observations and investigations were conducted; but, unfortunately, the insects differ, not only in species, but in genera also; and thus are we deprived of enjoying the benefit of the labors of our sister State in this direction to more than a very limited extent.

The appointment of a State Entomologist, although equally as important and fully as desirable as the office of School Commissioner, is, after all, perhaps not the most advisable method of eradicating the evils consequent upon the ravages of insects injurious to vegetation. The evils, inconveniences and disadvantages arising from ignorance, are so manifest and palpable that no argument is required to direct public attention to the cause of education; in fact, in rural districts, the acquirement of anything more than a district school education is regarded as a sure relief from the toil and drudgery of *farm work;* not unfrequently, however, is this relief secured at the expense of the morality, usefulness and happiness of the individual. But arguments and an intimate knowledge of entomology are required to convince the agricultural public of the extent, metamorphoses, fecundity, as well as the most effectual methods of destroying those insects whose existence is obtained and continued at a sacrifice of the farmer's hopes. Entomology should be taught as a branch of popular education in every rural district throughout the State, and the young agriculturist should be as famılliar, not with the *names* only, but the insects themselves, in all their various stages of metamorphoses as eggs, larvæ, crysalis, imago and fully developed male and female, as he is with the horses or cows on the farm. The most happy consequences would result, were it possible to induce every teacher of a common school in the rural districts to collect a cabinet of insects in the immediate neighborhood of the school, and teach the pupils their names, habits, metamorphoses, qualities, &c. This, although not an immediate remedy, is one which certainly will embrace a large field, and when put into operation cannot fail of being eminently successful.

The crop next in importance to wheat is that of corn—next in importance, so far as exports are concerned, but in all probability first in importance for domestic consumption. The spring of 1857 was exceedingly backward, and at one time it was supposed that the crop of corn would scarcely be worth the expense of gathering in the fields, such a crop as there might be. It is exceedingly unfortunate that this supposition should prove true—not, however, with respect to quantity, as was predicted in the spring time, but with regard to the quality.

The summer and early autumn were very favorable to the growth and maturity of corn, but an excess of moisture prevailed at a later period in the autumn, at a time when the heat of the sun was requisite to mature the corn properly. In consequence of this humidity, a great proportion has not matured, and being unfit for use, is therefore lost to the cultivator. Many persons supposed that notwithstanding the corn had not matured, yet that it might with impunity be fed to stock. In almost every instance where it has been fed, although cattle and hogs at first refused to eat it, but finding no alternative other than starvation, they ate it, sickened and died. The digestive organs of hogs and cattle are as delicately constructed, and just as susceptible of derangement, or liable to have their functions arrested or impaired from improper food, as are those of man.

Annexed is a statement compiled from authentic sources exhibiting the number of acres in corn, the bushels gathered, and the average per acre in every county in the State for the years 1850, '51, '52, '53, '54, '55, and '56.

From this compilation it will be observed that none of the counties in the Northern half of the State, nor any out of Miami or Scioto Valleys produced 1,000,000 bushels of corn in 1856. The counties each of which produced 2,000,000 bushels and upwards, are Butler, Fayette, Pickaway, and Ross. In 1855, Ross and Pickaway counties, embracing a territory somewhat less than 1,200 square miles, or about three-fourths of a million of acres, produced 7,500,000 bushels of corn. There are several States in the Union which do not produce as much corn as these two counties did in 1855. In 1856, Clinton and Franklin counties, each produced between one and a half, and two million bushels. The following eleven counties produced between one, and one and a half million bushels, viz: Champaign, Fairfield, Greene, Hamilton, Highland, Licking, Madison, Miami, Montgomery, Preble and Warren. Geauga produced 126,259 bushels only, being the smallest amount produced by any one county in the State.

CORN.

COUNTIES.	ACRES PLANTED.							AVERAGE YIELD OF BUSHELS PER ACRE.					
	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1850.	1851.	1852.	1853.	1854.	1855.
Adams	.....	23,724	26,167	28,414	28,338	30,740	30,238	...	31.9	26.8	30.3	17.9	36.16
Allen	10,272	11,326	11,957	13,636	15,866	18,859	19,011	32.2	39.1	27.1	38.9	32.0	29.29
Ashland	14,708	12,205	15,363	15,807	17,607	20,690	17,001	38.1	30.1	28.4	42.0	15.3	31.00
Ashtabula	.....	8,592	3,931	9,926	10,385	13,356	7,443	...	37.8	32.7	40.7	23.0	42.27
Athens	19,323	15,455	16,684	17,676	18,491	20,793	18,755	35.3	33.3	30.9	36.3	27.2	39.25
Auglaize	9,503	9,105	11,060	12,068	14,150	15,823	15,141	29.4	33.8	27.5	38.3	29.6	31.39
Belmont	26,669	25,219	24,996	27,910	28,860	31,282	24,676	37.1	29.8	39.3	37.8	30.6	48.34
Brown	37,536	38,237	39,571	39,870	40,419	43,325	39,509	35.0	30.6	33.0	36.8	18.4	36.51
Butler	62,031	54,640	57,763	62,470	55,594	61,939	59,513	42.6	49.3	42.3	38.5	32.6	52.39
Carroll	10,107	9,940	8,627	9,084	10,082	11,771	8,927	31.3	26.6	18.9	30.5	12.2	35.48
Champaign	27,680	28,239	30,874	28,824	29,588	35,993	33,657	34.4	44.8	31.7	44.8	27.6	43.49
Clark	24,591	25,328	24,117	25,797	26,199	29,362	29,000	32.5	42.1	28.0	44.5	28.5	43.35
Clermont	.....	35,979	35,397	32,682	33,700	38,306	35,680	...	37.4	33.4	37.8	24.2	41.90
Clinton	33,116	33,603	36,506	42,269	35,622	40,982	42,864	39.6	44.7	34.4	36.2	25.9	47.94
Columbiana	14,457	12,727	12,107	15,126	14,666	18,589	13,712	35.7	25.7	24.1	34.9	6.0	36.56
Coshocton	25,882	25,753	23,988	27,019	30,437	34,276	35,838	37.1	34.1	40.9	40.3	33.2	38.99
Crawford	15,907	14,780	14,499	17,295	18,117	24,706	20,839	30.7	32.9	30.4	41.5	28.4	33.20
Cuyahoga	12,018	10,928	4,169	9,223	9,335	12,408	9,101	33.0	29.7	31.9	41.5	19.8	37.28
Darke	.....	23,309	23,096	25,154	31,236	30,484	29,891	...	39.4	28.6	37.9	28.4	33.31
Defiance	4,175	3,352	4,979	4,954	7,263	8,259	10,028	32.8	24.6	28.8	37.8	29.3	24.33
Delaware	.....	22,110	21,946	33,890	28,537	29,259	31,050	...	34.2	38.5	35.8	35.3	38.19
Erie	14,569	10,657	13,149	11,811	15,386	21,396½	19,904	42.2	28.7	36.3	37.2	32.6	34.46
Fairfield	41,130	40,115	42,324	45,409	47,633	47,908	45,188	38.1	35.2	41.6	45.5	25.4	50.79
Fayette	32,080	32,798	37,061	39,047	40,994	46,089	43,367	41.5	47.8	41.0	51.4	22.1	46.62
Franklin	51,842	49,074	49,045	55,697	60,051	59,066¼	61,180	38.2	42.1	47.8	45.7	27.0	44.42
Fulton	5,309	4,231	5,073	5,738	7,847	8,449	8,614	32.1	22.3	27.0	43.0	35.9	20.46
Gallia	19,363	16,884	15,680	16,070	16,860	19,039	17,059	34.8	28.9	24.3	21.4	17.8	~~67.03~~
Geauga	8,579	6,846	6,931	7,061	6,878	8,886	5,100	36.2	30.0	25.2	42.0	13.4	31.08
Greene	53,177	29,340	31,969	33,347	33,739	36,923	34,609	35.2	46.4	29.0	43.7	32.6	47.00
Guernsey	25,056	17,578	11,757	18,760	20,491	21,875	19,420	33.9	24.1	48.9	32.8	27.9	39.61
Hamilton*	.....	24,677	24,040	13,593	35,429	32,528¾	36,085	...	42.5	37.1	43.5	33.3	49.28

* Only seven townships made report.

CORN—*Continued.*

COUNTIES.	ACRES PLANTED.							AVERAGE YIELD OF BUSHELS PER ACRE.					
	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1850.	1851.	1852.	1853.	1854.	1855.
Hancock	16,138	14,642	18,822	19,410	24,657	27,116	26,251	23.0	27.5	27.4	39.0	31.8	28.33
Hardin	6,989	7,232	8,233	10,224	12,200	15,050	20,836	28.5	29.2	33 1	41 0	27.3	35.18
Harrison	16,166	13,484	14,131	15,040	15,594	16,615	13,730	37.6	34.5	32.7	36.3	26 5	45 37
Henry	.....	2,500	3,298	3,309	4,190	.....	6,169	...	27 5	33.2	35.7	32.5	....
Highland	48,615	42,425	44,329	50,833	49,538	51,089	47,244	33.0	40.0	32.6	37.1	22.9	42.90
Hocking	14,319	12,212	13,315	14,433	13,857	15,194	15,506	32.2	29.0	27.0	32.0	22.1	34 52
Holmes	11,481	9,518	9,518	11,754	13,208	13,753	14,410	33.9	21.0	21.0	37 9	21.7	34 11
Huron	22,806	19 041	21,759	23,316	26,874	31,312	28,880	38.5	27.1	30.9	36.3	22.2	34.31
Jackson	15,680	17,767	17,649	17,712	14,910	20,497	16,510	28.0	24.1	20.0	18.7	23 1	32.44
Jefferson	14,923	12,623	12,989	12,943	14,690	15,994	11,661	38.1	35.4	35.2	40 0	21.1	46.50
Knox	22,111	18,196	21,498	21,018	23,448	34,011	29,586	34.5	30.1	31.2	43.9	31.3	40.82
Lake	7,403	6,621	7,739	7,236	7,182	8,383	5,576	38.8	37 8	29.9	42.3	25.9	35.00
Lawrence	16,110	15,605	31,267	14,382	17,194	18,913	17,942	33.0	28.2	14.6	30.8	24.5	35.91
Licking	38,241	36,083	39,027	41,252	42,548	45,243	43,202	39.9	33.5	38.0	39.7	26.7	43.97
Logan	16,926	22,242	22,040	22,098	28,279	28,590	26,634	43 3	34 2	32.2	38.8	25.0	34.53
Lorain	12,925	9,604	9,688	12,374	12,855	15,229	12,234	34.5	30.5	32.1	41.3	31.0	37.07
Lucas	.....	3,002	3,212	3,891	5,915	4,732	5,619	...	24.4	32.5	31.6	40.0	17.56
Madison	19,278	20,403	24,885	27,470	28,549	32,058	31,237	31.6	40.3	37.9	44.8	21 9	42.54
Mahoning	11,902	10,908	9,248	11,317	11,381	13,377	10,605	34.6	32.2	26.9	42.9	7.5	34.01
Marion	22,254	16,096	21,329	24,205	25,524	29,300	29,745	35 5	37.6	38.7	42.9	37.3	34.26
Medina	12,646	11,041	11,483	13,790	10,703	16,657	12 759	32.9	31.4	31.9	42.2	10.9	38.25
Meigs	.....	10,505	10,771	11,456	12,586	15,311	13,036	...	31.1	29.4	30.4	26.3	35 51
Mercer	8,395	9,199	9,501	11,602	13,715	15,550	15,899	25.5	34.1	28.7	33.8	31.1	28.34
Miami	31,891	35,610	35,020	36,937	45,513	39,677	43,575	37.1	45.2	31.3	45.3	21.9	34.40
Monroe	23,357	16,003	18,031	18 209	18,358	20,157	16,575	31.1	25.1	28.8	32.3	29.9	34.74
Montgomery	36,454	35,367	32,602	32,474	33,634	36,770	36,099	37 2	46.9	27.2	41.0	26 2	49.03
Morgan	34,032	13,825	16,202	17,909	17,825	19,402	18,644	34 7	33.9	33.4	38 0	24 6	42 97
Morrow	16,154	14,877	16,483	21,344	20,562	22,824	19,424	36 1	30.1	30.4	37.6	34 5	35.02
Muskingum	32,079	29 210	31,164	30,168	32,169	34,875	38,256	38.9	36.4	37.1	39.7	29 6	44 61
Noble	.....	15,796	20,294	19,956	20,436	22,521	18,057	...	29 7	28.1	35 0	25.7	40.34
Ottawa	2,483	2,279	2,190	2,504	4,239	4,288¾	4,182	30 9	30.8	36.3	38.3	30.1	21.97
Paulding	1,532	1,074	1,728	2,071	2,748	2 ,	6,048	38.5	30.3	28.6	39.6	34.8	19.88

Perry	21,267	19,580	18,679	19,183	20,295	20,809	18,530	35.4	23.0	29.3	34.8	18.3	41.80
Pickaway	65,860	65,755	67,034	53,703	63,634	76,414	64,849	39.8	45.7	45.3	52.8	26.1	47.23
Pike	22,957	20,470	22,841	22,825	24,788	29,541	24,985	39.3	43.0	30.3	42.0	49.4	36.58
Portage	10,426	9,405	7,701	9,191	9,499	11,682	6,745	31.5	31.2	26.5	47.0	10.1	41.24
Preble	34,927	29,400	29,316	32,156	31,925	37,139	34,027	33.4	43.6	37.4	36.5	31.2	42.80
Putnam	6,354	5,481	7,069	8,773	11,708	10,574	14,227	33.0	28.9	31.5	39.7	34.2	26.68
Richland	16,300	16,180	16,576	18,083	20,549	25,566	20,388	34.5	26.2	25.0	38.4	21.4	34.19
Ross	69,520	76,070	75,464	75,257	73,504	77,920	69,384	41.9	45.4	39.3	45.2	32.3	49.76
Sandusky	10,651	9,323	10,950	10,613	15,786	19,222	18,707	31.8	21.4	24.2	35.6	29.0	26.15
Scioto	.....	22,812	23,624	19,920	24,335	29,951	20,162	...	44.8	40.9	40.9	27.3	34.79
Seneca	17,940	15,671	17,566	19,997	24,361	32,000	27,456	36.2	31.3	30.2	49.7	28.9	31.55
Shelby	15,974	15,767	15,647	17,545	18,157	20,795	21,122	32.6	36.5	26.0	38.5	24.5	29.74
Stark	18,245	15,946	15,282	18,407	18,913	23,068	16,336	35.6	29.8	25.5	39.6	10.0	37.47
Summit	10,256	9,557	9,263	10,162	9,457	12,216	9,423	35.7	31.6	33.5	40.6	13.5	30.25
Trumbull	11,595	11,118	9,020	11,270	10,206	12,991	9,625	35.6	34.5	25.7	37.8	11.7	33.84
Tuscarawas	19,003	18,694	18,336	18,924	20,269	23,593	20,064	35.2	29.9	33.3	36.8	23.2	37.06
Union	16,413	17,451	17,946	20,700	22,491	25,930	26,711	32.0	33.7	33.2	42.0	29.9	32.00
Van Wert	3,436	3,337	4,077	5,170	6,121	7,338	7,474	26.9	21.8	27.0	37.2	32.8	23.47
Vinton	11,013	11,195	11,839	12,967	13,872	14,736	12,912	31.3	30.9	23.5	32.9	22.9	35.06
Warren	42,322	41,062	41,991	38,217	41,844	44,869	36,409	41.5	48.7	37.2	42.6	31.8	49.98
Washington	20,017	14,627	15,750	17,331	16,484	22,679	19,079	34.1	30.7	34.3	32.7	24.3	36.66
Wayne	....	15,481	17,400	19,310	20,068	23,052	18,670	...	18.9	24.5	42.0	12.6	31.98
Williams	.....	3,181	4,000	6,895	7,272	9,941	8,461	...	20.3	30.0	31.4	25.4	28.15
Wood	.....	5,333	7,552	8,713	12,900	15,299	24,059	...	30.7	33.2	34.3	37.3	15.60
Wyandotte	.....	9,790	.....	12,917	16,282	16,974	16,508	...	29.5	...	40.0	30.4	~~10.31~~ 28.0
Total	1,537,947	1,664,427	1,730,188	1,836,493	1,972,337	2,205,282	2,084,893	36.8	36.7	33.6	40.0	26.4	39.71

BUSHELS OF CORN GATHERED.

COUNTIES.	1850.	1851.	1852.	1853.	1854.	1855.	1856.
Adams	....	757,248	733,024	860,388	508,251	1,121,604	646,209
Allen	330,811	443,126	325,039	529,603	509,255	552,541	535,303
Ashland....	560,512	367,897	437,192	664,310	270,162	641,509	307,397
Ashtabula ..	....	325,588	128,900	403 570	239,365	564,573	190,069
Athens	683,341	515,638	516,952	641,967	503,503	816,302	408,913
Auglaize ...	289,217	308,655	304,573	462,385	420,404	496,716	386,934
Belmont....	991 215	753,934	984,713	1,055,613	883,910	1,512,245	527,575
Brown	1,314,741	1,170,730	1,306,349	1,467,088	747,174	1,582,109	991,060
Butler......	2 646,353	2,696,183	2,446,123	2,406,733	1,815,161	3,245,186	2,288,713
Carroll	316,999	264,835	163,371	276,691	123,190	417,640	148,580
Champaign .	954,609	1,266,020	979,544	1,292,327	818,627	1,565,499	1,102,258
Clark	799,489	1,067,673	675,304	1,142,847	748,018	1,272,840	952 537
Clermont ...	....	1,346 631	1,185,770	1 234,442	815,906	1,605,373	915,745
Clinton.....	1,313 375	1,504,280	1,258,977	1,528,246	924,510	1,965,069	1,649,323
Columbiana.	516,821	328,003	291,790	528,439	88,118	679,697	293,363
Coshocton ..	962,646	881,551	981,469	1,089,867	1,013,322	1,336,485	810,135
Crawford ...	489 151	487,054	442,015	716,870	514,734	820,377	652,793
Cuyahoga ..	396,922	325 570	133,097	383,069	185,453	462 625	285,605
Darke	....	919,155	661,019	952,555	888,369	1,015,702	629,356
Defiance....	136,983	82.635	143,565	187,120	213 136	200,972	330,386
Delaware ...	....	756,323	846,422	1,212,647	1,007,715	1,117,599	990,219
Erie	615 122	306,113	477,898	439,479	502,654	737,427	639,905
Fairfield....	1,569,313	1,412,776	1,763,030	2,066,021	1,213,497	2,433,666	1,389,928
Fayette....	1,331,927	1,570,114	1,519,721	2 123,221	906,267	2,148,412	2,144,887
Franklin ...	1,984,929	2,068,376	2,346,295	2,544,408	1,621,749	2,624,155	1,864,495
Fulton......	170,680	94,387	136,892	246,998	281,983	172,900	219,626
Gallia..	674 655	489,368	382,122	392,385	301,680	1,276,286	379 127
Geauga. ...	310,583	205,427	175,139	296,176	92,569	276,205	126,259
Greene.	1,170,543	1,361,965	927,289	1,457,846	1,100,910	1,735,469	1,241,116
Guernsey ...	851,181	424,390	576,071	614,882	570,814	870,613	368,116
Hamilton ...	....	1,050,412	891,953	590,715	1,181,148	1,603,253	1,349,293
Hancock....	533,249	403,014	517,136	757,690	785 432	768,469	799,556
Hardin	199,300	211,558	272,696	419,477	333,725	529,672	309 333
Harrison ...	609,010	466.400	463,087	545,919	413,495	753,836	362 213
Henry	....	68,788	199,405	118,265	136,480	....	206,978
Highland...	1,604,618	1,699,554	1,446,889	1,889,814	1,138,168	2,191,814	1,387,129
Hocking....	461,343	355,234	360,751	461,684	306,623	524,601	356,625
Holmes.....	389,550	200,710	200,710	445,980	287,202	469,244	257,455
Huron......	878,143	517,186	674,428	847,367	597,561	1,074,443	736,393
Jackson	439,850	428,313	353,318	332,789	344,609	664,952	248,356
Jefferson ...	568 782	447,134	458,413	518,646	310,565	743,728	202,872
Knox	762,906	547,835	682,651	922,067	734 257	1,388 547	654,490
Lake.......	287,750	250,711	231,706	306,187	186,532	293,461	171,963
Lawrence...	532,571	441,559	457,210	443,506	421,444	679,178	343,705
Licking	1,527,734	1,210,316	1,485,143	1,637,848	1,140,103	1,989,282	1,197,448
Logan......	734,376	760 921	709 925	858,453	708 596	987 363	734,610
Lorain	446,224	293,386	311,838	510,794	271,008	564 667	342,887
Lucas	....	73,508	104,532	123,100	237.723	83,109	82,905
Madison....	610 930	822,826	943,696	1,230,065	626,063	1,363,998	1,108,012
Mahoning ..	412,810	351,585	249,547	486,242	85,674	455,439	299 196
Marion	791,584	605,266	826,528	1,307,111	952,619	1,004,099	879,712
Medina.....	416,063	346,805	367,078	582,380	117 437	642,202	433,034
Meigs.	264,841	327,434	317,278	347,909	331,298	543,733	283,052
Mercer.....	214,838	314,103	273,526	391,631	426,807	440,733	334.181
Miami.	1.183,335	1,611,038	1,097,625	1,672,486	999,733	1,364,894	1,159,739
Monroe	728,242	403.052	520,821	587,235	384,403	700,343	287,684
Montgomery.	1,359.179	1,660,110	886,782	1,332,416	916,229	1,802,990	1,295,795
Morgan	834,998	469,372	541,455	680,630	438 731	833,759	493,333
Morrow	583,318	449,067	5[illegible]1,331	802,733	648 148	799,548	575 713
Muskingum.	1,249,456	1,063,914	1,157,183	1,198.170	954,527	1,555,782	767,396
Noble	....	469,644	571.138	699,926	526 110	908 648	363,052
Ottawa.	76,764	70,259	79,698	95,768	127,903	94,212	155 379
Paulding ...	59,054	32,595	49,470	82,090	95,682	59,264	226,344

BUSHELS OF CORN GATHERED—*Continua.*

COUNTIES.	1850.	1851.	1852.	1853.	1854.	1855.	1856.
Perry	752,982	451,869	547,827	667,563	371,914	869,893	454,081
Pickaway ..	2,627,727	3,007,410	3,039,418	2,845,999	1,660,950	3,609,765	2,345,963
Pike	902,611	881,026	692,415	959,763	1,229,759	1,080,996	693,567
Portage	329,539	293,659	204,255	431,956	96,634	481,231	174,860
Preble	1,167,548	1,283,743	1,097,187	1,172,423	998,792	1,589,572	1,012,382
Putnam	210,002	158,639	222,976	348,315	400,540	282,043	431,807
Richland. ..	563,320	424,457	416,441	694,195	441,254	874,321	439,575
Ross.......	2,918,958	3,460,486	2,971,500	3,399,800	2,375,917	3,877,710	2,135,541
Sandusky ..	339,531	201,307	265,850	377,592	458,426	502,806	605,529
Scioto......	....	1,023,540	966,762	813,934	665,273	1,042,159	678,307
Seneca.	649,943	492,026	531,952	814,413	705,694	1,009,675	828,347
Shelby.....	521,792	576,536	406,835	673,449	445,906	618 628	411,685
Stark	651,328	475,457	390,106	729,823	189,384	864,484	340,258
Summit	366,446	302,209	311,022	412,864	128,011	369,577	218,720
Trumbull...	413,598	383,969	232,443	426,322	117,203	439,615	249,716
Tuscarawas.	669,008	559,475	612,048	695,553	470,481	874,497	438,573
Union	525,732	589,002	596 083	870,193	674,422	839,106	714,807
Van Wert..	92,544	72,941	110,698	192,321	200,955	172,256	173,885
Vinton	345,470	346,334	279,190	427,042	317,750	516,665	273,178
Warren	1,757,409	2,001,048	1,566,165	1,627,679	1,334,021	2,242,805	1,401,759
Washington.	684,184	449,838	541,364	565,977	475,306	831,522	360,516
Wayne.	....	293,030	427,577	810,771	253,706	737,266	362,273
Williams ...	....	64,732	120,000	216,370	185,092	279.893	206,478
Wood	....	163,774	250,924	299,166	481,297	238,721	505,364
Wyandotte .	....	289,591	....	517,321	496,423	175,149	513,479
Total ...	56,619,608	61,171,282	58,165,517	73,436,090	52 171,551	87,587,434	57,802,515

The crop of 1857 has been estimated to be from sixty to ninety millions of bushels. It will be observed that the number of acres appropriated to the culture of corn has been gradually increasing since 1850, whilst that of wheat has been as regularly decreasing since that period; but the inference that the wheat lands have been converted into corn lands is not borne out by facts. A great proportion of lands released from the production of wheat has been changed into meadows and pasture lands, whilst the additional grounds which have been devoted to corn, are such as have recently been reclaimed from a state of nature.

The only change worthy of note from the aggregates of plow, meadow, and woodland as returned in 1853 is a change of plow land into meadow or pasturage. If from the plow land we deduct 3,563,058 acres, being the amount in wheat and corn in 1856, there will remain 2,963,104 acres for oats, potatoes, barley, rye, flax, tobacco, sorghum, grapes, broom corn, and orchards. The number of acres occupied by each of these products can be approximated only, and there is at present no data from which the amount in quantity, or the value, of these crops may be ascertained even approximately. Correct statistics in relation to the condition, quantity, and kind of crops grown in Ohio will in a few years be of as much importance as are the wheat and corn crops at present: they are equally the products and resources of the State, and are also articles of export from which no inconsiderable sum of money is realized.

Ohio boasts a population whose average density is 59 to the square mile; of this population 269,471 are landholders other than proprietors of town or city lots. The average quantity of land held by these owners is less than 90 acres to each proprietor. The aggregate number of acres in wheat in 1856 was about 19 per cent. of the entire amount of plow land; taking 90 acres as the average quantity of land in each farm, it follows that no more than about 17 acres are appropriated to wheat upon each farm. The success of the wheat crop upon these 17 acres is dependent upon more contingencies than those not familiar with the subject are willing to beleive; therefore means should be devised which will secure as prompt, and as correct returns of the amount and of the condition of all the various crops grown in the State annually, as is the enlistment and valuation of property by the assessor at present.

The year 1857 will long be remembered as the period in which an exceedingly valuable acquisition was made to our annual crops, in the form of a plant which, whilst it no doubt will prove valuable as a forage plant. is at the same time more valuable as a sugar-producing plant. The following facts were determined in relation to the *Sorghum saccharatum* during the past year:

I. It will grow vigorously and healthily, and mature properly, in every portion of the State.

II. It is an excellent forage plant, producing in greater abundance than corn.

III. It contains a saccharine juice, in great abundance, from which an excellent article of syrup may be manufactured.

IV. This syrup is susceptible of crystallization, thus forming a beautiful article of sugar, much resembling the maple sugar both in appearance and flavor.

The culture of the sorghum is destined to be an important item to the future agriculturist of this State. It is estimated that the experiment of growing this plant, as well as the manufacture of syrup from it, has cost the agriculturists of Ohio, in land, labor, and machinery, at least $100,000. There is no doubt that an impetus will be given to the culture of this plant in consequence of the signal success with which Mr. Jos. S. Lovering met in the manufacture of sugar from it. From communications which have been received at this office, from inquiries for seed, and from seed furnished through this office, there is reason to believe, that at least 20,000 acres will be planted in 1858 in sorgho. Mr. Lovering's statement and process of manufacture will be found in an appropriate place in this volume. Every one who grows the sorgho cannot afford the expenditure in cash for the machinery and necessary fixtures to manufacture sugar successfully. There is little doubt that the manufacture of sugar from this plant will become a permanent branch of industry, and that capital will be as permanently invested, and to as great an extent perhaps, as there is now in grist mills, and persons will engage in this new branch of industry as readily and as permanently as they now do in grinding wheat and other cereals.

Barley is grown to a much greater extent than formerly, both for domestic consumption and as an article of export.

Root crops are not grown to any considerable extent.

The Japan pea has been grown in Ohio within the past few years, and in a number of instances matured fully. The benefits to be derived from the culture of this plant are, to say the least, exceedingly doubtful. From a want of proper knowledge in the preparation of this pea for the table, it has failed to be appreciated as a vegetable suitable to be cultivated in the kitchen garden. Those who have witnessed the preparation of this pea for the table in Japan, state that the natives steep it in cold water for 24 hours previous to boiling; the cold water softens the external covering of the pea: whereas, if the pea is plunged into hot water without having been soaked in the cold, it becomes *harder* by boiling, instead of softer, as is the case with the common garden pea. I can state, from personal experience, that the Japan pea is exceedingly prolific, and matures in the latter part of September or commencement of October in this latitude.


(Hungarian Grass.)

An effort is being made to introduce the *Panicum Germanicum*, or Hungarian grass, in Ohio. The grass itself appears to be very coarse, rapid growing, much resembling the "barnyard grass" of Eastern States; it is evidently a grass that exhausts the soil with great rapidity. I have carefully examined METZGER'S work on European Cereals, also E. F. C. KŒNIG'S Forage Plants of Germany, and can find nothing in either of these works to recommend it to the favorable consideration of the farmers in Ohio. Its merits appear to be—1. It may be sown in the middle of June, and yield a good crop in a season of drought; or it may be sown in wheat or rye stubble, and produce a heavy growth of fall pasture. 2. It ripens in September, and produces an extraordinary amount of seed. The *hay* is said to be eaten with avidity by horses, but is injurious to cows. Its demerits are, that it is a rank growing weed, which German farmers would gladly exterminate; that in ordinary seasons it yields less than in seasons of drought; and, if sown early, is more liable to be killed by spring frosts than any plant in general culture. The Hungarian grass is undoubtedly an excellent grass for Illinois, Iowa, and perhaps a part of Wisconsin; but in Ohio, where such excellent crops of timothy, blue grass (*Poa pratense*), redtop, orchard grass (*Dactylis glomerata*), and other grasses in general culture, are grown with almost never-failing success, the Hungarian grass will not by any means prove a desideratum.

There is no doubt that many excellent grasses, which are now regarded as worthless, may, after having been subjected to the modifying influences of cultivation, perhaps prove to be excellent grasses for pasture as well as for hay. Many grasses which in a wild state are rough and harsh, become by cultivation tender, and the uninviting qualities become greatly modified. Instead of introducing the Hungarian grass, it would perhaps be as well to introduce the muskit grass of Texas for a late pasture grass. It has been introduced into Virginia with signal success, and, according to recent information from the latter State, it is found that it readily acclimates.

There are, according to Prof. Gray, in the Northern United States,

10 species of Equisetacæ, or the Rush Tribe;
26 species of Juncacæ, or the Reed Tribe;
214 species of Cyperaceæ, or the Sedge Tribe;
194 species of Graminacæ, or the Grass Tribe.

Of these 194 species of true grasses, 162 are natives of the United States, and 32 are introduced, chiefly from Europe.

There are found within the limits of the State of Ohio 105 species of true grasses, 26 of which have been introduced from other States; and, strange to relate, the introduced grasses are the only ones cultivated. Mr. L. Lesquereux, of Columbus, Ohio, a short time since, had nearly a complete collection of all these grasses in a good state of preservation. There are questions involved in connection with the culture of grasses and forage plants generally, sufficient to render necessary a thorough botanical survey of the State. Many individuals have collected specimens of all the plants in their immediate locality: a collection of these labors would furnish a list, more or less complete, of the indigenous as well as introduced species of plants; but a survey should include a description of the kind of soil best adapted; whether the plant delights in solitude, or in densely associated clusters or groups; what plants exercise a deleterious influence by rapid growth, expanded top, panicle, leaves, &c. &c., as well as a description of insects injurious to grasses and forage plants; rotation in culture, &c.

I herewith append a list of the true grasses found in Ohio; which has been compiled from various, yet authentic sources, as well as from personal observation.

	BOTANICAL NAME.	COMMON NAME.	PLACE WHERE FOUND.	CONDITION.	FLOWERING TIME.
1	Leersia Orizoides	Rice Grass, Cut Grass	Marshes around Columbus	Wild	August.
2	" Virginica	White Grass	" " "	"	"
3	Zizania aquatica	Indian Rice	Borders of streams (Toledo, &c)	"	"
4	" miliacea		Shallow water—Ohio (Rare)	"	"
5	Alopecurus pratensis	Meadow Foxtail	Fields and pastures	Cultivated	May.
6	" geniculatus	Floating Foxtail	Wet meadows	Wild	July, August
7	" aristulatus	Wild Water Foxtail	Marshes (Columbus, &c.)	"	June to Aug.
8	Phleum pratense	Timothy	Meadows	Cultivated	June, July.
9	Vilfa vaginæflora	Rush Grass	Dry fields	Wild	September.
10	" heterolepsis		Near Columbus	"	August.
11	Agrostis alba	English Bent, White Top	Meadows	Cultivated	July.
12	" canina	Brown Bent or Dog's Bent Grass	Fields and pastures	"	June, July.
13	" perennans	Thin Grass	Damp, shady woods	Wild	July, August.
14	" scabra	Hair Grass, Tickle Grass	Dry, open ground (Common)	"	June, July.
15	" vulgaris	Red Top	Meadows	Cultivated	July.
16	Cinna arundinacea	Wood-reed Grass	Shaded woods (Columbus, &c.)	Wild	July, August.
17	Muhlenbergia glomerata		Bogs (Common)	"	August.
18	" sobolifera	Awnless Muhlenbergia	Swamps and woods	"	August, Sept.
19	" Mexicana	Mexican "	Low grounds and fields (Common)	"	August.
20	" sylvatica	Sylvan "	Damp woods (Columbus, &c.)	"	August, Sept.
21	" Willdenovii	Willdenow's "	Rocky woods (Lancaster, &c.)	"	"
22	" diffusa	Drop Seed Grass	Along streams and creeks	"	"
23	Brachyelytrum aristatum		Rocks (Lancaster, &c.)	"	June.
24	Calamagrostis Canadensis		Wet ground (Northern Ohio)	"	July.
25	" coarctata		" "	"	August.
26	Oryzopsis melanocarpa	Mountain Rice	Rocky land (Lancaster, &c.)	"	"
27	Stipa avenacea	Feather Grass	Darby plains (Rare)	"	July.
28	Aristida dichotama	Poverty Grass	Sandy soils (Southern Ohio)	"	August, Sept.
29	" purpurescens		Sandy woods	"	September.
30	Spartina cynosuroides	Fresh Water Cord Grass	Lake shore, Darby plains	"	August.
31	" juncea	Rush Salt Grass	Marshes along the canal (Columbus, &c.)	"	"
32	Eleusine Indica	Wire Grass	Old road-sides, &c.	Cultivated	"
33	Tricuspis sesleroides	False Red Top	Sandy fields (Southern Ohio)	Wild	"
34	Diarrhena Americana	Diarrhena	Creeks in the woods	"	"
35	Dactylis glomerata	Orchard Grass	Meadows	Cultivated	June.
36	Kœleria cristata		Dry hills (Lancaster)	Wild	
37	" obtusata		Fields and open woods	"	June.
38	" truncata		" " "	"	"

	BOTANICAL NAME.	COMMON NAME.	PLACE WHERE FOUND.	CONDITION.	FLOWERING TIME.
39	Kœleria tuberosa		Fields and open roads	Wild	
40	Eatonia Pennsylvanica	Pennsylvanian Eatonia	Moist woods	"	June.
41	Melica speciosa	Melic Grass	Rich open soils	"	June.
42	Glyceria aquatica	Reed Meadow Grass	Wet places (Northern Ohio)	"	July.
43	" Canadensis	Rattlesnake Grass	Cranberry Marshes "	"	July.
44	" elongata	Long-panicled Manna Grass	Swamps in the woods (Columbus)	"	June, July.
45	" fluitans	Water Manna Grass	Shallow waters (Northern Ohio)	"	June, July.
46	" nervata	Meadow Spear Grass	Moist meadows (Common)	"	June, July.
47	" pallida	Pale Manna Grass	Swamps in the woods (Northern Ohio)	"	July.
48	Poa annua	Low Spear Grass	Waste grounds	Cultivated	April to October.
49	" alsodes		Woody hills (Common)	Wild	April, May.
50	" brevifolia		Hilly woodlands	"	May, June.
51	" compressa	Virginia Blue Grass	Dry fields	Cultivated	June.
52	" dentata		Swamps (Columbus)	Wild	June, July.
53	" flexuosa		Dry woods (Southern Ohio)	"	April.
54	" pratensis	Kentucky Blue Grass	Meadows	Cultivated	May, June.
55	" serotina	Fowl Meadow Grass	Wet meadows	"	June.
56	" sylvestris	Wood Spear Grass	Woods and meadows	Wild	June.
57	" trivialis	Pennsylvania Blue Grass	Meadows	Cultivated	June, July.
58	Eragrostis capillaris		Sandy places (Common)	Wild	August, September.
59	" pectinacea		Ohio River	"	August, October.
60	" pilosa	Slender Meadow Grass	Sandy places	Cultivated	August
61	" poæoides	Strong-scented Meadow Grass	Sandy places	Wild	August, September.
62	" reptans	Creeping Meadow Grass	Gravelly banks (Common)	"	August.
63	Festuca elatior	Fall Fescue Grass	Meadows	Cultivated	June, July.
64	" nutans	Nodding Fescue	Rocky woods	Wild	July.
65	" tenella	Small Fescue	Dry sterile soil	"	July.
66	Bromus ciliatus	Fringed Brome Grass	River banks	"	July, August.
67	" Kalmii	Wild Cheat	Southern Ohio	"	June, July.
68	" racemosus	Upright Chess	Grain fields	"	June
69	" secalinus	Chess or Cheat	Old fields	"	June, July.
70	Phragmites communis	Common Reed Grass	Swamps in the woods	"	September.
71	Lolium perenne	Darnel, or Rye Grass	Meadows	Cultivated	June.
72	Triticum repens	Dog's Couch, or Twitch Grass	Meadows and pastures	Wild	June, July.
73	Elymus Canadensis	Wild Rice, or Lyme Grass	Banks and woods	"	August.
74	" striatus	Slender, Hairy Lyme	Rocky banks	"	July.
75	" villosus		Rocky woods (Columbus, rare)	"	July.
76	" Virginicus	Lyme Grass	Banks, &c. (Common)	"	July, August.

77	Gymnostichum hystrix	Bottle brush grass	Moist rocky woods	Wild	July.
78	Aira flexuosa	Wood-hair grass	Dry places	"	June.
79	" cæspitosa	Hassock grass	Lake shore	"	May.
80	Danthonia spicata	Wild oat grass	Sterile soil (Lancaster, &c.)	"	June.
81	Holcus lunatus	Velvet grass	Wet meadows (North Ohio)	Cultivated	June.
82	Hierochlea borealis	Vinalla or seneca grass	Swamps along the canal (Columbus)	Wild	May.
83	Anthoxanthum odoratum	Sweet scented vernal grass	Meadows	Cultivated	May, June.
84	Phalaris arundinacea	Reed canary grass	Cranberry swamps (Northern Ohio)	Wild	July.
85	" canariensis	Common canary grass	Fields, gardens, &c.	Cultivated	July, August.
86	Millium effusum	Millet	Woods (Northern Ohio)	Wild	June.
87	Panicum capillare	Hair stalked panic grass	Waste fields (Common)	"	August, September.
88	" clandestinum		Thickets, &c.	"	July, August.
89	" crus galli	Barn yard or cock's foot grass	Ditches, &c (Common)	"	August, September.
90	" depauperatum	Straight panic grass	Dry woods (Lancaster)	"	May, June.
91	" dichotomum		(Common)	"	July.
92	" filiformis	Finger grass	Dry sandy soil	"	August.
93	" glabrum	Smooth crab grass	Waste places	"	August, September.
94	" latifolium	Broad leaved panic grass	Thickets	"	June, July.
95	" proliferum	Prolific panic grass	Along the Ohio river	"	July, August.
96	" pubescens	Hairy panic grass	(Columbus)	"	June.
97	" sanguinale	Purple finger grass	Waste places	"	August to October.
98	" virgatum		Moist sandy soil (Columbus)	"	August.
99	" viscidum		Roads, &c.	"	August.
100	Setaria glauca	Bottle grass	Old fields	"	July.
101	" viridis	Green foxtail or wild timothy	Old fields	"	July, August.
102	Andropogon furcatus	Forked spike grass	Sterile grounds	"	August.
103	" scoparius	Broom or purple wood grass	Sandy soil—woods	"	August.
104	" Virginicus		Swamps (Columbus)	"	September.
105	Sorghum nutans	Indian or wood grass	Sandy swamps (Columbus)	"	August.

The culture of the grape is deservedly attracting considerable attention; the amount of land now devoted to the culture of the grape in the State is estimated at 3,000 acres. The culture of the vine is destined to become an important item in our industrial system, and the product of the vine will not be an inconsiderable item in the annual aggregate of our increasing wealth. As an instance of the remunerativeness of the grape culture, I will repeat a statement made to me by Mr. CHAS. CARPENTER, of Kelley's Island—a gentleman whose integrity is unquestioned. In 1854 he sold, as the product of one acre of vines, 800 gallons of wine, at prices ranging from $1,25 to $1,50 per gallon; grapes to the amount of $100; roots and cuttings to the amount of $130. Thus did one acre return to its proprietor $1,330 in one year. Speaking of the culture of the grape, the Commissioner of Statistics says: "The capacity of the grape to make wine is properly considered an important test of climate. HUMBOLDT says (Cosmos, vol. 1, p. 324) that to procure *potable* wine, it is requisite that the *mean* annual heat should exceed 49 deg., that the winter temperature should be upward of 33 deg., and the summer temperature upward of 64 deg. At Cincinnati, where wine is made in large quantities, the temperature of the winter is slightly above the minimum required; the temperature of the summer, ten degrees higher, and the mean temperature of the year four degrees. This proves that it will not do to take the mean *annual* temperature as a test of climate; but we must also take the mean temperature of the winter and summer. It is not the temperature of the summer, or even of the year, which prevents the culture of the European grape, or plants which readily grow in the same latitude of Asia; but the great range of the *extremes* of temperature." HUMBOLDT's observations are undoubtedly correct for Germany, and based upon actual observation, but may not be correct for America. I am not aware that a registry of meteorological observations has been made at Kelley's Island, but feel confident that the mean temperature of the winter is no higher on the Island than at Cleveland, (which is less than 32 deg.,) and yet it is very doubtful whether Cincinnati can manufacture a *better* wine than is produced on the Island. There is reason to believe that the range of *extremes* is not so great on the Island, or at Cleveland, as at Cincinnati; hence, although HUMBOLDT's doctrine may be correct in the main, yet situations and locality certainly exert modifying influences. The annexed table, compiled chiefly from Blodget's Climatology of the Uunited States, exhibits the meteorology of ten prominent points in Ohio.

METEOROLOGY OF OHIO.

PLACE.	North Latitude.	West Longitude.	Elevation above tide water.	No. of Years.	Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Spring.	Summer	Autumn.	Winter.	Year.	Maxima.	Minima.	AUTHORITY.
Portsmouth.	38.45	82.56	540	20	1824–46	34.6	36.6	45 5	54.6	64.6	72.1	75.3	74.7	65.5	59.2	45.0	38.0	54.8	74.2	55.0	36.0	55.0	100.0	–6.0	Hempsted. *Drake*
Oberlin	41.20	82 15	800	8	1850–7	28.2	24.8	36.8	48.1	59.4	67.6	75.5	71.7	68.3	51.5	41.8	30.0	46.6	70.2	51.2	29.2	49.3	100.0	–13.0	J. H. Fairchild.
Cincinnati .	39.06	84.29	543	20	1835–55	33.1	34.1	43 5	54.1	63.6	71.4	76.5	74.2	66.0	53.2	42.5	33.8	53.7	74.0	53.9	33.7	53.8	100.0	–17.0	Prof Ray.
Hillsboro' ..	39.15	83.30	1131	15	1836–50	30.9	31 4	39.5	52.7	60.1	67.5	72.2	69.3	63.1	50 2	40.3	31 4	50.8	69.7	51.2	31.2	50.7	.....	.....	Matthews.
Marietta ...	39.25	81.31	630	10	1847–56	30.3	34.0	41.2	51.9	61.3	69.8	73.4	71.0	64.7	52.8	43.3	33.8	51 5	71.4	53.6	32.7	52.3	100.0	–23.0	Dr. Hildreth, M.S.
Germant'wn	39.30	84.10	720	5	1851–55	28.8	32.2	40.2	50.9	61.9	69.4	74.4	71.4	65 9	51.3	40.5	30.7	51.2	71 6	52.6	30.6	51.4	99.7	–31.0	L. Groneweg.
Steubenville	40.25	80 41	670	27	1831–57	29.7	31.5	39.7	51.6	61.9	70.3	74.6	71.8	65.8	51 5	40.7	31.6	51.1	72.2	52.7	30.9	51.7	105 0	–22.0	R. Marsh, M.S.
Hudson.....	41.15	82.28	1131	7	1838–44	28.1	29.3	37.8	51.5	58.1	67.8	72.9	69.8	61 5	48.0	35.6	29.0	49.1	70.2	48.4	28 8	49.1	93.0	–10.1	Prof. Loomis, M.S
Perrysburg.	41.35	83.36	610	3	1854–5	23.5	21.0	31 6	54.0	62.0	72.6	77 6	72 0	66.6	54.0	41.6	28.6	54.0	74 1	49.2	24.3	50.4	99.0	–18. 0	D. K. Hollenbach.
Cleveland ..	41.31	81.46	650	2	1856–7	15 1	28 0	28.8	43.5	55.3	67.7	72.3	67.9	63.7	50.8	38.2	29.5	42.5	69.3	50 9	24 2	46.7	92.0	–17.5	G. A. Hyde, M.S.

Experiments have been made to a very limited extent, however, with the *Dioscorea Batatas*, or Chinese Yam. So far as heard from, the results of these experiments are by no means flattering. In a country where from $50 to $150 may be realized from an acre of potatoes in a single season, or not unfrequently $50 from an acre of water-melons, it is not very probable that the Yam will supersede any of the more popular and familiar esculents. It would be well, however, to test the matter of its growth and adaptation to our climate, to a greater degree than has been done, before the culture is entirely abandoned.

The most remarkable progress observable in agriculture is the extensive introduction of improved implements, and machinery.

There is, no doubt very much due to the generous encouragement extended to improved implements and machinery by the State Board of Agriculture, at State Fairs, for the unprecedented distribution of them, and demand for them. Prominent among the more recent machines are those for reaping and mowing. Ten years ago a machine to reap or mow—although then a desideratum, nevertheless appeared to those in Ohio who were accustomed to "*swing the cradle*," as impracticable as did "Ocean steamships" to the learned Dr. LARDNER; but to-day there are perhaps no less than 10,000 machines which were employed as reapers or mowers, or both, within the limits of the State during the past year. Of these there were

Manufactured in	Cleveland	1,643
"	Sandusky	1,000
"	Springfield	1,300
"	Dayton	1,826
"	Canton	1,507
Sold at different points in the State, of foreign manufacture		1,000
		8,276

There were probably no less than 2,000 reapers and mowers sold in the Territory of Ohio previous to 1857, which were manufactured in other States. The manufacturers in Ohio state that they were unable to supply the demand for these machines. From present indications, in a few years the grain cradle will be as obsolete an implement as is the sickle at present.

At a trial of reapers and mowers held at Hamilton, in Butler county, from the 1st to the 3d of July last, under the auspices of the State Board of Agriculture, there were entered twelve machines which were reaper and mower combined, two as reapers only, and two as mowers only, as competitors for a gold medal, which was offered by the State Board for the best of each of the above named classes of machines. The report of the awarding committee will be found in an appropriate place.

Each of these machines proved itself eminently successful in all its operations, and each of them is not only a triumph of mind over matter, but a complete substitute, so far as haying and harvesting is concerned, for from three to five agricultural laborers.

There are at present no reliable statistics from which the number of drills, horse-rakes, corn-shellers and threshing machines can be determined with any degree of accuracy. But the amount of agricultural machinery introduced within the past ten years is sufficient to perform the labor of 100,000 agricultural laborers. Every new agricultural machine is met with a generous greeting, not by landed proprietors only, but strange and inconsistent as it may appear, is hailed as a treasure by the agricultural laborer himself. How striking is the contrast of the introduction of machinery for agricultural purposes in the United States, as compared with the attempt to do so in England in 1830. There, and at that time, the laborers organized themselves into companies, and proceeding from farm to farm, they destroyed all the agricultural machines, and a majority of the implements. The price of an agricultural machine appears to be of minor importance only, at the present time: the absolute scarcity of laborers compels the agriculturist to supply their place by machinery.

The Commissioner of Statistics has just ascertained that the number of reapers, mowers, drills and threshing machines made in 1857 by the principal manufacturers, was *eight thousand*, and the value exceeded a million of dollars. There were over one thousand threshers manufactured.

The steam thresher has proved very successful in Ross county. Its cost is $700, and performs labor equivalent to eighty men. "In the past autumn, one of these machines threshed out 36,000 bushels of wheat in one neighborhood, and its proprietor expected to accomplish as much more during the winter. The value of this application is in the saving of *time*, rather than of money. The use of the steam thresher saved the owner of a single farm a thousand dollars, by enabling him to market a large crop of wheat while the prices were yet high."—*Mansfield.*

The brief experience of the agriculturist with machines has convinced him of the following facts:

I. The machine will perform any given amount of labor in less time than the laborer could perform it.

II. It performs it much more uniformly—consequently better than a laborer.

III. It performs labor in the aggregate much cheaper than the laborer.

From the above statement the conclusion is that whilst the agriculturist economizes both time and money—which Dr. Franklin regarded as synonomous—he is, unconsciously perhaps, although certainly adopting an improved system of agriculture.

Whilst on the subject of agricultural labor and laborers, it may not be inappropriate to remark that the census of 1860 will present a much greater comparative disparity between the numbers of agriculturists in Ohio, and the numbers residing in villages, towns and cities, as compared with that of 1850, than did the latter as compared with the census of 1840. There is no evidence that the entire natural increase of the rural population have been transferred to towns and cities, and the proportion that has thus changed is very small, in comparison to the numbers which have supplied other demands on our agricultural population:

I. The war in Mexico received a just proportion of soldiers from Ohio.

II. The discovery of gold in California seduced from rural life and converted into a Californian, every one who had the means, the inclination and the health to encounter the incidents and dangers of a voyage thither.

III. The precariousness of regular or continued labor on the farm by employees, has induced every one who could command the means, to emigrate to the "*west*" to labor in his own "*vineyard*," and repose in the genial shade of his own "*fig-tree*."

IV. Railroads have made a more extensive demand for employees upon our rural population than did the entire Mexican war.

Hence, there is no just cause for surprise, that in 1857 agriculturists in Ohio, were compelled to employ machinery in harvesting, equivalent in extent to 50,000 laborers.

Were the landed proprietors in Ohio to adopt some system by which farm labor could be so regulated as to furnish employment throughout the entire year to farm laborers, there is no doubt that in the course of a few years laborers would again become abundant; because, many would prefer to remain in the immediate neighborhood of their nativity, than to emigrate. But under the present order of things, farm laborers can depend upon no longer period of employment annually, than from seven to eight months, and many only during haying and harvesting, and to assist in gathering corn and fruits.

A very large proportion of the arable soil of Ohio is clayey loam or stiff clay, which if properly and thoroughly underdrained would yield crops if not more ample, at least less precarious. The several counties in which underdraining has been practiced, uniform success in growing larger and healthier crops has crowned the effort. It would be well for agriculturists to employ laborers to underdrain, employ other laborers also to manufacture tile. An excellent Essay on Drainage, will be found in this volume, by Mr. J. BRADY, of Butler county, which discusses the subject in a clear and able manner.

The low price of western lands has caused many not farm laborers only, but small farmers, to seek a home in the west, where they, for the sum obtained for a few acres in Ohio, could obtain many acres of virgin soil. At the same time there is no place where the agricultural laborer is paid such high wages as in Ohio—except, perhaps, in California. In many instances the more wealthy farmers purchase the few acres from the smaller farmers, so that that which had been the homesteads of half a dozen families is now one farm only. In this respect the census of 1860 will show a much greater decrease of population in rural districts than the census of 1850. To what extent this system of depopulation is going on may be inferred from the following statement, taken from the census reports of 1840 and 1850, in my native county (Stark); although the aggregate population during the decade referred to, increased 5,116, but there is no doubt that the increase of town and village population during these years would greatly exceed the aggregate increase in the county; there certainly has been no increase in the rural population, and it is presumed that it is actually less in 1850 than in 1840. The following townships in Stark county, are of rather more than average fertility when grown in grain; they are well adapted to agriculture generally, and are among the best townships in the county. Annexed is the amount of inhabitants of each, in 1840 and 1850:

	1840.	1850.	Decrease.
*Jackson	1,547	1,500	47
*Osnaburg	2,333	2,225	118
*Sugar Creek	1,862	1,743	119
†Tuscarawas	1,792	1,714	78
†Perry	2,209	2,016	192
	9,743	9,198	545

In five townships in one of the best wheat counties in the State has the agricultural population decreased 545 between 1840 and 1850. A similar decrease in agricultural population has taken place in Wayne, and many other counties. Annexed is a table copied from the report of the Commissioner of Statistics, exhibiting at a glance, in the several counties, the distribution of land among holders.

*Including village population. †Excluding village population.

DISTRIBUTION OF LAND AMONG HOLDERS.

Counties.	Number of Acres.	Largest am't taxed to one man.	Average am't held by each man.	Counties.	Number of Acres.	Largest am't taxed to one man.	Average am't held by each man.
Adams	284,069	1,111	110	Licking	429,578	1,492	80
Allen	256,977	2,476	104	Logan	288,132	10,731	80
Ashland	268,811	660	64	Lorain.......	307,384	4,362	70
Ashtabula......	444,188	6,400	80	Lucas	208,595	12,140	....
Athens	306,669	7,950	124	Madison.....	287,744	6,214	125
Auglaize.......	247,419	2,866	75	Mahoning ...	265,989	1,680	83
Belmont	334,863	1,072	100	Marion......	254,232	7,417	128
Brown	306,223	4,632	82	Medina......	262,795	2,335	50
Butler	293,762	....	....	Meigs	261,266	5,159	110
Carroll.........	248,785	1,713	120	Mercer	279,730	2,900	116
Champaign	268,029	1,360	80	Miami.......	256,117	1,030	85
Clark..........	249,271	3,987	117	Monroe	289,005	1,038	70
Clermont.......	281,359	3,131	50	Montgomery..	287,008	771	91
Clinton	260,104	4,000	....	Morgan......	255,877	....	....
Columbiana	336,747	869	99	Morrow	253,759	600	80
Coshocton......	350,953	3,000	107	Muskingum .	419,048	6,734	101
Crawford	252,808	2,323	58	Noble	253,240	846	83
Cuyahoga	279,212	2,752	....	Ottawa	162,230	....	....
Darke	363,227	....	....	Paulding	223,817	4,320	143
Defiance	250,786	0,343	74	Perry	257,427	1,380	101
Delaware	248,598	1,447	78	Pickaway ..	310,966	4,500	146
Erie...........	156,325	2,871	....	Pike.......	208,409	3,200	80
Fairfield	314,571	1,627	84	Portage	315,966	1,412	70
Fayette........	250,497	....	....	Preble	268,421	1,297	110
Franklin.......	334,930	....	....	Putnam.....	284,244	2,950	....
Fulton.........	258,059	14,000	*46	Richland	311,971	640	75
Gallia	286,036	....	....	Ross	404,049	3,585	155
Geauga	256,416	1,288	65	Sandusky. ..	254,253	....	....
Green	254,148	1,805	101	Scioto	281,667	....	....
Guernsey	326,580	....	....	Seneca......	344,577	....	....
Hamilton	249,472	2,316	48	Shelby	254,702	1,128	80
Hancock	337,090	....	....	Stark	349,960	2,135	65
Hardin	290,970	10,300	110	Summit	261,616	....	....
Harrison.......	255,260	667	120	Trumbull....	395,933	....	....
Henry	254,807	....	....	Tuscarawas..	357,273	1,033	....
Highland	338,582	....	....	Union	269,351	....	....
Hocking	261,972	1,980	80	Van Vert....	254,442	2,534	120
Holmes........	268,979	1,689	116	Vinton	256,777	....	....
Huron.........	313,450	2,800	65	Warren......	253,117	4,160	98
Jackson	255,685	2,931	....	Washington .	390,732	5,500	110
Jefferson	257,317	1,683	126	Wayne......	339,693	....	....
Knox	334,879	836	104	Williams....	265,640	1,430	44
Lake..........	145,025	2,420	30	Wood	386,361	....	....
Lawrance......	279,188	....	....	Wyandotte...	255,440	....	....

Manures are attracting more attention than formerly, and the increased crops resulting from this cause have justly caused considerable investigation in this direction. Agricultural chemistry has not yet demonstrated whether organic or inorganic manures subserve the intended purpose best, nor which contribute most in a direct manner to the health and nutrition of the plant. It is not yet certain that plants assimilate organic, more readily than inorganic matter.

*There may be errors.

The following statement of the value of the annual agricultural products is not as authentic as could be desired, and consequently is scarcely an approximation to the truth. It is to be hoped that a law will be passed authorizing the assessors, or some other officers, to procure annually as correct returns of all the agricultural products as may be:

Wheat	$21,000,000
Corn	36,000,000
Hay	20,000,000
Oats	5,000,000
Potatoes	3,000,000
Seeds, timothy, flax, clover, and grass seeds	1,470,000
Tobacco	3,000,000
Vegetables	800,000
Fruit	1,000,000
Wine	400,000
Sundry articles, including beans, flax, wood, hops, rye, barley, buckwheat, &c., &c	12,000,000
Fat cattle	15,000,000
" hogs	10,000,000
Horses	8,000,000
Sheep	800,000
Wool	3,500,000
Cheese	2,000,000
Butter	8,180,000
Poultry	500,000
Eggs	1,600,000
Honey, sugar, beeswax, and molasses	650,000
Total annual products	$153,900,000

During the past ten years the live stock of Ohio has increased in valuation (as returned to the office of the Auditor of State) almost 200 per cent., but in no instance has any of the stock increased 100 per cent. in numbers. There are at least two causes—perhaps three—for this increased valuation:

I. A tax law which changed the assessment from a nominal, to an actual cash valuation.

II. An increased demand for all descriptions of live stock has considerably augmented the value.

III. The liberal encouragement by the State Board of Agriculture has no doubt caused animals of better strains or breeds to supersede, for almost all purposes, the native varieties.

The following tables exhibit the valuation of horses and cattle from 1836 to 1845; the valuation, together with the number of animals, from 1846 to 1857; also the number and valuation of sheep and hogs from 1846 to 1857:

NUMBER OF HORSES.

Counties.	1836.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
Adams......	3,562	6,080	5,949	5,760	3,450	6,267	6 324	6,723	6,863	7,008
Allen	1,189	3,788	3,488	3 618	2,659	5,182	5,566	5,257	5,438	5,148
Ashland	......	6,657	7,120	7,429	5 627	8,794	9,031	8,509	8,234	8,518
Ashtabula...	3,306	4,078	5,438	5,701	4,125	7,367	8,020	7,525	7,516	7,651
Athens......	2,681	4,407	3,916	3,862	2,586	4,800	5,242	5,035	5,296	5,529
Anglaize....	......	......	3,085	3,266	2,015	4,478	5,025	5,236	5,429	5,059
Belmont.....	1 618	9,780	9,656	9,687	7,695	11,468	11,368	11,198	11,192	10,491
Brown......	4,709	8,128	7,854	7,653	4,909	8,169	8,781	8,799	8,929	8,876
Butler	7,846	10,690	10,319	10,175	8,465	10,894	11,262	10,963	11,160	11 307
Carroll......	3,768	5,798	5,611	5,649	4,170	6,547	6,263	6,229	5,916	5,977
Champaign..	5,191	7,134	7,063	7,180	6,346	7,779	8,585	8,053	8,197	8,080
Clark.......	5,529	6,966	6.668	6,523	5,836	7,258	7,670	7,466	7,660	7,955
Clermont....	5,466	8 400	8,174	7,969	5,921	8.076	8,131	8,526	8,697	8,746
Clinton	4,421	6,832	6,601	6 586	6,002	7,836	7,683	7,999	7,874	8,299
Columbiana..	8,204	8,376	8,437	8,659	6,306	9,655	9,979	9,196	9,030	9,603
Coshocton ...	3,097	6,690	7,435	7,777	6,057	9,351	9,198	8,693	8,649	8,593
Crawford....	1,818	4,511	5,381	5,652	4,981	7,401	7,734	7,403	7,538	7,857
Cuyahoga ...	2,940	4,634	6,973	7,089	5,190	9,157	9,430	8,594	8,517	9,091
Darke	2,329	5,941	6,439	6,621	5,206	8,799	8,834	8,905	8,858	10,226
Defiance	......	850	1,265	1,480	884	2,040	2,488	2,617	2,623	2,712
Delaware....	3,823	8,196	6,814	7,134	5,393	8,562	8,635	8,292	7,932	8,000
Erie.........	......	2,986	3,894	4,009	4,195	4,988	4,921	4,644	4,817	4,822
Fairfield.....	7,549	10,292	10,413	9,857	8,730	11,451	11,963	12,170	11,643	11,099
Fayette.. ...	3,644	5,896	5,508	5,363	4,546	6,676	7,361	6,780	7,049	7,337
Franklin....	5,075	8,217	11,198	9,848	7,805	12,045	13,285	12,291	11 490	11,948
Fulton......	......	......	1,211	1,553	1,296	2,154	2,691	3,026	2,926	3,138
Gallia	2,256	4,078	3,787	3,844	1,839	4,000	3,901	4,453	4,584	4,917
Geauga......	4,050	2,983	4,243	4,493	3,237	5,382	5,239	4,827	4,994	5,118
Green.......	5,837	7,937	7,609	7,347	6,189	8,650	10,079	9,103	8,994	9,352
Guernsey....	5,534	9,653	9,299	8,101	5 139	8,944	9,269	8,799	8,615	8,444
Hamilton	8,396	11,587	12,017	17,971	9,407	13,220	14,625	14,010	13,413	13,913
Hancock	1,036	3,649	4,650	5,160	4,116	6,994	8,065	7,353	7,912	7,886
Hardin	......	1,878	2,440	2,480	1,907	3,654	4,033	3,989	3,726	3,851
Harrison	5,064	6,274	6,069	6,034	5,365	7,119	6,820	6,486	6,381	6,444
Henry	171	380	612	640	355	972	1,303	1,413	1,355	1,446
Highland ...	5,623	8,895	8,813	8.743	6,581	9,086	11,794	9,963	10,298	10,614
Hocking	1,161	3,202	3,572	3,187	1,919	4,660	4,906	4 864	5,012	5,088
Holmes	3,060	5,990	6 286	6,529	4,754	7,654	7 627	7,669	7,450	7,664
Huron.......	4,085	5,050	6,795	7,306	6,062	9,302	9,650	8,715	8,412	8,466
Jackson.....	1,791	3,658	3,153	3,529	1,837	3,724	4,095	4,045	4,335	4,013
Jefferson	......	6,758	6,311	6,332	5.138	6,997	6,844	6,517	6,457	6,597
Knox.......	5,843	9,629	8,132	8,272	6,328	10,319	10,235	9,668	9.601	9.711
Lake	......	2 593	3,282	3,318	2,636	3,961	3,982	3.780	3,758	3,793
Lawrence ...	1,343	2,518	2,885	2,610	1,052	2,564	2,730	2,812	2,811	2,900
Licking.....	6,900	11,306	12,143	12,188	8,212	12,880	13,100	13,330	12,311	5,340
Logan	3,211	5,712	6,394	6,639	5,331	7,646	8,074	7,405	7,875	7,716
Lorain	1,933	3,997	6,142	6,519	4,853	8,228	8,390	7,658	7,415	7,041
Lucas.......	555	2,285	1,815	1,900	1,498	2,654	3,007	3,123	3,231	3,160
Madison	3,419	4,623	4,734	4,384	4,231	5,690	5,609	5,994	5,883	5,906
Mahoning ...	......	6,128	7,020	7,000	5,831	8,068	8,008	7,823	7,633	7,509
Marion......	2.790	5,506	4,939	5,183	4,824	6,278	6,609	6,500	6,297	6,432
Medina	2,382	4,322	6,032	6,171	5,301	7,968	7,871	7,498	6,859	7,074
Meigs.......	1,639	2,892	3,044	2,893	1,602	3,495	3,804	3,900	4,007	4,270
Mercer..	761	2,327	2,408	2,560	1,472	3,741	4,196	4,613	4,555	4,686
Miami	4.717	7,262	7,499	7,417	6,756	8,465	8,874	8,963	8,542	8,237
Monroe	2,228	5,879	6,009	4,731	2,359	5,688	5,871	6,016	5 912	6,062
Montgomery .	6,532	10,201	9,980	10,057	9,010	11,026	10,896	10,386	10,537	11,609
Morgan	3,531	7,686	8,033	5,538	3,616	6,722	6,875	6,962	6,775	6,808
Morrow	......	......	6,439	6,630	5,282	8,584	8,813	8,136	7,899	8,132
Muskingum .	7,628	11,450	11,810	11,725	9 761	13,216	13,161	12,516	12,540	12,654
Noble	......	......	......	5,029	3,707	6,727	6,840	6,979	6,975	7,120
Ottawa	......	739	899	1,012	638	1,481	1,777	1,751	1,771	1,874

NUMBER OF HORSES—*Continued.*

COUNTIES.	1836.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
Paulding....	......	235	355	438	200	698	820	809	781	832
Perry	4,170	6,316	6,404	6,547	4,652	7,467	7,641	7,314	7,107	7,340
Pickaway ...	6,119	8,739	8,208	7,954	7,308	9,365	10,185	9,987	9,955	10,005
Pike	1,906	3,310	3,363	3,254	1,984	3,652	4,026	4,029	4,784	4,127
Portage	5,112	4,628	6,201	6,085	4,795	7,225	7,481	6,636	7,120	7,154
Preble	5,150	7,849	7 867	8,017	7,283	8,833	9,002	8,661	8,673	8,524
Putnam	540	2,068	1,938	2,101	1,513	3,042	3,436	3,551	3,435	3,432
Richland ...	8,320	9,828	8,954	8,503	7,433	10,187	10,411	9,904	9,707	10,124
Ross........	7,471	10,883	9,748	9,729	8,398	10,695	11,283	10,921	11,502	11,201
Sandusky ...	1,146	2,876	3,735	4,144	3,076	5,316	6,640	6,358	6,095	6,204
Scioto	2,145	3,882	3,853	3,705	2,185	3,626	3,730	3,690	3,745	4,754
Seneca	2,338	6,369	7,616	7,834	6,442	9,777	10,255	10,065	10,243	10,314
Shelby	1,180	3,870	4,384	4,484	2,823	5,705	5,905	6,302	5,748	5,999
Stark	......	9,637	10 268	11,090	9,314	12,356	12,263	11,784	11,971	11,981
Summit	......	4,864	5,841	6,193	5,182	7,109	7,139	6,497	6,434	6,564
Trumbull ...	8,161	5,924	7,144	7,310	5,855	8,668	9,526	8,754	8,829	8,713
Tuscarawas .	3,797	7,781	8,272	8,386	6,046	9,730	9,910	9,955	9,423	9,741
Union	1,688	3,376	4,432	4,337	3,364	5,632	5,889	5,891	5,746	5,889
Van Wert ...	......	676	1,063	1,203	766	1,792	2,174	2,450	2,199	2,247
Vinton	......	......	2,351	2,433	1,275	2,921	3,329	3,002	3,178	3,233
Warren	7,083	8,550	8,383	8,313	7,473	9,039	9,009	9,390	9,499	9,484
Washington .	2,471	4,910	5,219	5,316	2,759	5,860	6,313	6,317	6,522	6,867
Wayne	7,291	9,817	10,233	10,531	9,054	13,284	11,844	11,852	11,595	11,708
Williams....	......	788	1,284	1,496	808	2,210	3,019	3,055	3,112	3,095
Wood	439	1,568	2,146	2,348	1,438	3,300	3,954	4,396	4,601	4,197
Wyandotte ..	......	2,691	3,235	3,461	2,652	4,645	4,972	5,064	4,841	5,011
Total..	268,662	475,788	513,652	517,396	402,695	615,085	632,598	624,746	621,443	630,659

Value of horses in	1836	$10,746,480
" " "	1846	15,005,263
" " "	1850	19,142,789
" " "	1851	20,337,442
" " "	1852	16,863,796
" " "	1853	27,844,619
" " "	1854	32,512,983
" " "	1855	31,415,004
" " "	1856	36,231,127
" " "	1857	39,409,890

NUMBER OF CATTLE.

Counties	1836.	1846.	1850.	1851.	1852	1853.	1854.	1855.	1856.	1857.
Adams	4,188	8,012	8,520	8,906	7,434	13,554	15,101	16,348	15,734	16,449
Allen	2,042	6,379	6,758	7,182	6,650	12,680	14,370	15,029	14,880	13,291
Ashland	......	14,397	13,629	14,672	13,758	19,762	23,233	23,144	20,434	22,965
Ashtabula	12,932	22,203	36,141	33,803	29,662	43,206	44,128	43,437	39,765	38,509
Athens	5,105	9,590	10,285	9,581	8,652	16,943	17,359	17,960	16,673	15,499
Auglaize	......	......	6,746	6,440	5,417	11,745	13,424	15,142	13,930	12,436
Belmont	8,889	12,749	14,395	15,287	15,855	23.620	24,020	24,368	22,966	23,164
Brown	5,280	9,584	10,344	10,406	9,986	17,035	19,397	19,635	18,022	8,995
Butler	8,151	12,496	12,618	13,044	15,360	20,095	20,913	20,914	19,829	18,252
Carroll	5,731	9,868	10,499	10,682	8,294	14,622	15,640	14,481	12,339	13,893
Champaign	6,845	11,411	12,232	12,517	16,566	20,711	23,332	23,379	21,958	21,204
Clark	7,263	14,392	13,764	11,943	17,319	19,581	21,803	21,064	19,957	18,945
Clermont	6,360	10,732	10,761	11,127	11,172	15,410	16,855	18,009	16,776	16,091
Clinton	5,113	9,361	11,751	11,905	16,906	21,052	21,577	20,434	18,839	31,956
Columbiana	13,123	14,061	15,637	16.209	14,097	21,803	23,876	20,609	17,170	21,516
Coshocton	5,823	12,503	14,404	16,045	15,305	21,890	22,796	23 362	22,296	21,253
Crawford	4,992	11,320	13,936	14,069	14 243	21,188	23,221	24,113	22,386	21,286
Cuyahoga	9,205	14,040	20,592	18,922	16,500	27,480	26,985	25,687	24,238	26,340
Darke	2,974	9,810	10,486	10,641	11,474	19,717	24,012	24,850	21,978	20,186
Defiance	......	2,404	3,400	4,650	2,898	7,020	8,533	9,522	9,121	9,289
Delaware	6,914	14,192	13,150	13,570	13,539	21,927	23,456	23,846	22,764	20,257
Erie	......	8,782	9,355	9,592	9,089	10,219	10,415	10,908	11,003	11,107
Fairfield	9,116	17,382	17,910	17 566	22,626	29,742	31,430	28,009	27,393	25,293
Fayette	6,512	11,924	16,233	15,409	21,626	24,437	25,067	22,514	23,805	23,007
Franklin	6,426	13,594	14,700	14,849	16,217	23,288	25,765	24,412	21,743	21,547
Fulton	......	7,792	5.512	7,116	3,445	8,979	9,929	12,039	11,114	10,963
Gallia	3,727	13,800	7,675	7,529	5,429	10,773	11,931	14,147	13,727	13,967
Geauga	14,144	......	24,153	23,008	22,490	32,068	32,436	30,202	31,613	31,982
Greene	6 541	10,599	12,289	12,146	17,384	22,800	22,051	23,231	21,796	20,311
Guernsey	6,725	14,412	15,029	14,163	11,562	19,425	12,196	21,701	20,336	20,149
Hamilton	8,843	12,202	12,102	12,720	11,359	15,097	18,060	17,363	17,544	16,857
Hancock	2,290	6,878	8,893	9,887	9,710	18,720	22,536	23,468	22,139	21,135
Hardin	......	3,674	5,043	4,538	4 622	9,912	11,757	12,287	11,704	11,340
Harrison	6,162	9,095	10,240	10,638	12,099	15,711	14,585	14,739	13,337	14,012
Henry	468	1,503	2,243	2,210	935	3,955	5,056	5,958	5,071	4,962
Highland	5,689	10,601	12,676	13,393	15,931	21,627	23,972	25,493	25,359	24,534
Hocking	1,785	5,940	7,204	7,030	4,494	11,371	12,385	12,164	11,274	11,849
Holmes	4,828	11,712	12,341	13,188	10,343	19,325	19,456	21,590	20,334	20,055
Huron	12,356	14,631	18,635	19,282	17,406	27,004	30 251	27,954	25,293	24,498
Jackson	3,054	8 927	7,450	9,092	7,024	12.932	12,184	16,063	13,590	13,510
Jefferson	......	9,559	10,368	11,241	10,988	14,456	14,819	13,830	12,810	13,645
Knox	8,059	15,756	13,766	11,949	13.214	20,505	22,504	23,838	23.624	23,066
Lake	......	8,790	12,006	10,379	9,561	13,698	15,219	14,575	13,823	13,123
Lawrence	2,281	6,143	6,187	5,429	3,968	9,047	10,129	10,491	10,797	11,233
Licking	9,471	19,850	20,713	21,932	22,454	32,969	34,606	34,855	31.798	32,321
Logan	4,110	8,750	10,201	10,746	12,328	17,099	20,444	28,215	19,929	18,467
Lorain	7,228	15,240	22,000	23,132	18.106	31,593	32,491	32,765	30,144	31,380
Lucas	1,491	8,813	4,723	5,076	3,006	7,386	7,844	8,187	7,425	7,011
Madison	11,828	18,833	21,993	15 142	25,459	28,970	24,950	22,245	25,363	21,987
Mahoning	......	12,413	17,352	17,149	17,235	23,829	24,503	22,978	20 589	21,298
Marion	6,980	11,973	12,333	11,428	13,893	17,279	20,245	21,169	20,982	18,147
Medina	9,242	14,621	20,423	19,813	18,080	27,373	27,076	26,027	23,196	25,455
Meigs	3,198	6,728	7,492	7,573	5,089	12,120	13,764	14,129	13,318	12,986
Mercer	1,646	5,512	5,040	5,024	3,417	8,940	9,806	11,649	11.109	10,794
Miami	5,010	10,810	10,926	10,919	13,565	17,687	20,236	19,245	17,812	16,655
Monroe	3,366	9,342	11,037	8,916	5,186	14,262	14 899	16,076	16,146	15,782
Montgomery	7,226	14,665	14.150	13,893	15,600	20,224	21,201	21,013	19,566	19,822
Morgan	4,980	11,632	13,539	10,029	8,689	17,664	19 49[illegible]	18,849	18,028	17,624
Morrow	......	......	12,543	13,059	13,797	22,446	25 986	25,036	21,983	22,768
Muskingum	9,869	18,260	20,924	21,640	24,204	30,813	33,901	32 786	30,862	30,857
Noble	......	......	......	8,504	8,718	16,815	19,045	20,244	19,450	19,497
Ottawa	......	2,620	2,832	3,520	1,995	4,185	4,668	5,396	4,083	4,380
Paulding	......	689	980	1,290	727	2,681	2,735	3,221	3,056	3,390
Perry	4,879	10,357	11,113	11,898	12 932	19,141	21,331	19,734	18,735	17,213

NUMBER OF CATTLE—*Continued.*

COUNTIES.	1836.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856	1857.
Pickaway ..	14,637	16,994	26,227	27,267	26,737	27,720	29,985	28,336	33,565	26,289
Pike	3,354	5,553	5,690	5,478	4,836	8,322	8,791	9,865	10,089	10,336
Portage	20,294	19,859	29,110	27,576	27,526	38,177	36,260	34,140	33,186	34,336
Preble	5,817	11,438	10,916	11,114	15,117	20,556	21,713	21,910	20,821	18,395
Putnam	1,018	5,076	4 208	4,819	3,868	9,170	10,780	12,038	10,073	10,542
Richland ...	18,555	17,540	16,786	17,742	16,254	23,650	25,801	27,173	26,976	24,560
Ross	14,402	17,369	23,624	22,477	23,668	26,632	28,548	29,297	30,524	25 981
Sandusky ..	3 879	8,707	9,387	10,126	6,412	17,049	25,573	19,374	19,035	18,176
Scioto......	3,229	6,827	6,742	6,765	5,021	9 449	10,350	11,344	12,508	11,568
Seneca	5,587	14,212	15,208	15,820	14,340	26,450	26,683	27,463	25,880	25,363
Shelby	2,310	6,968	7,536	7,854	6,322	12,773	15,081	15,466	13,643	12,529
Stark	......	18,637	20,767	21,781	22,394	30,268	33,325	32,303	28,523	30,264
Summit	......	14 017	18,675	19,041	19,142	25,089	24,268	22,868	20,788	22,497
Trumbull...	24,496	23,380	36,134	35,233	32,618	45,989	48,035	43,771	41,618	42,126
Tuscarawas	6,300	15,358	16,450	18,205	14,323	24,299	27,177	30,069	25,838	21,311
Union......	2,723	6,324	9,176	9,707	9,247	13,871	14,562	16,256	15,368	13,915
Van Wert...	....	1,845	3,033	3,407	2 331	5,966	7,149	7,729	7,423	7,300
Vinton	......	......	6,789	6,241	5,360	9,779	10,238	10,607	10,049	10,770
Warren	7,353	11,924	11,984	12 340	14,832	20,265	20,599	19,706	17,837	17,787
Washington	5,124	10,216	11,962	12,121	8,926	18,270	19,097	20,866	20,509	20,106
Wayne	11,726	19,415	19,953	20,776	20,758	28,009	30,873	31,180	28,449	29,978
Williams ...	......	3,278	5,304	5,858	1,975	8,178	11,165	12,504	10,788	11,690
Wood	1,616	6,184	6,421	7,038	4,309	12,030	13,653	14 985	12,924	12,233
Wyandotte.	......	5,666	8,365	9,185	9,816	14,636	15,661	15,812	16,344	15,698
Total......	372,866	920,995	1,103,811	1,116,145	1,093,218	1,646,195	1,772,667	1,791,189	1,687,710	1,655,415

Value of Cattle in 1836.. $2,982,928
" " " 1846.. 7,572,123
" " " 1850.. 11,315,560
" " " 1851.. 11,382,950
" " " 1852.. 10,097,858
" " " 1853.. 17,646,810
" " " 1854.. 20,995,680
" " " 1855.. 18,902,006
" " " 1856.. 21,175,070
" " " 1857.. 21,662,223

NUMBER OF SHEEP.

COUNTIES.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
Adams	20,379	19,632	18,397	10,773	19,182	21,807	24,009	22,319	19,489
Allen	11,168	11,320	12,114	8,900	17,516	18,069	18,245	15,902	14 542
Ashland	53,686	77,395	79,837	65,301	89,953	113,081	86,301	68,295	63,290
Ashtabula	56,324	46,197	35,242	26,056	41,786	52,208	47,454	38,945	39,157
Athens	42,458	38,307	34,424	26,342	34,759	36,297	38,342	30,727	25,495
Auglaize	......	8,340	8,463	4,464	12,323	14,584	14,934	12,231	11,337
Belmont	68,128	70,480	65,810	51,009	70,276	73,143	71,342	58,670	56,844
Brown	27,289	19,022	16,922	11,853	21,689	26,045	27,275	22,652	20,918
Butler	23,535	12,447	9,515	8,298	9,095	10,253	10,073	7,958	6,364
Carroll	57,271	79,804	77,841	57,231	78,870	86,531	80,510	69,569	73,877
Champaign	41,339	43,436	44,262	47,970	50,833	65,863	55,551	46,865	40,081
Clark	58,135	54,902	47,445	57,616	73,852	79,446	61,900	51,206	44,469
Clermont	26,604	18,204	15,645	12,106	13,842	17,568	16,917	14,033	12,552
Clinton	36,544	43,638	47,981	58,402	72,713	77,644	67,186	54,287	43 224
Columbiana	96,978	120,938	106,730	75,117	100,296	134,178	97,845	82,537	93,402
Coshocton	47,009	61,279	61,924	49,007	65,767	79,252	84,421	67,517	50,723
Crawford	37,447	55,818	68,878	70,177	71,259	111,742	90,661	64,186	52,842
Cuyahoga	51,573	79,596	59,056	43,163	60,860	60,183	54,180	69,761	39,293
Darke	1,519	22,164	19,921	15,243	23,731	26,950	25,642	20,057	18,464
Defiance	20,221	2,198	3,002	1,470	4,420	5,579	6,434	5,788	6,647
Delaware	60,995	47,861	51,007	45,389	66,415	77,550	68,504	57,313	52,003
Erie	39,570	53,461	57,099	50,502	53,260	59,409	51,241	42,381	35,116
Fairfield	41,101	48,927	43,911	47,243	61,293	71,631	60,869	45,287	40,228
Fayette	36,868	41,567	38,269	46,109	54,953	65,846	53,451	44,702	42,111
Franklin	29,612	29,496	26,811	24,151	32,155	39,698	35,842	26,055	22,307
Fulton	......	8,081	10,006	5,726	9,467	11,556	15,718	13,146	12,712
Gallia	20,233	19,209	17,237	8,331	18,075	20,348	20,599	19,771	19,556
Geauga	51,873	69,457	47,830	31,746	42,502	51,049	45,328	38,135	31,343
Greene	47,159	38,225	36 661	43,531	50,200	65,407	48,369	41,298	34,165
Gu·rnsey	66,678	79,473	66,136	46,511	75,714	93,686	93,661	76,507	69,423
Hamilton	13,447	7,597	4,772	5,927	5,063	7,913	5 340	4,429	3,950
Hancock	16,665	19,564	20,117	14,877	31,720	40,256	41,234	31,102	32,199
Hardin	5,477	6,316	7,072	5,741	13,557	15,160	15,237	12,058	11,517
Harrison	97,623	121,206	112,103	109,351	118,768	131,714	130,377	128,797	125,297
Henry	584	1,266	1,033	411	1,525	1,763	2,196	1,475	1,620
Highland	36,637	32,711	27,925	26,419	36,919	38,014	34,604	29,046	21,969
Hocking	14,260	28,666	17,560	6,545	17,870	17,975	16,968	15,726	16,981
Holmes	34,378	51,918	50,983	33,389	53,980	62,705	64,975	53,922	56,883
Huron	51,248	78,995	82,741	67,229	94,833	127,748	93,456	70,453	67,628
Jackson	18,912	18,093	16,154	8,783	15 575	16,618	16,933	15,499	14,197
Jefferson	84,673	106,638	104,653	82,901	89,702	99,051	84,143	80,466	89,871
Knox	69,596	85,794	89,711	85,751	105,307	115,489	114,078	95,576	82,092
Lake	35,435	40,189	29,130	21,809	31 346	36,739	34,838	25,321	27,032
Lawrence	9,212	8,158	6,710	2,408	6,637	7,339	7,533	7,546	6,915
Licking	85,732	123,715	125,825	123,714	162,470	233,300	196,761	157,405	153,570
Logan	29,299	34,926	31,249	26,284	34,442	42,258	40,919	30,651	27,738
Lorain	56,332	88,431	80,880	50,253	83,787	96,214	85,262	65,592	69,816
Lucas	10,859	6,802	8,922	5,796	6,798	9,749	9,239	6,107	5,233
Madison	41,372	43,489	51,818	57,970	82,061	87,782	76,821	65,684	57,568
Mahoning	87,191	99,931	84,015	60,698	83,703	91,921	80,025	67,801	70,453
Marion	44,870	49,238	70,907	85,775	86,655	112,079	82 545	52,517	46,003
Medina	57,262	107,934	401,859	86,169	111,888	127,605	106,344	80,777	77,745
Meigs	21,396	20,533	18,591	10.806	19,649	21,519	19,421	15,994	14,244
Mercer	4,754	5,303	5,702	2,817	7,778	7,408	8,208	7,172	7,687
Miami	29,405	25,789	22,722	21,474	23,119	24,454	23,253	18,678	17,150
Monroe	25,943	28.040	19,852	7,988	20,702	21,977	22,515	20,492	18,862
Montgomery	26,911	19,961	18,554	15,676	16,388	16,482	15,816	11,618	10,596
Morgan	46,656	58,689	36,604	25,811	40,659	51.055	47,916	39,026	35,559
Morrow	......	60,689	65,849	62,468	105,051	129,722	101,534	72,322	64,361
Muskingum	62,532	80,642	78,051	70,987	86,044	106.107	97,810	83,225	79,400
Noble	......	......	28,907	24,387	41,801	53,736	48,648	36,625	32,142
Ottawa	6,297	7,690	10,302	9,280	12,160	14,396	14,382	11,173	10,936
Paulding	267	455	460	324	559	819	810	735	940

NUMBER OF SHEEP—*Continued.*

Counties.	1846	1850.	1851.	1852	1853.	1854.	1855.	1856.	1857.
Perry	38,149	52,637	44,448	38,542	48,580	63,251	54,712	46,994	45,257
Pickaway	26,443	28,156	25,236	24,038	27,437	26 778	26,356	19,681	18,151
Pike	10,467	11,145	9,673	6,071	9,308	9,903	11,583	10,895	11 380
Portage	84,422	116,551	90 249	70,852	89,823	93,365	80,589	72,146	64,061
Preble	30,527	24,505	21,793	22,612	26,026	29 252	25,252	18,398	13,802
Putnam	6,444	5,665	6,436	5,018	9,528	10,089	11,917	9,376	9,793
Richland	58,714	70,599	72,764	63,066	87 663	103,415	96,341	74,131	63,689
Ross	29,534	26,653	23,617	20,227	25,097	26,255	25,340	21,212	18,314
Sandusky	17,951	24,982	28,059	15,498	31,861	39,246	34,618	27,093	26,883
Scioto	12,328	10,761	9,152	4,141	8,170	8 568	8,884	8,654	8,783
Seneca	46,349	64 113	69,972	61,674	91,144	113,598	104,489	80,191	77,564
Shelby	12,672	16,396	14,952	10,124	17,674	21,167	20,882	15,456	15,140
Stark	75,717	96,227	90,937	73,373	83,591	95,555	89,830	69,151	65,478
Summit	67,427	9,863	79,878	62,196	77,520	83,106	75,965	54.871	48,318
Trumbull	89,604	73,016	60,387	46,552	60,319	67,171	65,810	57,935	57,457
Tuscarawas	52,974	77,273	76,129	50,212	70,385	81,916	86,957	69,456	72,591
Union	14,710	22,909	23,605	23,580	33,439	40,526	40,973	28,539	21,706
Van Wert	1,183	2,193	2,542	1,483	3,932	4,161	4,462	4,154	4,039
Vinton	......	15,314	14,155	7,132	16,293	15,376	15 783	14,627	13,967
Warren	32 175	25,961	21,658	22,234	24,026	30,197	25.510	22,541	17,629
Washington	38,534	41,558	38,394	27,949	39,129	37,768	38,104	32,875	30,537
Wayne	64,772	88,463	87,317	67,346	108,517	103,043	90,175	67,586	61.109
Williams	2,239	4,595	5,402	1,325	7,963	10,585	12.609	10,547	10,760
Wood	6,249	7,067	8,048	4,870	10,886	14,362	14,763	10,024	9,594
Wyandotte	25,402	34.463	41,573	50,633	56,567	60,846	63,111	53,018	46,419
Total	3,141,946	3,812,707	3,619,674	3,059,796	4,104,450	4,845,189	4,337,943	3,513,680	3,276,539

Value of Sheep	in 1846	$1,758,433
" "	" 1850	1,984,983
" "	" 1851	2,060,012
" "	" 1852	3,581,385
" "	" 1853	6,448,391
" "	" 1854	8,031,854
" "	" 1855	5,664,829
" "	" 1856	5,009,410
" "	" 1857	5,357,275

NUMBER OF HOGS.

Counties.	1846.	1850.	1851.	1852.	1853	1854.	1855.	1856.	1857.
Adams	21,133	23,605	20,650	15,869	32,893	38,670	33,113	31,524	35,060
Allen	11,744	12,741	13,162	8,426	22,699	29,985	25,518	16,935	22,992
Ashland	17,341	21,612	19,563	13,279	30,151	36,836	24,736	21,239	27,585
Ashtabula	5,796	5,922	5,129	3,897	8,026	8,778	5,733	5,301	5,962
Athens	11,957	12,911	10,663	9,890	20,433	18,927	18,393	15,113	19,428
Auglaize	......	11,973	10,414	5,919	18,782	27,588	24,569	16,283	20,792
Belmont	25,405	28,355	22,537	20,742	36,346	37,334	30,512	28,768	36,172
Brown	29,412	33,093	30,823	25,182	50,669	59,409	44,188	37,358	44,874
Butler	54,077	52,467	41,515	51,362	66,249	66,695	53,137	47,399	49,566
Carroll	12,533	14,584	12,405	7,608	15,340	16,265	11,111	10,931	14,119
Champaign	19,494	23,220	17,243	21,358	31,308	38,956	27,509	23,840	30,670
Clark	19,492	21,490	17,967	18,168	28,546	36,982	29,240	24,606	29,327
Clermont	31,659	30,382	38,477	40,633	60,716	59,307	46,540	45,474	45,768
Clinton	26,188	33,240	29,146	38 670	55,288	51,115	39,508	36,213	52,614
Columbiana	17,096	18,025	14,443	13,122	23,859	28,289	16,028	16,826	20,042
Coshocton	17,728	25,501	21,539	20,209	40,064	47,037	34,916	32,008	36,189
Crawford	15,099	20,262	18,386	15,508	34,378	44,313	30,232	22,901	31,714
Cuyahoga	7,048	10,147	8,400	5,183	9,600	10,755	7,337	7,014	8,337
Darke	3,820	30,652	23,246	22,434	45,010	58,383	44,682	36,477	41,467
Defiance	22,280	5,771	6,090	2,178	10,174	12,921	13,788	10,199	15,373
Delaware	22,949	24,010	18,192	16,053	49,165	49,096	34,612	25,838	36,442
Erie	6,718	6,935	7,812	6,391	11,057	12,041	7,349	6,657	8,969
Fairfield	30,214	34,613	26,891	31,766	58,921	61,100	40,948	38,696	47,260
Fayette	20,768	25,685	23,664	31,738	44,154	52,852	36,082	34,439	48,318
Franklin	33,568	43,323	35,722	32,313	68,475	75,621	55,683	39,724	55,241
Fulton	......	5,113	5,338	1,550	6,478	8,266	8,874	6,032	9,167
Gallia	11,315	11,031	9,424	6,154	18,382	17,199	14,813	15,607	19,786
Geauga	4,425	5,247	4,328	2,814	5,998	6,402	3,676	3,554	3,917
Greene	25,769	32,546	26,907	33,118	45,290	49,270	38,316	35,244	46,135
Guernsey	22,442	26,386	18,311	11,266	24,801	27,903	23,139	19,302	22,954
Hamilton	31,494	30,756	25,717	30,309	46,726	62,694	39,251	39,274	42,898
Hancock	13,935	16,524	17,795	9,502	30,287	42,219	31,679	20,238	31,420
Hardin	7,062	9,050	10,163	5,402	16,774	24,833	18,142	13,100	17,491
Harrison	14,877	19,131	14,733	13,509	20,620	19,916	14,587	13,057	16,590
Henry	1,434	3 971	2,777	647	5,691	7,727	7,732	4,369	7,469
Highland	28 444	37,762	35,589	43,959	61,578	69,963	56,261	51,418	63,397
Hocking	8,255	12,481	9,508	5,523	20,586	22,784	18,316	16,127	20,941
Holmes	14,227	19,104	17,786	10 235	23,717	28,451	24,654	20,960	27,464
Huron	12,729	15,763	14,389	11,362	29,007	38,831	21,555	16,055	20,655
Jackson	10,532	10,954	9,205	7,406	17,540	17,678	17,059	16,307	17,586
Jefferson	17,071	19,430	14,743	11,732	19,025	20,131	16,423	11,558	15,919
Knox	19,340	19,092	19,236	13,072	28,462	39,950	29,596	25,188	34,192
Lake	4,067	3,746	2,822	2,040	4,675	5,392	3,391	2,744	3,337
Lawrence	10,020	10,391	9 134	4,476	17,666	18,563	17,815	16,899	17,723
Licking	26,893	28,123	22,112	21,206	43,190	55,135	36,565	29,764	49,828
Logan	14.414	19,391	15,451	11,672	27,605	34,349	25,530	19,239	24,160
Lorain	8,326	11,193	9,950	4,422	11,758	14,891	9,688	7,900	9,862
Lucas	7,155	4,348	5,044	2,632	6,046	7,994	7,331	4,991	6,058
Madison	15,355	19,634	15,880	19,921	33,706	30,815	26,592	17,755	29,824
Mahoning	10,937	12,349	11,003	8,473	14,374	16 640	11,273	11,511	12,975
Marion	18,025	19,731	17,216	12,019	29,687	39,908	28,498	20,112	29,359
Medina	9,428	12,345	9,803	8,263	16,264	19,052	10 491	9,507	11,175
Meigs	7,990	7,627	7,209	4,523	14,624	16,631	13.996	13,273	16,225
Mercer	10,114	11,347	10,156	5,030	20,032	24,670	25,859	18,372	20,120
Miami	22,075	23,373	21 513	25,026	51,164	44,629	31,358	30,070	40,679
Monroe	17,666	22,221	12,495	5,499	21,132	22,895	16 763	16,278	18,036
Montgomery	31,690	33,386	31,921	29 540	48,373	51,324	39,889	37,257	45,204
Morgan	19,298	23.454	12,521	8,874	24,609	31,495	24.337	22,030	23,965
Morrow	......	15 455	13,964	10,489	31,908	42,534	26,819	19,895	27,223
Muskingum	30,760	33,087	27,439	27,311	45,700	52,558	37,951	34,862	43,137
Noble	......	......	12,793	8,528	23,368	28,220	20 537	18,733	21,934
Ottawa	3,470	4,347	4,435	1,718	5,821	7,984	6,964	4,836	7.434
Paulding	1,574	2,119	2,254	775	3,808	5,869	6,512	3,876	5,232

NUMBER OF HOGS—*Continued.*

Counties.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
Perry	18,572	20,299	15,804	14,673	30,615	35,129	24,561	21,827	27,953
Pickaway	33,769	43,453	38,674	42,381	60,452	69,326	47,884	43,088	55,888
Pike	13,505	16,477	14,514	16,018	28,480	28,594	28,206	25,769	25,950
Portage	8 113	9,500	7,610	5,537	10,732	21,218	7,058	7,066	7,933
Preble	30,969	37,238	31,799	38,646	55,010	57,557	45,162	35,688	41,381
Putnam	7,815	8,648	8,594	4,336	14,284	19.487	19,469	13,510	17,851
Richland	23,772	23.649	23,102	20,729	33,598	40,129	31 743	25,804	31,296
Ross	46,868	56,205	46,018	62,905	89,362	87,833	67,973	60,694	72,712
Sandusky	11,553	13,014	14,684	5,516	21,614	29,334	21,690	15,173	22,484
Scioto	10,896	12,119	10,633	8,668	20,869	21,155	20,954	20,144	19,516
Seneca	21,020	23,726	21,896	15,259	37,233	44,985	34,912	24,943	36,578
Shelby	12,611	14,920	12,100	8,153	22,196	30,797	25,036	18,137	24,963
Stark	23,383	27,548	25,948	21,968	36,807	43,918	29,721	28,048	33,164
Summit	11,112	12,528	10,782	9,260	17,604	16,992	11,308	10,200	13,265
Trumbull	10,424	10,028	8,374	5,153	10,803	12,574	8,673	8,234	9,668
Tuscarawas	19,155	24,916	21,358	15,113	32,703	41,451	32,523	27,178	34,944
Union	11,735	17,716	14,195	9,058	20,110	28,846	26,390	14,055	19,614
Van Wert	3,426	6,690	6,201	2,490	12,411	16,741	15,983	10,968	14,369
Vinton	......	8,529	6,203	4,651	12,132	13,657	12,716	12,289	14,993
Warren	36,144	35,839	28,305	34,314	47,397	51,152	37,166	31,642	37,519
Washington	12,448	12,669	11,268	6 995	19,960	21,522	18,998	18,091	20,420
Wayne	22,945	27,195	24,794	19,472	33,432	39,997	29,605	25,050	32,856
Williams	4,005	6,682	6,426	1,048	8,968	16,032	14,226	9,780	13,154
Wood	6,950	7,807	8,759	2,120	13,231	15,411	14,246	8,610	13,899
Wyandotte	7,775	12,348	12,840	7,288	20,284	28,158	21,870	15,489	23,356
Total	1,405,094	1,672,178	1,450,643	1,299,746	2,498,792	2,887,015	2,195,769	1,851,124	2,331,778

Value of Hogs in	1846	$2,238,876
" " "	1850	1,902,029
" " "	1851	2,297,229
" " "	1852	3,081,981
" " "	1853	5,624,790
" " "	1854	5,558,487
" " "	1855	3,531,562
" " "	1856	5,268,008
' " "	1857	6,772,470

NUMBER OF MULES.

Counties.	1846.	1850.	1851.	1852.	1853	1854.	1855.	1856.	1857.
Adams	7	22	5	12	29	57	127	74	82
Allen	...	5	...	2	3	6	3	13	45
Ashland	8	3	3	...	...	6	18	42	73
Ashtabula	40	16	24	17	14	15	22	22	22
Athens	6	...	...	1	8	6	16	15	10
Auglaize	...	22	18	42	60	83	91	64	64
Belmont	...	30	25	19	39	44	54	55	59
Brown	...	26	35	30	74	143	146	172	127
Butler	11	25	22	47	48	96	154	169	161
Carroll	9	7	11	8	4	7	7	5	3
Champaign	88	95	67	73	78	114	112	154	211
Clark	55	115	99	179	138	153	146	129	104
Clermont	52	65	54	65	75	113	170	259	327
Clinton	32	112	112	112	78	71	90	49	120
Columbiana	9	8	20	38	42	37	30	28	63
Coshocton	...	7	7	5	1	2	3	5	9
Crawford	...	...	...	1	2	5	8	19	50
Cuyahoga	3	4	1	1	3	4	9	21	28
Darke	1	2	2	6	14	23	29	76	52
Defiance	...	2	3	2	1	...	4	9	13
Delaware	43	12	17	33	53	65	84	82	73
Erie	15	...	...	2	3	2	1	...	4
Fairfield	3	30	39	126	70	253	222	105	103
Fayette	32	125	124	160	74	173	207	118	150
Franklin	85	134	161	125	83	48	62	92	116
Fulton	...	1	1	1	1	1	...	1	4
Gallia	17	21	32	43	66	32	40	46	48
Geauga	2	7	12	7	20	26	10	30	27
Greene	23	75	49	154	140	130	123	151	171
Guernsey	7	23	69	30	27	17	21	2	16
Hamilton	41	31	25	25	55	106	190	360	455
Hancock	...	2	1	1	1	1	8	11	18
Hardin	4	4	3	4	10	72	87	43	46
Harrison	6	14	20	39	33	27	28	32	26
Henry	2	4	5	8	5	8	5	3	7
Highland	19	62	77	50	53	157	196	288	216
Hocking	1	...	...	...	10	31	42	39	38
Holmes	1	8	8	7	2	14	38	36	48
Huron	6	15	13	5	6	12	35	39	24
Jackson	21	22	10	18	20	41	58	78	78
Jefferson	3	2	3	3	18	7	8	5	7
Knox	7	9	2	14	17	2	1	7	9
Lake	4	6	3	...	2	1	...	...	3
Lawrence	86	67	67	53	58	69	77	124	167
Licking	12	17	13	50	16	16	32	38	30
Logan	...	56	24	36	79	151	236	224	241
Lorain	9	8	10	28	36	63	86	93	138
Lucas	...	3	2	...	2	2	10	13	26
Madison	140	174	247	216	138	301	397	347	339
Mahoning	16	16	16	34	51	70	71	127	151
Marion	152	71	4	...	11	5	8	6	19
Medina	...	2	...	3	7	17	36	68	72
Meigs	7	27	15	17	37	42	37	49	48
Mercer	...	2	7	10	8	25	23	38	35
Miami	...	4	5	114	210	152	146	157	135
Monroe	3	14	17	11	16	14	17	12	10
Montgomery	8	10	5	8	9	5	21	34	55
Morgan	5	7	9	5	10	12	10	15	27
Morrow	...	14	2	11	30	15	14	10	13
Muskingum	22	31	37	67	87	59	53	60	47
Noble	...	...	1	...	1	2	3	6	12
Ottawa	...	...	1	1	1	...	...	...	...
Paulding	...	...	...	1	1	1	1	2	2

NUMBER OF MULES—*Continued.*

COUNTIES.	1846.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
Perry	....	12	7	12	49	13	24	38	24
Pickaway	7	5	28	114	118	376	129	42	70
Pike	18	7	10	18	23	16	31	78	121
Portage	35	36	9	45	39	71	19	24	27
Preble	11	61	2	18	18	33	53	43	71
Putnam	2	....	......	2	8	4	3	3	5
Richland	6	16	14	18	31	29	30	20	31
Ross	40	50	157	133	96	134	161	178	165
Sandusky	4	1	......	3	5	......	......	2	6
Scioto	93	82	74	87	93	102	135	175	227
Seneca	4	....	......	2	12	16	25	30	28
Shelby	6	52	38	66	71	125	64	46	51
Stark	11	7	6	12	14	12	13	20	66
Summitt	9	....	1	12	15	15	19	26	43
Trumbull	46	24	41	34	42	61	79	130	202
Tuscarawas	11	17	15	18	23	26	32	28	22
Union	63	80	33	132	123	208	231	243	216
Van Wert	....	6	2	10	12	7	6	15	15
Vinton	....	3	2	7	10	11	10	16	32
Warren	14	16	......	20	3	11	53	58	92
Washington	....	....	......	25	89	34	20	39	42
Wayne	....	8	......	16	42	78	95	114	134
Williams	1	1	......	......	......	10	5	4	7
Wood	1	....	......	5	9	10	10	7	3
Wyandotte	4	4	......	13	3	70	85	60	165
Total	1,516	2,180	......	3,002	3,222	4,704	5,315	5,750	6,742

Value of Mules in 1846	$57,562
" " " 1850	86,828
" " " 1851	......
" " " 1852	125,925
" " " 1853	159,538
" " " 1854	255,869
" " " 1855	303,125
" " " 1856	367,114
" " " 1857	485,622

From the foregoing it will be seen that the average value of the horse has increased from $31.53 in 1846, to $62.49 in 1857. From being valued at $8.22 per head in 1846, cattle are now valued at $12.77. Sheep, in 1846, were "*listed*" at 55 cents per head, and in 1857 at $1.66. Hogs have increased in assessors' estimation from $1.58, in 1846, to $2.90 in 1857.

In 1854 sheep attained their maximum in numbers; since that time they have been rapidly decreasing. The cause of this decrease may be found chiefly in the inefficiency of the statute providing for the protection of sheep from the depredations committed on them by dogs. No one has abandoned wool growing in consequence of the climate being unsuited, or the pastures not adapted, or of unprofitableness in the product itself; but because the ravages by dogs can neither be prevented, nor redressed without involving the wool grower in harassing and tedious litigations. The interest of the wool grower must be better protected, or it will entirely cease, and the revenue which will arise from $4,000,000 (the value of the wool clip in 1854) we can illy afford to dispense with at the present time.

It is to be hoped that as civilization progresses, pork, as an article of diet, will fall into disuse; it must be gratifying to every philanthropist to learn that in Ohio there is certainly a great decline in the use of it as an article of food. It is exceedingly doubtful, however, whether any vegetable product can be found to supply the place of lard, and lard oil, for mechanical purposes, or of the blood of the hog for sugar-refining purposes.

Several Cashmere goats have been introduced in one of the southern counties of the State. Whether a "clip," amounting to two or three ounces of *very fine wool* from each goat, together with a fleece of 5 to 6 pounds of coarse wool, will be remunerative to the farmers of Ohio, is a problem which time alone can solve. It is possible that they cannot readily be acclimated; Mr. Peters, of Atlanta, Georgia, however, is of the opinion that there will be no difficulty in acclimating them to the South.

Many years must elapse, under the most favorable circumstances, before the goat will supplant the sheep entirely, in this State, either for the fleece or for flesh, which latter is said to be most delicious and tender, of the Cashmere goat.

The quantity of fishes in the streams are annually decreasing, caused undoubtedly in a great degree by those who ply the art piscatorial; but measurably, also, by obstructions in some of the streams, which prevent the ascent of many choice varieties to deposit their spawn in the sources of the streams. The government of France has deemed it proper to commission several gentlemen skilled in the art of artificial reproduction of fishes, to re-populate several of the principal streams of France, together with their chief tributaries, with choice varieties of fish. It affords me great pleasure to state that the art of artificial reproduction of fishes has been successfully practised with many varieties of Ohio and Lake Superior fishes—more especially with brook trout (*salmo fontinalis*)—during the past several years, by THEODATUS GARLICK, M. D., of Cleveland. The Legislature has frequently made appropriations of considerable sums of money for purposes less beneficial to the citizens of the State, than would be an appropriation for the extension of fish culture, in some of our larger streams.

During the ten years which intervened from 1836 to 1846, the value of cattle increased in the aggregate $2,647,716, or $264,771 on an annual average; from 1846 to 1857, a period of twelve years, the aggregate increase of value is $15,875,399, or an average of $1,322,783. It will be remembered that the Ohio State Board of Agriculture was organized in 1846, and this unprecedented increase in the value of cattle is mainly due to the generous and untiring exertions of this organization. It is true that in 1834 an importing company was organized, which in 1834, 1835, and 1836, introduced some of the best strains of "short-horns" from England; but in the absence of railroads at that period, the imported stock was not accessible to the mass of cattle breeders, and many of the smaller farmers then as to-day, "don't take the papers," so that after all the imported stock acquired little more than a merely local reputation.

For several years past the various strains of the "*Morgan*" horses have been exceedingly popular in many portions of the State, but for farm purposes, in grain growing districts, they are found to be too light, ample evidence of which may be found in the fact that at a sale of imported horses which took place at Milford Centre, in Union county, on the 30th of December last, an English draft stallion sold for $2750; a Cleveland bay (the English coach horse) for $2050; a Clydesdale (the Scottish draft) for $1800; the Norman, or French draft, sold upwards of $1800, whilst thorough bred turf stock did not command more than one-third of these rates. From 1836 until 1845, the valuation of horses increased in the aggregate $4,265,520, or less than half a million annually; from 1846 to 1857 the aggregate increase was nearly twenty-five millions, or upwards of two millions annually. Notwithstanding we have nearly 3,000 miles of railroad within the limits of the State in actual operation, there has been no period in the history of the State at which horses commanded a higher price, or were more in demand than at present. An organization which can, by its generous encouragement, in the short space of twelve years, increase the basis of taxation to the amount of $40,000,000, is certainly worthy of the most earnest consideration on the part of the Legislature.

The increase in the value and improvement of domestic animals is the first and most manifest fruit of the labors of the State Board, because the improvement addresses itself to the eye, and the understanding, and is founded upon an immutable law of nature, that "*like produces like*," under similar circumstances. These indispensable circumstances are more apparent and more readily comprehended in relation to the improvement of live stock, than in the culture of the soil.

The annual exhibition of the Society was held at Cincinnati, on the 15th, 16th, 17th and 18th days of September. Notwithstanding the weather was excessively warm, the number of visitors from the rural districts was fully as large as at any previous exhibition. The Society was somewhat disappointed in the meagre exhibition made by the artists and manufacturers of the "*Queen City*." The display of agricultural implements, machines, and engines, has perhaps never been equaled at any similar exhibition in the United States; and establishes, beyond successful controversy, the efficiency of the State Fair as a place to introduce to the agricultural community implements and machinery which is, to a very great extent, supplying the place of manual labor on the farm. The Society has encouraged, so far as it legitimately could, the manufacture of household fabrics, by farmers' wives and daughters; and it is to be regretted that this department of industry is annually receiving less attention than in the earlier times in the history of the State. It is, however, the province of the political economist, rather than the secretary of the agricultural department, to determine the influence upon the wealth and prosperity of the State, of this departure from the teachings of the olden time.

In the display of live stock, although the number of animals was less, yet many of them were superior to those exhibited at Cleveland, the previous year. Although comparisons may in many instances not be commendable, yet it will gratify many parties interested to see a comparative statement of the State Fair held at Cleveland, in 1856, and the one recently held at Cincinnati. The following transcript from the entry books will at a glance present the comparative merit of each, so far as numbers are concerned; it must be remembered, however, that fruit was almost an entire failure in 1856, whilst 1857 was a most excellent fruit season:

Animals.	Cleveland, 1856	Cincinnati, 1857.
Shorthorns	109	120
Devons	52	32
Herefords	5	13
Ayrshires	7	0
Oxen and fat cattle	43	17
Milch cows	3	2
Total	219	184
Thorough bred horses	21	19
Roadsters	117	58
All work	98	92
Draft	27	24
Coach and match, &c	191	117
5 colts of one sire	50	30
Total	504	340
Jacks and mules	22	25
Saxons and grades	2	64
Merinos and grades	149	99
Long wool	120	104
Middle wool	75	57
Fat sheep	12	19
Total	378	343

Entries.	Cleveland, 1856.	Cincinnati, 1857.
Swine	58	58
Poultry	82	24
Plows	39	75
Rollers, drills, &c	87	95
Agricultural machines	93	96
Engines, &c	82	113
Philosophic apparatus	16	26
Fine worked metals	11	4
Silk and mill fabrics	20	14
Household fabrics	131	40
Hardware	66	65
Vehicles and cabinet ware	56	35
Coopers' and carpenters' ware	30	51
Curriers' and saddlers' ware	19	49
Tailors and hatters	33	8
Glass, crockery, &c	13	6
Chemicals	57	56
Metal, wood and stone	34	6
Stove castings, &c	...	58
Flour, bread, butter, &c	96	42
Cheese	26	11
Honey, sugar, &c	26	34
Grain	43	26
Natural minerals	10	....
Flowers	69	117
Apples	39	49
Peaches, pears, &c	18	87
Grapes	24	8
Melons	29	9
Vegetables	265	129
Paintings, &c	170	85
Needle, wax, &c., work	210	98
Musical instruments	15	7
Total	1817	1509
Total entries	3060	2493

The comparison will appear less favorable to Cincinnati when it is remembered that her population is at least three times as much as that of Cleveland—that her commerce, manufactories, and agricultural resources are second to no city west of the Allegheny Mountains.

I have devoted considerable time, as well as have taken great pains to collect data from which to construct charts or maps, exhibiting the mean distribution of Spring, Summer, Autumn, Winter, and annual precipitations throughout the State. These maps are submitted to the public in this volume with great reluctance, knowing as I do, that they abound in inaccuracies, which, for want of exact or precise data, it was impossible to correct. The only good which I hope will result from the publication of these maps, is, that the inaccuracies so palpably presented will induce public spirited individuals, in every county throughout the State, to commence a series of meteorological observations, and thus, in the course of the next quarter of a century, a map may be compiled with an approximation to correctness. There should be an appropriation on the part of the State of a fund sufficient to purchase a suite of meterological instruments, consisting of a Barometer, Thermometer, Hygrometer and Rain Gauge, to be distributed to every county throughout the State. Persons may be found in every village and town, who for the use of instruments, would cheerfully keep a meterological record for the benefit of the State.

A map exhibiting the Isothermal, Isotherial, and Isocheimal lines, is of more importance to the agriculturist and horticulturist than is generally supposed.

One fact has been established by the world's experience in agriculture, beyond successful contradiction, namely: that labor decreases in cost just in proportion as it is intelligently directed and performed; and information of the kind indicated in the preceding paragraph, thoroughly and widely disseminated, will greatly aid in directing the operations of the agriculturist in a more profitable manner. It is no less true than humiliating, to be obliged to admit that from the days of Adam until a comparatively recent period, agriculture was conducted as though it were an imperfect system of delving only, and it is within the memory of many yet living, that science, as such, was first pointed out as bearing any relation whatever to agriculture; in all that pertains to the practical application, comparatively little is known, but very much less is practiced. Men of comprehensive views, however, are rapidly becoming sensible that our increasing civilization demands a corresponding advance in the method of tilling the soil. This end can be attained only by educating those who are, and those who are to be engaged in agriculture, in all that pertains to their avocation. The successful handling of the plow, or any other agricultural implement, argues of itself no more proficiency in agriculture proper, than does the skillful handling of a razor in the hands of a barber argue a thorough knowledge of surgery, as was once supposed. To handle implements properly, is indicative of a knowledge of the mechanical portion of agriculture only; there is a very close relation between the sciences of Geology, Mineralogy, Botany, Zoology, and Entomology of the State, and its agriculture.

Geology teaches the order, arrangement, and position of the rocks; a knowledge of Mineralogy is necessary to recognize the elements which, when the rock is crumbled down, give fertility to the soil which it forms. Agricultural Chemistry teaches us the constituent parts of plants, a knowledge of which is necessary to enable us to select the proper elements from inorganic sources, for its nourishment and growth. The form, history habits, instincts, and propensities of the animal kingdom, are taught by Zoology. Chemistry is the great artizan who teaches the agriculturist the hidden mysteries of nature, and points out, with unerring precision, how inorganic matter is first converted into vegetables, and how these latter are in their turn converted into the various component parts of the animal. Botany not only dissects the plants and demonstrates how cell gives birth to cell, but teaches us the history of the plants, from the blade of grass by the wayside to the giant oak of the forest, as well as their habits, wants, adaptation to soil, climate, temperature and moisture. Entomology makes us familiar with insect life; it teaches the student their history, habits, the time and manner of their annoyance, and, as far as known, the best means of defence against their ravages, and the means for their destruction.

"Valuable, indeed, to science and to the world, are the labors of the Geologist, the Mineralogist, the Botanist, the Zoologist and Entomologist; but not less valuable are the labors of the Chemist, the Analyst, and intelligent Agriculturist, who take their work where they leave it, and elaborate and appropriate it to the wants and practical purposes of life. It is humbly but confidently claimed, that the intelligent agriculturist, who successfully applies the principles of these sciences to enlarge and to improve the means of human life, is entitled to share in the general commendation, as a benefactor of his race."

In order to produce the greatest amount capable of being produced on any given soil, not the greatest expenditure of physical labor is required, but the most comprehensive intelligence to direct the labor. For example, some of the soils in the State are susceptible of producing forty bushels of wheat per acre; and when such an amount is produced, it is regarded as somewhat extraordinary; but the intelligent man at once ascribes the bountiful crop to the fact that all the external conditions, as well as the soil, must have been most favorable, and that the culture must at least have approximated to a conformity with the inflexible laws governing the vegetable world. There are well authenticated cases on record, where one farm produced forty bushels of wheat per acre, whilst adjoining ones have produced less than half that amount, although enjoying equal external conditions. There is no probability, at least, that the meteorology on adjoining farms could be different; the conclusion, therefore, in the cases just named, is irresistable, that the increased crops are due to a compliance with Nature's laws.

Education is everything to a free people. It is justly regarded as the most efficient means for the promulgation of such principles as contribute in the greatest degree to the permanency of our institutions; and the system of education adopted in Ohio should be the most effectual means for disseminating that knowledge required by the most important class of our people, namely, the agriculturists. That the Ohio system of education has truly and fully performed its mission in the past, let the condition of Ohio agriculture answer!

There have been established in our midst, by and with the consent of the Legislature, and encouraged and patronized by the Farmers, law schools, theological schools, and medical schools, but nowhere within the boundaries of the State has there been established by legislative authority, and encouraged and patronized by the government, an agricultural school. It is well that encouragement, aid, and support have been given to schools for the learned professions,—these schools are monuments of the wisdom, liberality, and appreciation of the legislative body that created them: "these things ought ye to have done, but not to have left the other undone." The result of this negligence is calculated to confer preferment on professional life; to elevate it, and give it advantages and facilities to obtain knowledge over the agriculturist; to be strengthened and built up, whilst the agriculturist is bound hand and foot, and left to grapple with ignorance and error. Is it at all surprising that many ardent and aspiring young men should abandon farm life, and the dull routine of agricultural labor, and rush into professional life, where they see that public sentiment, as well as legislative action, has bestowed so many manifest advantages?

These young men, as a general thing, would be content and willing to labor on the farm, if they had any opportunity of perfecting themselves in the science and theory of agriculture to as great an extent as others in the learned professions. They express a desire to become instructed in the laws of chemical action as exemplified in the analysis of soils, the combination of elementary substances as developed in vegetable and animal physiology. They wish to learn why different manures are adapted to different soils and crops. They wish to become familiar with comparative anatomy and comparative physiology, as well as to be acquainted with the diseases of domestic animals and the best method of treatment. They require instruction in the principles of mechanical philosophy as adapted to the construction and use of agricultural implements. They wish to be instructed in the natural history of the different races of animals, and the true principles of animal physiology, as adapted to the feeding, fattening, crossing, and breeding of the best farm stock. Could these young men be afforded the facilities for becoming as learned in the science of agriculture, as are others in Law, Divinity, or Medicine, we would no longer hear of wheat "*freezing out;*" of the midge destroying one-third of the crop; nor of farmers being obliged to occupy the background in society.

It may be well to remark that the establishment of public institutions for the dissemination of agricultural knowledge, is not so very recent as to be looked upon as a remarkable innovation. They have been instituted in France, Switzerland, England and Germany, with good success. One was founded by Schwartz, at Hohenheim, in 1817, and since patronized by the King of Wurtemburg, is perhaps the oldest now in successful operation. It has extensive buildings, a library, and farming and other grounds to the extent of 960 acres. The beneficial results of this institution are widely diffused through Wurtemburg, and the peasantry are everywhere found an enlightened class, always ready to give a clear and ready answer to any question proposed regarding their agricultural practices.

The celebrated College of Möeglin, in Germany, was founded by the King of Prussia, about 1819. An estate, consisting of about 1,200 acres of poor land, was attached to it, yielding an annual rental of only about £300; but in the course of not more than ten years, this estate became so greatly improved as to be worth an annual rental of £1,800.

The French Agricultural College of Grignon was founded in 1826. The lands consist of 1,100 acres, variously disposed in tillage, pasture-meadows, water-meadows, and woodland. The pupils are taught mathematics, chemistry, natural philosophy, botany, vegetable physiology, &c., and the application of these sciences to practical agriculture.

It may not be irrelevant to notice the proceedings of the fifth annual meeting of the agricultural association of Denmark, held at Flemsburg, 1855, from which the following is translated: "The committee appointed to report on the question, 'In what manner ought the State to aid in educating the young agriculturist?' presented a report, recommending the addition to one or more of the higher institutions of learning, already existing in the country, of an agricultural department, providing a proper course of instruction in all matters pertaining to the theory of agriculture, as well as chemistry, botany, entomology, &c., &c. Also, that a course of agricultural teaching be established in the more advanced schools throughout the country, for the education of those whose situation and means do not permit them to obtain the necessary preliminary education to enable them to enter the agricultural department of the college." They laid great stress upon the necessity of a more general agricultural education, by which means the cultivation of the soil may be raised to the dignity of a science.

So far as agricultural schools or colleges have received any encouragement from State governments, Michigan, Maryland, Pennsylvania, New York, Virginia, and Connecticut are the only ones which have been thus encouraged, and are the only States that have schools in actual operation. Massachusetts has an experimental farm. Kentucky, Georgia and Tennessee have each bills under consideration for the purpose of advancing agricultural education; whilst Ohio, the first agricultural State in the Union in many respects, can boast of nothing whatever in the direction of agricultural education. True, there were several patriotic as well as scientific and otherwise properly qualified gentlemen, who, during a portion of two successive years, delivered lectures upon agricultural subjects, at Cleveland, and had established a nucleus of an agricultural school, but not receiving any encouragement from the Legislature, this school failed to command the confidence of the public; the number of pupils did not warrant the continuance of the school, whilst the lecturers were remunerated for their services by the consciousness only, of having discharged their duty.

The propriety of establishing an agricultural college by legislative authority is so manifest that no labored argument is necessary to sustain it. The present excellent system of common schools, established in this State by the Legislature, is a sufficient guaranty that this question will meet with proper attention from those whose duty it is to guard with jealous care the interests confided to them, and to contribute, in every legitimate way, for the promotion of the common interests of the people.

Respectfully submitted,

JOHN H. KLIPPART,
Corresponding Secretary.

STATE AGRICULTURAL ROOMS,
Columbus, O., January 12, 1858.

PROCEEDINGS OF THE STATE BOARD OF AGRICULTURE.

STATE AGRICULTURAL ROOMS,
January 13, 1857.

The Board met pursuant to adjournment, President WADDLE in the Chair. Members present: Messrs. Musgrave, Green, Barker, Buttles, Stedman, Millikin, Smith, and Krum.

The minutes of the last meeting were read and approved.

Judge Musgrave reported having examined the farm of Isaac T. Reynolds, of Huron, Erie county, Ohio, and recommended the first prize of $50 to be paid. Adopted.

The following is the statement furnished by Mr. Reynolds:

I. T. REYNOLDS' STATEMENT.

HURON, ERIE CO., O., Dec. 1, 1856.

To the State Board of Agriculture, Ohio:

The undersigned, residing in Huron township, Erie county, Ohio, proposes to compete for the premium, as offered in your list of premiums for the year 1856, under the head of "Management of Farms," for the best cultivated farm, not less than fifty acres, exclusive of woodland and waste land, answers being hereby submitted, under the head of "Directions to Exhibitors."

SOILS, ETC.

Ques. 1. My farm consists of 227 acres, 190 under improvement, and 37 of woodland; no waste land. My fields are divided into 10, 15, and 20 acres, in good form, except several small pieces about my house and barn, which are inclosed for garden, orchard, yards, &c.

Ques. 2. The soils of my farm are various, though sandy loam predominates, with clay subsoil; no stone or rocks.

Ques. 3. I prefer and use the subsoil plow, almost universally, on all my land, plowing under clover for wheat, using my coarse or barn yard manures on my corn ground, and for other crops, with plaster. I find the subsoil plow of the greatest importance.

Ques. 4. I aim to plow 9 to 10 inches deep. I carry a small rule and measure frequently.

Ques. 5. I have not taken pains to weigh and measure to tell the difference, but I am well satisfied from observation that I find good profit in deep plowing and subsoiling.

Ques. 6. Have used the subsoil plow, and believe it as important for grass as for grain crops.

Ques. 7. White oak, hickory, elm, black oak, and chestnut.

MANURES.

Ques. 8. I use about 15 loads manure to the acre. I litter my stables thoroughly with straw, and throw it out in heaps in my barn yard, keeping a part of it only under cover. I make near 400 loads, and use only what I make.

Ques. 9. Answered above.

Ques. 10. I use the most of my manure in the long or raw state, but I make compost of part, and use it for a top dressing in the fall, on my wheat land; also on my meadows.

Ques. 11. As I keep a large amount of stock, I have not thought it important to make an extra effort to increase the quantity of manure.

Ques. 12. I have used plaster and ashes freely, and with very beneficial results, sowing the same broadcast. I apply about one bushel of plaster per acre.

TILLAGE CROPS.

Ques. 13. I till about 30 acres, viz: 15 acres corn, 6 acres of barley, 7 acres oats, 1 acre potatoes, 1-2 acre beets, and 1-2 acre spring wheat.

Ques. 14. Seed used: 5 quarts corn per acre; 2 1-4 bushels barley; 2 bushels oats; 10 bushels potatoes; wheat, 1 bushel to the half acre. In consequence of the failure of my seed corn, my planting this year was later than usual, and the last of it was done the first of June; but the usual time is from the 10th to 15th May. Barley sowed 10th April, and oats 15th April; potatoes 1st May; wheat 1st May. The land was carefully plowed in narrow furrows, then dragged; then went over it with a wheel cultivator, thoroughly. Harvested with common cradle my barley and oats, raked and bound in bundles. Corn produced 50 bushels per acre: barley, 30 bushels; oats, 55 bushels; potatoes, 172 bushels; beets, 448 bushels from one-half acre; wheat, 12 1-2 bushels from the half acre. Insects have not troubled me this year.

Questions 15 and 16. Answered in No. 3.

Ques. 17. No trouble by disease in potatoes.

GRASS LANDS.

Ques. 18. I use clover and timothy, chiefly. I mix the seed and sow about 7 quarts per acre. Sow with oats and barley, broadcast, in the spring. These grasses, with white clover, which comes in naturally, are the best for dairy purposes and stock growing.

Ques. 19. I mowed, this year, 41 acres; average product, 2 tons. Commenced mowing about the 6th July, and as soon as the blossom falls from the timothy. I use "Ketchum's Mower," cutting when the dew is off. Rake with a horse rake, frequently mowing in the forenoon and hauling in, in the afternoon.

Ques. 20. My mowing land is all suitable for the plow.

Ques. 21. None.

Ques. 22. Have reclaimed some low wet land by draining, placing manure in the low places, and plowing and scraping the dirt from my drain on to it, making it equal to any of my land.

Ques. 23. I find deep plowing and thorough tillage the best method of keeping out weeds; yellow dock is the most troublesome weed.

DOMESTIC ANIMALS—ON HAND JAN. 1, 1856.

Ques. 24. One yoke of oxen, 19 cows, 44 head young cattle, and 14 horses. My cattle are all Durhams and their grades. Horses are common stock.

Ques. 25. I think the Durhams, for beef, are superior to any other stock that I know of; and the cows are equal to any I ever used.

Ques. 26. I stable all my cattle above one year old, and feed in mangers, and my yearlings have an open shed, and my calves I keep in an enclosed shed by themselves. I litter thoroughly my stables, and feed cut corn stalks, once a day; wet the same, and sprinkle on meal, about two quarts to each animal. I use for this cutting or grinding stalks, one of Bishop & Perkins' machines, manufactured at Norwalk. I find a large saving in feeding in stables, as I can feed my straw and chaff, after all my coarse fodder is used; then I feed good hay, and keep all my stock up until about the 1st of May.

Ques. 27. Have made 1,360 pounds of butter; no cheese; have averaged to milk 8 of my cows. We skim the milk after standing from 24 to 48 hours; churn with an old-fashioned dasher churn, by dog-power; we wash our butter, and work out the milk by hand, thoroughly.

Ques. 28. 100 sheep, a cross of French merino. They yield 3 3-4 lbs.

average, which brought 38 1-2 cents this year. Reared 18 lambs from 40 ewes. All the sheep I have sold to the butcher this year have been at $3 per head.

Ques. 29. I have not sheltered my sheep, but I consider that the best mode. I feed good hay, in racks, with a small quantity of corn to each, once a day. I have had none die. I consider the fine wool sheep stand the winter as well as any other.

Ques. 30. Average about 25 hogs. My sows are of improved stock, and I use a 3-4 blood Suffolk boar. I kill my spring pigs in the fall for my own use, which usually weigh 200 lbs. each, and sell the most of my hogs on foot.

Ques. 31. Have made no experiment: potatoes are worth too much to feed. I feed some mangle wurtzel, and white sugar beets; am feeding them this year, and think them valuable.

FRUIT.

Ques. 32. 150 apple trees, mostly grafted fruit—chiefly winter fruit.

Ques. 33. Very few fruit trees, except apples, survived the last cold winter; though I have some cherries, pears, and a few peach trees young.

Ques. 34. Have not been troubled with insects on my fruit trees, except the curculio, which has destroyed my plums, and this complaint is universal through this region.

Ques. 35. I haul manure and place about my fruit trees, and let my hogs run in the orchard and root about them.

Ques. 36. I think I have found my experiments in using food for animals by grinding my corn stalks, and cutting my fodder, and feeding it in the close, clean, careful manner as I do, a system that will richly repay the trouble to any farmer who keeps as much, or even half as much, stock as I do.

FARM BUILDINGS, ETC.

Ques. 37. My dwelling house is a two-story brick, 25 by 35, with a kitchen 15 by 15 on the end, with wash room, with well and cistern in the rear, well built and finished throughout, with out buildings, one of which, 22 by 90, used for wood house, shop, carriage house, feed room, with kettle set in each, &c.; hog pen and stable, hennery, smoke house, and ash house. A frame barn, 46 by 100 feet, two stories; the basement affords stabling room for 24 head of cattle, 5 horses, with gates to separate each animal from the other. A granary and vegetable room, and on one side sheds for my yearlings and calves. A driving way into the upper story, which is used for hay, and grain, and corn, with room for my machinery, as a threshing machine, corn sheller, stalk cutter, wood sawing, &c. It is difficult to describe accurately the construction and conveniences of this barn, and needs to be seen to be appreciated. I have adjoining the before mentioned barn, another, 30 by 45 feet, 16 feet posts, a shed on the end, 26 by 50, the upper part used for hay, the lower part open, except a stable 14 feet off one end; this barn has stabling for 16 head of cattle. Between the last named barn and the main barn, is a house for sheltering my horse power, which is used for driving my machinery.

Ques. 38. My fences are chiefly oak-rail worm fences, staked at the corners and capped with strong wire caps, 8 rails high; the length of the same is 1,948 rods, or about 6 1-2 miles of fence, and this includes only my half of line fences; in this are 22 pairs bars, 4 large gates and 2 small gates. This report does not include rails used in stack pens, or rails not in use, which are about 1,800. I have 38 rods of picket fence 6 feet high, painted; 2 large and 2 small gates; 47 rods plain board fence, with 3 large and 2 small gates, painted; 37 rods barn yard fence, oak, not painted, 9 large and 4 small gates; 18 rods tight board barn-yard fence 6 feet high, 5 large gates; 31 rods fence around vegetable garden, 1 gate; making in all 166 rods of fence. In front of my house a fancy fence 72 feet in length. I have also 8 sections of portable board fence 10 feet each, which I find very useful, and shall make more.

Ques. 39. I weigh stock and measure and weigh grain, but have no record which I deem accurate enough to insert.

Ques. 40 and 41. I annex my farm account.

ISAAC T. REYNOLDS.

My farm in account for 1856: *Dr.*

To rent of farm this year	$500 00
" taxes for the year 1856	101 56
" wages paid for hired men	494 50
" wages paid hired girl	20 92
" board of hired help	237 00
" cash paid for cattle	396 54
" paid for extra hired help by the day	25 00
" 10 bushels seed potatoes, 37½c	3 75
" 14 bushels seed oats, 30c	4 20
" 14½ bushels seed barley, $1,25	18 12
" 1 bushel seed wheat	1 50
" 2½ bushels seed corn, 50c	1 25
" 1½ pounds beet seed, 75c	94
" blacksmith bills	25 00

To use of teams and tools	$125 00
" cash paid for one 4 year old colt	115 00
	$2,070 28
To balance profit	1,357 72
	$3,428 00

Farm in ac't, 1856. *Cr.*

By sale 1 yoke oxen	$120 00
" " 10 three year old steers	398 16
" " 9 cows and heifers	240 00
" " 1 brood mare	125 00
" " years' growth on 7 colts	150 00
" " 1 horse colt raised	28 00
" " years' growth on one four year old colt	25 00
" " 1,122 lbs. butter, after deducting for family use 238 lbs., at 18c	201 96
" " 4 fat sheep, sold at $3 per head	12 00
" " 18 lambs at 1 12½	20 25
" " 288 lbs. wool at 38½c	110 88
" " 723 lbs. pork at 4½c	32 53
" " 27 shoats, 2,755 lbs. at 4½c	123 72
" " 755 lbs pork at 4¾c	35 85
" " of apples	92 55
" " 172 bushels potatoes at 50c	86 00
" " of chestnuts	14 75
" " 180 bushels barley at 1,10	198 00
" " 385 bushels oats at 31c	119 35
" " half beets and turnips, 448 bushels at 25c	112 00
" " 82 tons hay at $6	492 00
" " 750 bushels corn at 50c	337 50
By premiums received from Erie Co. Agricultural Society, 1856, and the Ohio Farmer and Cultivator,	28 50
By highway work over and above my tax	25 00
By 13 head steers over and above my stock on hand at the 1st of January 1856, at $23	299 00
	$3,428 00
By balance of profit	$1,357 72

ISAAC T. REYNOLDS.

A communication from W. C. Chapman was read, requesting a change in the premium awarded him on shaft-fasteners. Resolution to change was lost.

A communication from Mr. Egbert, of Lebanon, in regard to premiums on horses, was read.

Mr. Millikin moved that the next State Fair be held on the 15th, 16th, 17th and 18th of September next. Agreed.

The following communication from the Cincinnati Horticultural Society was read:

Preamble and Resolution adopted by the Cincinnati Horticultural Society at its regular meeting January 10, 1857.

WHEREAS, An effort is now being made by the citizens of Cincinnati to induce the Ohio State Board of Agriculture to locate their annual fair for 1857, in this city or its immediate vicinity; therefore,

Resolved, That the members of the Cincinnati Horticultural Society will heartily co-operate with and aid by horticultural contributions, the State Board of Agriculture, in preparing and arranging for the Ohio State Fair for 1857, proposed to be held in the vicinity of Cincinnati next autumn.

I. J. ALLEN, Secretary.

Mr. Green tendered a proposition from Cincinnati, to donate $3,000, in case the next State Fair be held in, or near that city.

Mr. Millikin tendered a proposition from Hamilton, in Butler county, to donate $3,000 in cash, and the use of the grounds on which to hold the next State Fair, provided it be located in, or near that town.

Mr. Green offered the following, which was adopted:

Resolved, That the State Fair, for 1857, be located at, or in the immediate vicinity of the city of Cincinnati; *provided,* the sum of three thousand dollars be secured to the satisfaction of the Executive Committee, and suitable grounds be furnished free of expense to this Board.

Mr. Millikin submitted the following, which was adopted:

Resolved, That the Corresponding Secretary telegraph forthwith to the State Boards of New York, Pennsylvania, Kentucky, Indiana and Michigan, that we have fixed on the 15th, 16th, 17th and 18th days of September next, as the time, and Cincinnati as the place, of holding the next State Fair.

Mr. Barker, of the committee appointed to offer a premium for, and suggest experiments which would elicit information as to the comparative value of different breeds of sheep for wool and mutton, made report, setting forth the difficulties in the way, which was accepted:

DIFFERENT BREEDS OF SHEEP, HOGS, ETC.

The Committee appointed by the late delegate meeting of the State Society of Agriculture, to inquire into the expediency of offering such premiums as would elicit reliable information, as to the comparative value of the different breeds of wool and mutton sheep, and of the different breeds of swine, have had the subject under consideration, and are unanimous in the opinion, that it is not expedient to offer such premiums, with the view of eliciting reliable information thereby. The committee are of opinion, that the object of the resolution cannot be satisfactorily consummated, except by a direct appropriation of a fund sufficient to purchase or rent lands and fixtures; to purchase the different breeds of animals, upon which it is desirable to make experiments; to employ disinterested men to conduct the experiments, that they may be made in every particular under the same circumstances. Whether such a course of experiments would require a greater expenditure than it would be expedient for the Board to make at this time, the committee are not prepared to say, but respectfully leave it to the judgment of the Board to determine.

PREMIUMS FOR ESSAYS.

Your committee respectfully recommend to the Board, to offer liberal premiums for the best essays on such subjects as the following:—Domestic Animals; Insects Injurious to the Farmer; Birds Beneficial to the Farmer; Grasses; Soils of Ohio; Drainage; Hedging; and many others of equal interest, the details of which can subsequently be arranged. All of which is respectfully submitted.

THE BEST CATTLE.

John M. Millikin, chairman of the committee to suggest the best mode of ascertaining the value of several breeds of cattle, made a report, which was accepted.

REPORT ON THE BEST MEANS OF ASCERTAINING THE RELATIVE VALUE OF VARIOUS BREEDS OF CATTLE FOR BEEF.

As one of a committee appointed to suggest the best mode of ascertaining the relative worth of the several breeds of cattle, for beef and for milk, I beg leave respectfully to submit the following, in reference to cattle for beef.

I have no confident hope that the great end which we aim at, will ever be attained by offering premiums. Indeed, I do not believe it to be at all practicable, for reasons which are abundant, and to me entirely satisfactory.

We have no men, of sufficient wealth and leisure, connected with the agricultural interest of Ohio, who will undertake, and prosecute, so laborious, so expensive and pains-requiring task. Neither the increased value of the animals fattened, nor the hope of obtaining a liberal premium, will at all compensate any one for the extraordinary amount of care and attention, which must be faithfully and constantly bestowed upon experiments, necessary to ascertain what every farmer so much desires to know. In England, however, where men are able to engage in such investigations, where labor is comparatively low, where superior beef commands exorbitant prices, where the value of the manure made, would in part pay for the extra expenses incurred, and where too, a man who would thus devote his means and his labor in prosecuting such researches would receive praises and honors commensurate with the value of his discoveries, men might be induced to institute and carry out with completeness, such a system of experiments, as are indispensable to the ascertainment of the truth upon this subject.

With us we have no breeders who are extensively engaged in raising stock of more than one breed. Every breeder has his decided favorites, and therefore it is not probable that any breeder will undertake to make a fair and impartial test between any two breeds. If premiums shall be offered for feeding Durhams, and for feeding Devons, those who may compete, will severally give the details of their mode of feeding, and the process of conducting their experiments generally; yet, their reports as severally made, will form no safe data upon which to form a reliable opinion of the relative quantities of these breeds for fattening.

While I believe that nothing valuable and satisfactory can be accomplished by offering premiums, I am nevertheless fully persuaded that the State Board of Agriculture, can cause a test to be made, which will thoroughly settle, beyond all controversy, the question of the relative value of the several breeds for beef, and which will be productive of great value to breeders and feeders of cattle. While, too, the comparative value of the several breeds of cattle is being ascertained, other tests of exceedingly great value and interest, to the entire agricultural community, may be made of the comparative value of the various kinds of food—ground and unground—cooked and raw, and also of the value of good pasturage as compared with grain, roots, &c.

Believing that the expenses of such investigation ought to be borne by those to whose benefit they will most contribute, I respectfully submit the following as a brief and imperfect outline of a plan to be adopted and carried out by the State Board of Agriculture of Ohio, under such rules and with such modifications as they may deem to be necessary.

1. The State Board should employ some intelligent and reliable man, familiar with the quality of stock and feeding the same, who would undertake the care of such animals, as might be committed to his charge, and who would at all times, *carefully* and *faithfully conform* to such rules and regulations as the Board might, from time to time, see proper to prescribe.

Suitable cattle stables and pasturage should be provided. Scales to weigh the animals—to weigh hay, straw and every variety of grain, or other food, should also be furnished, suitable for the purpose intended.

2. The State Board should cause to be purchased, two steers three years old, and two four years old, of thorough bred Durham, and a like number of like ages of Devons, and of such other breeds as they may desire to make a test with. The precise age and weight of each at the time of the commencement of the experiment, should be accurately ascertained and registered. If there should be any apparent difference in the condition of the several animals, it should be noted.

3. The animals should each be numbered. They should be fed at the same hours of the day, and each should be allowed to eat as much as it would be proper, at each time of feeding. The quantity of hay given to each animal at each time of feeding, and of every kind of food, should be carefully weighed and noted in the daily register, showing not only the amount fed to each every day, but showing also the several amounts eaten by each at the several times of feeding on every day. The register kept should also exhibit, not only the amount consumed each day by every single animal, but should also show the amount consumed by each every ten days, and every month of the year.

4. Every animal should be carefully weighed at the same hour of the day, on the 1st, 10th and 20th days of each month, carefully noting the changes each have undergone, during each interview between the times of weighing.

5. In feeding, the same kind of grain should be given to each animal the same length of time. Whenever the condition or state of the same kind of food is changed, as to one animal, the same change should be made as to all others. Grain should be fed, ground and unground. It should be fed in a dry state, soaked and thoroughly cooked. The relative value of corn in the ear—corn and cobs crushed, on the modern crusher, and finely ground corn meal, should, if possible, be determined. All changes of food above mentioned, and such other as experience and further investigation may suggest, should commence either on the 1st, 10th or 20th of a month, and be continued as long as may be deemed necessary and then terminate on one of the aforesaid days. During the summer the entire herd should be pastured one or two months, weighing as above, and noting the changes in each.

6. The quality of manure made by each animal should be accurately ascertained and the value thereof credited to each when sold.

7. Very careful and minute accounts of all the expenses incurred for

cost of cattle, for grain, fodder, hay, straw, for rent of stables, pasturage, &c., and for the herdsman, so that the cost per pound of the increase every ten days may be known, should be carefully kept. Not only can the relative value of the several breeds of cattle be reliably ascertained, and the comparative worth of various grains, in different conditions be determined, but the husbandmen of the country may also be taught the value of turnips, beets, carrots and parsnips, used separately, or used in connexion with grain of any kind, in any condition, if the above proposed course of experiments shall be determined upon and faithfully carried out.

8. When the mode of experiment, which I have imperfectly given, shall have been carried on a sufficient length of time, then the Board should cause to be killed, one of each age of the several kinds fed, carefully noting the gross weight of each—the weight of the several quarters—the weight of the tallow and the weight of hides. As far as practicable, competent and disinterested judges should make examination of the relative quantities each animal may have of choice parts of the beef, and also of the relative quantity of inferior or waste parts of the animal. They should also judge of the relative quantity of each. The remaining cattle can be subsequently killed and the like accounts kept.

From the foregoing course of proceeding abundant data will be furnished to open an account with each separate head of cattle, charging and crediting each, as may be proper, so as to show the profit or loss on each head. And so too will the several accounts, show whether money has been made or lost by the operation.

If the proposed mode of testing the respective claims of the various breeds of cattle can be thoroughly and accurately carried out some important questions will be satisfactorily solved; and upon others valuable information will be acquired, which will greatly assist the farmer in deciding what course of policy he ought to pursue, in the management of his stock and in the disposition of his grain. 1. He will have data, upon which to determine the profitableness of grain feeding cattle. 2. The propriety of grassing cattle, while making superior beeves. 3. Their relative growth, while on grass, as compared with their improvement while not on grass. 4. The relative improvement of the several breeds of cattle on grass. 5. The worth of roots in feeding. 6. The relative value of cooked food. 7. The advantages, if any, of soaking grain. 8. The value of corn and cob-meal, if any, over corn in the ear. 9. The value of fine corn meal over corn in either of the above conditions. 10. The relative growth or increase of the 3 year olds as compared with the 4 year olds. 11. The relative value of the several breeds in early fattening. 12. What proportion the dressed meat of a well fatted 3 year old bears to the gross weight, and what proportion exists with a 4 year old. 13. What is the relative proportion of dressed meat to the gross weight, between the several breeds. 14. What breed has the largest per cent. of choice beef, and what the largest per cent. of inferior. 15. Which breed produces good beef at the lowest cost per pound; and finally, 16. What is the relative value, all things considered, of the several breeds of cattle, for the purpose of producing beef.

The foregoing is a general outline of the plan which I would propose, leaving the details to be determined by the Board, as circumstances might direct during the progress of the feeding.

All of which is respectfully submitted,

JOHN M. MILLIKIN.

ABEL KRUM'S REPORT ON CATTLE FEEDING.

For the best conducted experiment for testing the relative value of the different breeds of cattle for making beef, a premium of $300.

RULES AND REGULATIONS GOVERNING COMPETITORS.

1. Each competitor shall take not less than 3 steers or bullocks, as near as may be of the same age, and not less than 4 years old; each to be of different breeds, and either full blood or grades of not less than half pure blood. The competitor, if he exhibit full blood stock, shall give pedigree, and if grade stock, shall give pedigree on the pure blood side, and state upon what race the cross is made. The animals shall be fed upon the same kind of food, and be subject to the same treatment, for 20 days preceding the trial, as preparatory to the commencement of feeding.

The trial shall commence on the first day of June, and continue up to the time of the State Fair.

Each animal shall be accurately weighed at the commencement of feeding, and also at the end of each 20 days during the trial.

Each competitor may feed such kind and quantity of food as his judgment may dictate; but all the animals in his charge shall be fed alike at each feeding, as to kind and quantity of food, and each animal shall be fed as much as he can be made to consume, with the maintenance of a good and healthy state of the animal.

Each competitor shall keep a correct register, showing the weight of each animal at the commencement of the trial, and also at each succeeding period of 20 days.

The register shall further state the kind and quantity of food fed each day, and the exact weight of food and water consumed by each animal per day, with a statement of the average daily cost of feeding each animal during each period of 20 days, together with a full description of the manner of preparing the food, manner of feeding it, the treatment of the animals, and all the incidents connected with the trial, which tend to show the true character of the experiment.

For the best conducted experiment to test the relative value of the different breeds of cows for dairy purposes, a premium of $300.

RULES AND REGULATIONS.

1. Each competitor shall take at least three cows of different breeds, and not less than 5 years old; the cows shall be fed upon the same kind of food, and be subject to the same treatment, for ten days preceding the commencement of the trial. The first trial shall commence on the first day of June, and continue 30 days; the cows to be fed on grass only, and if grazed, to be kept in the same pasture; if fed in stall, each cow to have the same quality of food.

Each competitor shall keep a register, in which shall be entered the breed and age of each cow, and the time that each cow has been in milk; the live weight of each cow at the commencement and at the end of each trial, and also the daily weight of milk yielded by each cow during the trial, and also the number of pounds of butter or cheese made from each cow during the trial; and shall exhibit the cow and the butter or cheese at the Annual Fair of the Society.

Upon the same, the second trial shall commence on the first day of August, and continue 30 days.

It shall be conducted, in all respects, like the first trial, except that the cows shall be fed in the stall.

A register shall be kept, in which shall be noted the live weight of each cow, the daily consumption of food and water, the yield of milk, and the produce of butter or cheese; the weight of the cows at the end of the trial, the cost of feeding, and every circumstance affecting the experiment, and calculated to show its true character.

C. SPRINGER'S REPORT ON CATTLE FEEDING.

To the Ohio State Board of Agriculture:

MR. MILLIKIN—Dear Sir: Your favor of the 12th inst. is received, and is the first intimation that I have had of being appointed a member of the experimental cattle committee, as I had left the agricultural convention before it was announced, and have been absent from home ever since, until now. And as I have shortly to leave again, to be gone a month, I only have a few hours to attend to your proposition, to give a statement to the Board of my views on the subject.

I do not profess to be a cattle man, or to have any very valuable experimental knowledge upon the subject of cattle culture. I have, for many years, devoted my farm to the purpose of a drove stand; keeping cattle, and other stock, over night, on their way to the eastern market. But as the railroads have broken up that business, I am casting round for some other mode of disposing of my products, and have been anxious to know which breeds of cattle are the best for the several purposes for which cattle are cultivated. But there is such a perfect jargon of opinion on this subject, among cattle raisers themselves, that, in the absence of personal experience, I am unsatisfied in the premises, except on one question, that is, that the Durhams are best for beef on the Scioto valley. But whether they are the best, there, for the dairy, or whether they are the best for beef in a more northern climate—say on the Lake shore, from the conflicting testimony I cannot satisfactorily make up my mind.

By reference to an article which I published, last winter, in the Ohio Farmer, consisting mainly of extracts taken from the Patent Office Report on this cattle question, it will be seen that this jargon of opinion as to which breeds are best for beef, dairy, and working purposes, is co-extensive with the United States. In view of these facts, I am of opinion the Board could not do a better service to the State, and render itself more useful and respectable before the country, than to take measures to test these matters by actual experiment. And I am glad to learn that they have the means at their command for this purpose, although it will require very considerable expense.

Having been a member of the Board for four years, I became familiar with the diversity of sentiment in relation to the merits of the different breeds of cattle. In 1853, I offered a substitute to Mr. Renick's resolution, to lower the premiums on Herefords and Ayrshires,—which Mr. R. accepted,—requesting the Board to "so regulate the premium list as to offer awards for cattle according to their uses; say for beef, dairy, and working purposes, and not for different breeds, as heretofore; and that they be requested to take such measures as would determine, by practical tests, which breeds were best for these several purposes." I am not, however, correctly reported at page 40, Ag. Rep. for 1853, where this transaction is recorded. As this was the first time that such a proposition was submitted to the Board, it raised quite a breeze. After I had fully expressed my sentiments, and knowing there was nothing to be gained by pressing the matter, but relying upon the common sense view of the subject, I moved to lay the question on the table, which was agreed to. Last year the same proposition, substantially, at your move, passed, so far as I could perceive, without a dissenting voice. I name these facts to show you there is such a change in public sentiment, in favor of this matter, as, in my opinion, would justify the Board in acting.

The thing to be tested, as I understand it, is to ascertain what breeds of cattle will put on the most flesh, or yield the most dairy products, from a given quantity of food. The breed that does this is certainly the best adapted for the purpose in which it excels. On winter feeding this may be tested with tolerable accuracy; but on grazing will be more difficult.

As to the plan to be pursued to ascertain these results, we have not time to give details, but must be satisfied with a few general remarks on the subject.

1. Then there should be two tests, one in Northern and one in Southern Ohio. Say about Circleville, and near the Lake Shore. It is admitted by many Devon men that the Durham is best adapted to the Scioto Valley. But they contend they do not do so well on the Reserve as the Devon. Now, if one breed is adapted to a Northern, and another to a more Southern location, it is of very great practical importance that this fact should be known.

2. There should be at least three animals of each breed entered for competition, either for beef or dairy products, as a test with one alone would not be so fair, as it might be either better or worse than an average of its species. And the selections should be made, as far as practical, by the friends of the different breeds, so that no suspicions or complaints of unfairness might be made after the result.

3. Sufficient stabling for winter should be had, and scales provided to weigh the food, and also the dairy products, as well as to weigh the beef animals; and a man of special habits to superintend the whole, who should be very careful and exact in everything.

4. The Durhams for northern Ohio should be taken, as far as practical, from those which have remained the longest in that locality. There are certain latent laws in the animal economy, which lie dormant until they are brought into contact with the circumstances which require their exercise. It takes some time, however, so to strengthen them as to answer the intention of the Creator. When these laws are so matured as to meet the object of their intention, it is what is called acclimation. An acclimated

animal will, therefore, give a better prospect of success than one that is not. This principle will apply to every change of climate.

5. Testing on grass would have to be done by weighing. As every animal might be supposed to consume food in proportion to its size, a data would here be given on which calculations could be made.

Very respectfully, &c., in haste,

C. SPRINGER.

MEADOW FARM, O., *Dec.* 20, 1856.

THE OHIO AGRICULTURAL COLLEGE.

On motion of Mr. Green, Hon. Norton S. Townshend was invited to address the Board on the subject of Agricultural Schools. Mr. T. being present, gave a brief history of the rise and progress of Agricultural Schools in Europe, and then gave a succinct statement of the condition and prospects of the "*Ohio Agricultural College.*" Messrs. Krum, Smith and Stedman were appointed a committee to confer with Dr. Townshend, and report upon the proposition submitted by him.

After a short conference, the committee presented the following report, which was accepted:

The committee appointed to consider the propriety of giving encouragement to Agricultural Colleges, respectfully submit the following

REPORT:

Of the great advantages of Schools or Colleges, adapted to give to young Farmers an acquaintance with those branches of science that have important bearings on Agriculture, your committee think there can be but one opinion. And the committee are equally well satisfied, that the time is fully come for the establishment of Agricultural Schools in the State of Ohio. In the absence of these institutions, those who purpose to engage in this most important of all occupations, cannot secure the educational qualifications for their calling, which in many other pursuits are deemed indispensable, and which, we believe, are equally indispensable, or at any rate, equally valuable to the farmer.

Therefore, to encourage the establishment of Agricultural Schools in Ohio, we recommend that this Board memorialize the Legislature for an annual appropriation of ten thousand dollars, to be applied under the direction of the Board, in aid of any institution, or institutions in the State, that will teach, in a satisfactory manner, such branches of Agricultural Science as this Board may prescribe, and make the instruction free to all the citizens of the State.

Mr. Millikin offered the following resolution, which was adopted:

Resolved, That in the opinion of this Board, the Agricultural interests of Ohio require liberal appropriations by the Legislature, and provisions for the establishment of Agricultural Colleges for the proper teaching of Agriculture, Horticulture, and kindred Sciences.

It was afterwards resolved, to ask the Legislature to appropriate annually $6,000 for the use of the "Ohio Agricultural College," at Cleveland, and throw its lectures open to all.

TRIAL OF REAPERS AND MOWERS.

On motion it was

Resolved, That a trial of Reapers and Mowers take place at Hamilton, Butler county, on the first day of July next, and that the following premiums be awarded:

1. For the best Reaper, $50. For the second best Reaper, $30.
2. For the best Mower, $50. For the second best do, $30.
3. For the best Combined Reaper and Mower, $50. For the second best Combined Reaper and Mower, $30.

Resolved, That any one machine may compete for any, or all, of the above premiums, with this qualification, that every machine competing for the third premium shall both reap and mow.

SUGAR AND SYRUP FROM CHINESE SUGAR CANE.

Resolved, That a premium of fifty dollars be awarded for the best specimen of granulated Sugar, not less than ten pounds, manufactured from the so-called Chinese Sugar Cane, (*Sorghum Saccharatum*,) grown north of 38 degrees north latitude—the manufacturer to give the Board of Agriculture a written detailed account of the process of manufacturing.

Resolved, That a premium of five dollars be awarded for the best gallon of Syrup, manufactured from the *Sorghum Saccharatum*—the manufacturer to state the amount produced to the acre, as well as the amount produced from a hundred weight of the stalks.

The following committees were appointed to revise the premium list for the present year:

Messrs. Millikin and Krum—*Sheep, Hogs and Poultry.*

Pres. Alex. Waddle—*Agricultural Implements.*

Messrs. Musgrave and Barker—*Cattle.*

Messrs. Buttles and Smith—*Horses.*

Board adjourned until Wednesday morning, at 9 o'clock.

SECOND DAY.

State Agricultural Rooms, Jan. 14, 1857.

The Commissioners of the Reform School appeared before the Board, and desired, through its chairman, (Hon. Chas. Reemelin,) an expression of opinion on the part of the State Board of Agriculture in favor of the ability of the inmates of the proposed Reform School Farm to sustain themselves by the product of their own labor. Maj. Millikin offered the following, which was adopted:

Resolved, That Alex. Waddle and Lucian Buttles be a committee, on the part of this Board, to confer with any committee of the Ohio Legislature, and of the Board of the Reform School, in reference to the connection of the Ohio State Board of Agriculture, in the management of the Reform Farm.

The following correspondence was submitted:

Columbus, O., Dec., 1856.

To the State Board of Agriculture of the State of Ohio:

The undersigned commissioners of Reform School for the State of Ohio beg leave to submit to your honorable body the following propositions:

That whereas, you were pleased at your evening session of the 4th of December, to pass the following:

Resolved, That the State Board of Agriculture be and the same is hereby directed, at once to enter into correspondence with the said commissioners.

Resolved, That the State Board of Agriculture be and it is hereby authorized to pledge the cordial support and the co-operation of this convention and its own in any and all proper ways to carry out the above purpose.

We therefore respectfully suggest to you, that you express in an official letter to this Board, your willingness to take charge of the labors of the youth of a State Reform Farm, upon the general condition that you are to have the appointment of the officers under whose superintendence the boys are to be employed, chiefly in agriculture and such mechanical labors as are intimately connected with agriculture and gardening. And that in consideration of your having the use and profits of the labor of the juveniles, you will clothe and feed them. The State to prescribe the general discipline, to provide teachers and moral and religious instructors, and the general superintendence of the police of the Institution, and also to be at the expense of the purchase money for the Farm, and of the erection of all permanent buildings.

JAS. D. LADD, *Sec'y.*

Chas. Reemelin, Jno. A. Foote and Jas. D. Ladd, Commissioners.

Messrs. REEMELIN, FOOTE, and LADD, Commissioners.

Gentlemen: The undersigned appointed a committee, on behalf of the Ohio State Board of Agriculture, to receive and answer any communication from your body in reference to a State Reform School and Farm, respectfully acknowledge the receipt of your communication and hasten to submit a reply.

With every disposition to give the "cordial support," and co-operation of the State Board of Agriculture to the establishment of the proposed Reform School, and to establish in connexion therewith an experimental farm, under the supervision of the Board, we nevertheless with our present views, find ourselves unable to pledge the Board to the acceptance of your proposition, which is "to clothe and feed the juveniles" for "the use and profits of their labor."

As at present advised we are altogether unprepared to estimate correctly, either the value of the labor of the juveniles, or the probable expenses that may be incurred in providing them with clothing and food. Consequently we would not act with ordinary prudence or circumspection, in undertaking to bind the State Board to that which might conflict with the object of their organization, or which indeed they might prove to be wholly unable to perform.

It appears to the undersigned to be impossible, at this juncture, to decide how far the joint action and control proposed over the inmates of a Reform School and Farm, might tend to produce beneficial results. The industrial direction of the time of the inmates might seriously interfere with the disciplinary government of the Institution. Until the school and Farm shall have been put into operation—the system of government, the ability and willingness of the inmates to work, the productive value of their labor, the style and cost of clothing, the expenses of food, the relative number of males and females, the relative number of those that may work at mechanical labor and at farm labor and sundry other matters shall be fully known, we do not think that a definite arrangement could be made.

Beside these considerations, the location of the farm and its adaptedness to particular uses, would materially affect the value of the labor of the inmates. So, too, the permanent improvements that might be made upon the farm, would render it more or less valuable. Indeed it is quite impossible *now* to decide upon what should be regarded as permanent improvements.

While the whole subject is new and with us untried, and while so many embarrassing questions remain undetermined, we feel constrained, at present, to decline to enter into any arrangement upon the subject.

Although we decline to accept of your proposition, yet we feel it our duty to add that the Agricultural population of Ohio feel a lively interest in the proposed philanthropic undertaking. They believe that the cause of humanity and of public morals demand that more efficient reformatory measures should be adopted to bring back to the paths of industry and virtue, that class of destitute and neglected youth, which such an institution is designed to reclaim. The subject so imperatively calls for legislative action, and so strongly commends itself to our Representatives, that we do not doubt but they will speedily establish a Reform School, not caring for the present, under whose supervision the agricultural labor of the School is to be applied.

Before concluding we desire to assure your Board that the Agriculturists of the State are anxious for the establishment of an Experimental Farm, and that whenever it shall be manifest that such a Farm can be successfully carried on in connection with a Reform School, upon well adjusted terms, satisfactory to both Boards, that then we have no doubt that an arrangement will be promptly consummated.

Very respectfully yours,

ALEX. WADDLE,
L. BUTTLES,
JOHN M. MILLIKIN.
Committee of the Ohio State Board of Agriculture.

December 18, 1856.

On motion of Maj. Millikin, the following was adopted:

Resolved, That the Ohio State Board of Agriculture approve of a more general use of agricultural books, as premiums at the State and County Fairs, believing that the circulation of such books is eminently useful; and we recommend the catalogue of C. M. Saxton & Co., of New York, to the attention of the County Societies, as containing standard works of permanent value upon many branches of farming and agriculture.

PREMIUMS ON ESSAYS.

The committees appointed to revise the premium list reported progress.

On motion, that portion of the list not apportioned to committees was made the order for the remainder of the session. A committee, appointed to select topics for Essays, upon which a premium of $50 is to be awarded to each, if approved by the Board at the December meeting, reported the following:

For the best Essay on Drainage, $50.

For the best Essay on Grasses, $50.

For the best Essay on Insects Beneficial to the Agriculturist, $50.

For the best Essay on Veterinary Science, $50.

Statements of applicants for premiums on Field Crops were then examined, and the Board awarded premiums to the following:

Statement of E. S. Willard, Cuyahoga County.

ONE-FOURTH ACRE SWEET POTATOES.

To one-half day's plowing	$1 00
" 3 loads manure	2 25
" 2,000 potato sets	10 00
" ridging 2 days	00
" hoeing 6 "	3 00
" digging 5 "	5 00
	$23 25
By 65 bushels sweet potatoes, at $2	130 00
	$106 75

First premium awarded, $12.

Statement of E. S. Willard, Cuyahoga County.

ONE-FOURTH ACRE OF ONIONS.

To plowing one-half day	$1 00
" 12 loads manure	9 00
" planting 1 day	1 00
" 20 days' female labor	10 00
" seed	1 25
	$32 25
By 220 bushels onions, price 81c	178 20
	$145 95

CLEVELAND, Dec. 1, 1856.

First premium awarded, $12.

Statement of John Kelley, of Cuyahoga County.

STATEMENT OF ONION CROP, RAISED ON ONE-FOURTH OF AN ACRE.

	To plowing one-half day, with one horse	87
	" 12 one-horse loads of manure	$4 50
	" draying and raking	1 25
	" 1½ bushels seed onions	1 87
April 12.	To 1 day's planting	1 00
May 20.	" 7 days' labor	3 50
June 12.	" 4 "	2 00
July 7.	" 3½ "	1 75
" 28.	" 2 "	1 00

Aug. 15.	To 1 day's labor	50
Sept. 29.	" 3 "	$1 50
Oct. 10.	" 6 "	3 00
To marketing		9 00
	Total expense	$31 74
191 bushels and 21 quarts, at 90 cts. per bushel		172 56
	Net proceeds	$140 82

NOVEMBER 29, 1856.

Second premium of $6 awarded.

Statement of T. D. Crosby, of Cuyahoga County.

EUCLID, Cuyahoga county, ss:

Thos. D. Crosby, being duly sworn, says that he raised a crop of potatoes the past season, upon the land measured by Wyllys Welton, and that the quantity of potatoes raised thereon was 240 bushels by measure, or 264 by weight, 60 pounds to the bushel, and that the statements in regard to the manner of cultivation, etc., are correct to the best of my knowledge. The soil, a moist, sandy soil (half acre).

To 5 loads barn yard manure, put on broadcast, at 50 cts. per load	$2 50
" one half day's plowing, with Michigan double plow	1 00
" 1 day's planting, planted in rows one way, one piece in a place	1 00
" 5 bushels seed, the kinds Neshannock and pink-eye	2 50
" twice cultivating and hoeing	2 00
" 4 days' harvesting, at $1 per day	4 00
" 5 days' marketing, at $2 per day	10 00
Expense of raising, &c	$23 00
240 bushels, at 75 cts. per bushel	180 00
Deduct expense of raising, $23 00, leaves a balance	$157 00

The time of planting about the 20th of April. THOS. D. CROSBY.

First premium, $20, awarded.

Statement of Edwin Harris, of Franklin County.

Buckwheat crop; soil, black loam; sod having been in meadow some ten years; plowed the 15th of June last, about 7 inches deep, and sowed about 15th of July; rolled once and harrowed once before sowing; after sowing, harrowed once and finished by rolling once more; cut the 29th of September, 1856; yield, 45 bushels; measured in a sealed half bushel.

EXPENSE OF CULTURE.

Plowing one acre of sod, three-fourths of a day	$1 50
Rolling and harrowing once before sowing, one-fourth of a day	50
Sowing	12
Harrowing and rolling once after sowing, one-fourth of a day	50
Cutting, threshing and cleaning, 2¾ days	2 75
Marketing	50
Seed, one bushel	1 00
	$6 87

Cr.

To 45 bushels, at $1 per bushel	$45 00
Expenses	6 87
Net profit	$38 13

First premium awarded, $20.

Mr. Smith submitted the following:

GEOLOGICAL SURVEY.

The Ohio State Board of Agriculture believe that the prosecution of the geological survey of Ohio will tend to the more rapid development of the natural resources of Ohio—resources that are now admitted as unsurpassed in amount and availability; that the survey formerly commenced has already been of great advantage to the State generally, and to the counties examined particularly; that it will tend in the future, as it has in time past, to promote the agricultural interests, the commercial interests, the manufacturing interests, and the financial interests of Ohio.

The Ohio State Board of Agriculture have in years past recommended the prosecution of the geological survey; the agricultural conventions have at sundry times recommended it; the American Association for the Advancement of Science have, at their meetings at Cincinnati and at Cleveland, at Albany and Washington, recommended it to the Legislature of Ohio; and the Governor of Ohio, in his recent message to the Legislature of Ohio, has recommended it; and finally, there is a growing sentiment among the people that the prosecution of this work is important to make known to them the resources dormant in their lands, the value and availability of which they do not fully know.

For all these reasons, the Ohio State Board of Agriculture have passed the following resolution, viz:

Resolved, That the Ohio State Board of Agriculture recommend that the Legislature take such action as to insure the prosecution and completion of a geological survey of the State of Ohio, including an analysis of its soils, marls, ores, and the various natural products that will aid in the development of the resources of Ohio, and in making them available.

The premium list was then taken up, the different committees reporting a few changes.

Mr. Green offered the following, which, on motion, was adopted:

Resolved, That the rules for the organization of county societies be so amended that they be authorized to permit all persons to compete for premiums without restriction, except for field crops, which shall be confined to each county respectively.

Messrs. Barker and Krum having been appointed a committee to report a rule as to the time of weighing hay, which has been entered for a premium, reported the following rule, which was accepted:

The hay shall be well cured, and weighed not less than sixty days after cutting.

On motion of Mr. Stedman, it was

Resolved, That the corresponding secretary of the State Board of Agriculture be elected annually, at the December meeting, and that his term of office commence and date from the first day of the succeeding February.

The President then named Messrs. John K. Green and John M. Millikin as members of the executive committee.

On motion of Mr. Musgrave, it was

Ordered, That the sum of three thousand dollars, together with the Cincinnati subscription, be, and the same is hereby appropriated, subject to the order of the President, for the use of the executive committee, in preparing ground for the Fair to be held at Cincinnati the present year.

On motion,

The Board adjourned, *sine die.*

In accordance with a resolution passed at the January meeting, authorizing a trial of reapers and mowers to take place at Hamilton, Butler county, on the first day of July, the public were advertised of the intention of the Board, and at the time and place designated, there was assembled a large concourse of agriculturists from the adjoining counties, to witness the trial of the machines. There were entered for competition twelve combined machines, four as mowers exclusively, and three as reapers exclusively; being equivalent to thirty-one machines.

The trial continued during three days, namely, Wednesday, Thursday, and Friday, the 1st, 2d, and 3d days of July. Little else was accomplished the first day than determining the rules which should govern, the points of merit to be considered, &c., in consequence of a rain which prevailed during the afternoon. Several of the reapers and combined machines had, however, been subjected to trial in a field of rather light barley, before the rain commenced.

The second day proved to be a very fine one, and the mowers and combined machines were placed on trial in a meadow of well grown timothy (*Phleum pratense*). This exhibition of the capability of the different machines was not only eminently successful but entirely satisfactory to all who witnessed it. Towards the close of the day, the draft of the mowers was tested by Gibbs' Dynamometer, the most reliable instrument of the kind in general use in this State.

The third or last day was set apart for the trial of reapers. It is much to be regretted that no field of wheat could be obtained sufficiently ripe which would present the crop under all circumstances; that is to say, land having an uneven surface, wheat fallen, tangled, and heavy; instead of such a field, the machines were tested as to draft, and facility and capacity of cutting, in a field the surface of which was extremely even; the crop was rather light, and in excellent cutting condition, the stalks standing as regular and erect as the most fastidious could desire. The details of the trial will be found in the committee's annexed

REPORT OF THE TRIAL OF REAPERS AND MOWERS, AT HAMILTON, BUTLER CO., O., JULY 1st, 2d, AND 3d, 1857.

To the President of the State Board of Agriculture:

Sir: The undersigned, appointed by the State Board of Agriculture to act as judges at the trial of reapers and mowers, at Hamilton, on the 1st, 2d and 3d days of July, respectfully make the following report:

ENTRIES.

REAPERS EXCLUSIVELY.

1. Illinois Harvester, by Haines, Hawley & Co., Pekin, Ill.

2 and 3. Whiteby & Fassler's Reaper (two styles), Springfield, O.

MOWERS EXCLUSIVELY.

4. Allen's Mower, by R. L. Allen, No. 189 Water Street, N. Y.
5. Ohio Mower, by E. Ball, Canton, O.
6. H. F. Mann's Mower, by H. F. Mann, Westville, La Porte Co., Ind.
7. Aultman & Miller's Patent, by Miller, Aultman & Co., Canton, O.

COMBINED MACHINES.

8. Atkins' Self-raking Reaper and Mower, by R. Dutton, Dayton, O.

9 and 10. Kirby's Patent (one and two-horse), Buffalo Agricultural Works, N. Y.

11. Whiteby & Fassler's, of Springfield, O.

12. Manny's Reaper and Mower, by Baldwin, Dewitt & Co., Cleveland, O.

13. Hamilton Harvester, by Long, Black & Allstatter, Hamilton, O.

14. Ohio Harvester, by Warder, Brokaw & Childs, Springfield, O.

15. J. J. Mann & Son's Self-raking Reaper and Mower, of Westville, La Porte Co., Ind.

16. Forbush's Improved, by W. S. Hazard, Cincinnati, O.

17 and 18. McCormick's (two sizes), by W. B. Silver, Sugar Valley, Preble Co., O.

19. Hilt's Machine, by A. Hilts, Springfield, O.

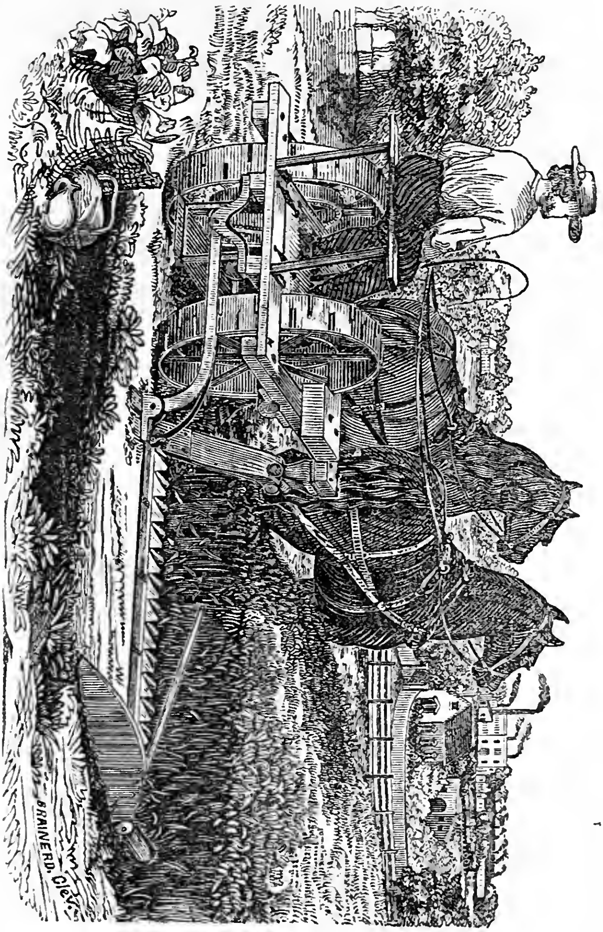
CROPS, WEATHER, GROUND, ETC.

In an ordinary season, the vicinity of Hamilton would be a most admirable point for such a trial, it being one of the best farming regions in the State; but owing to the cold and continued rains of the present season, the crops were one or two weeks more backward than usual. On the 1st of July—the day appointed for the commencement of the trial—it was difficult to find either grain or grass ripe enough for cutting. At the same time, the weather proved unpropitious, the rain arresting our proceedings on the first day, when but little progress had been made. This condition of the crops and weather prevented a trial as extended and complete as many would have desired; we believe, however, it was in the main satisfactory.

THE MOWING.

The morning of the second day presenting an appearance of rain, it was determined to proceed first with the trial of mowers. A large field had been obtained for the purpose, having some inequalities of surface, and on different sides of the field very considerable variety in respect to crop. On account of this difference, the field was not divided off and a particular portion assigned to each machine, but all in turn made one or more circuits of the entire piece, the levelest and most uniform part in regard to crop being selected for testing the draft with the dynamometer. In the use of the dynamometer the committee were assisted by Mr. J. W. Gibbs, of Canton, O., the manufacturer of the instrument, in whose hands greater accuracy was doubtless obtained than would have been possible in the hands of persons of less experience.

The Ohio Mower, entered by E. Ball, of Canton, Ohio, was first introduced. This machine is a mower exclusively; it has no reel; the cutter bar is attached to the machine by a hinge joint, by which it accommodates itself readily to uneven surfaces. The frame is placed upon two wheels, either of which may act as driver independently of the other, or they may act together; and consequently, when the machine moves in a curve,



OHIO MOWER.

either to the right or left, the knives are kept in proper motion, and the liability to clog under such circumstances obviated. When the machine moves backwards the knife ceases to vibrate. The cutter bar is easily detached, and the machine moved from place to place. This machine performed admirably in all parts of the field. For width of cut, draft, and some other particulars, see tabular statement.

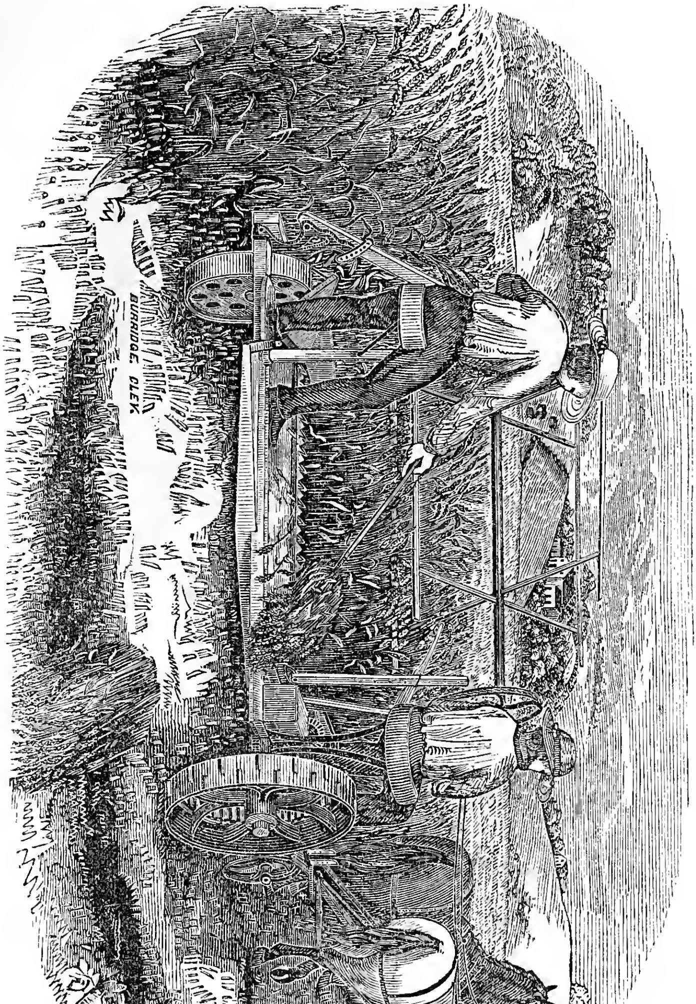
Allen's Mower.—Like the preceding, this is exclusively a mower; it is a compact, well balanced machine, and also without a reel. The knife is worked by a cam instead of a crank, which appeared to obviate the jerking motion noticed in some other machines. It is so geared as to secure sufficient motion to the knife when the team moves slowly, being in this respect adapted to mules, or even oxen. The frame is so supported by springs as to run more smoothly over rough ground than it otherwise would. The work was well done by this machine.

Atkins' Mower is the reaper with the automaton raker laid aside. This machine, from the works of R. Dutton, of Dayton, Ohio, was a specimen of most beautiful workmanship. The frame is supported by fore wheels attached like those of a wagon; the team may, therefore, turn to the right or left about with great ease and in a very small space. This machine has a reel. Its work was well done.

Kirby's Patent, from the Buffalo Agricultural Works, is a compact and simple machine, constructed almost entirely of iron. It has the driving wheel so connected with the frame that when the wheel passes over uneven ground it does not carry the cutter bar up or down, but leaves it to follow the ground over which it passes, independently of the driving wheel. During the trial of this machine, the wind was occasionally quite strong, and when both had the same direction, the machine once or twice passed over the grass, as any other machine without a reel would probably have done.

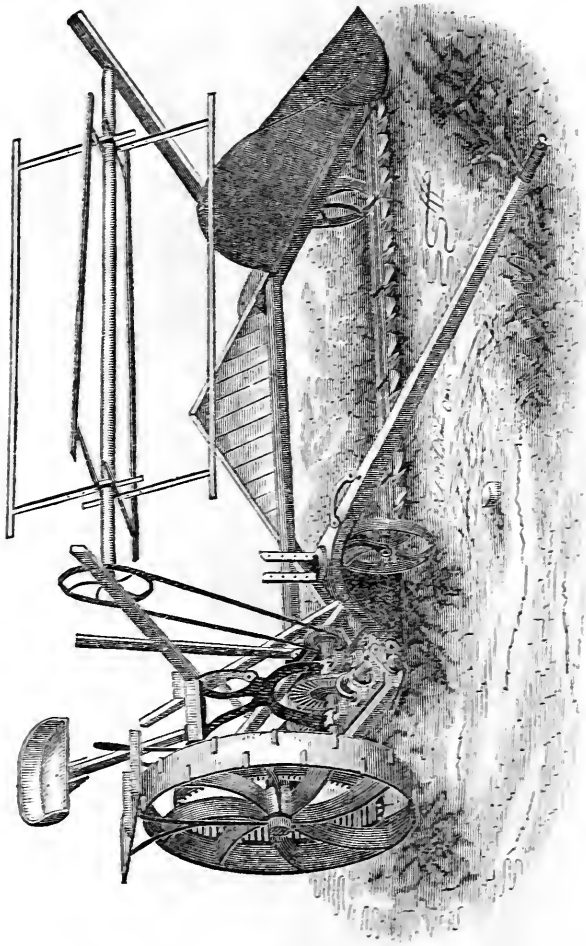
Whiteby & Fassler's is a combined machine, which, in changing from a reaper to a mower, has a change of pinion, so that the knife is made to operate more rapidly in grass than is required in grain. In this machine ample provision is made against clogging and side draft. It is less portable than some, and less readily adjusted to different hights. The cutting was well done.

J. H. Manny's Combined Reaper and Mower, by Baldwin, Dewitt & Co., of Cleveland, attracted considerable attention from its being, more



MANNY'S REAPER.

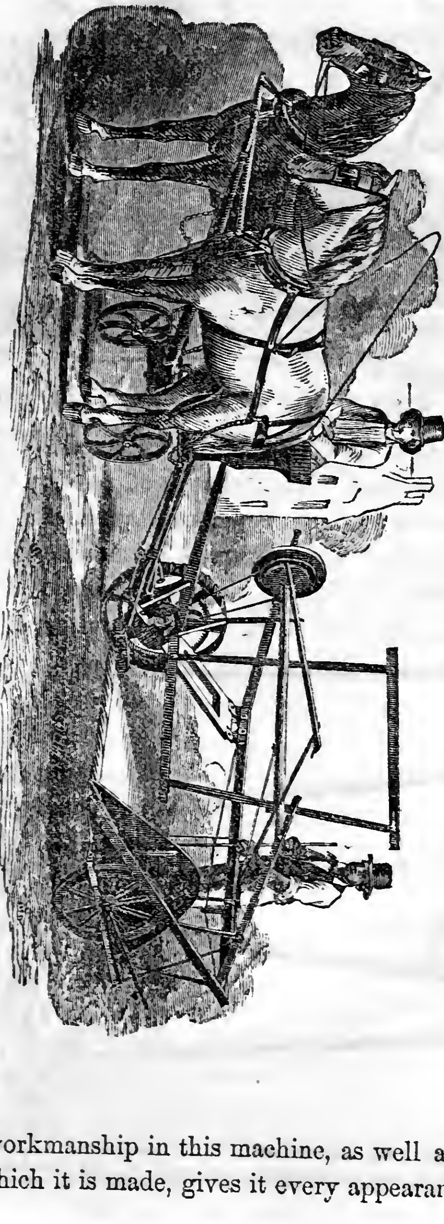
completely than any other, under the control of the driver; it was several times, when going at the usual speed, raised with apparent ease over a log and rails laid in the grass. It is readily adjusted to any hight, cuts a wide swath, with a light draft. The cutting was done perfectly.



MANNY'S MOWER.

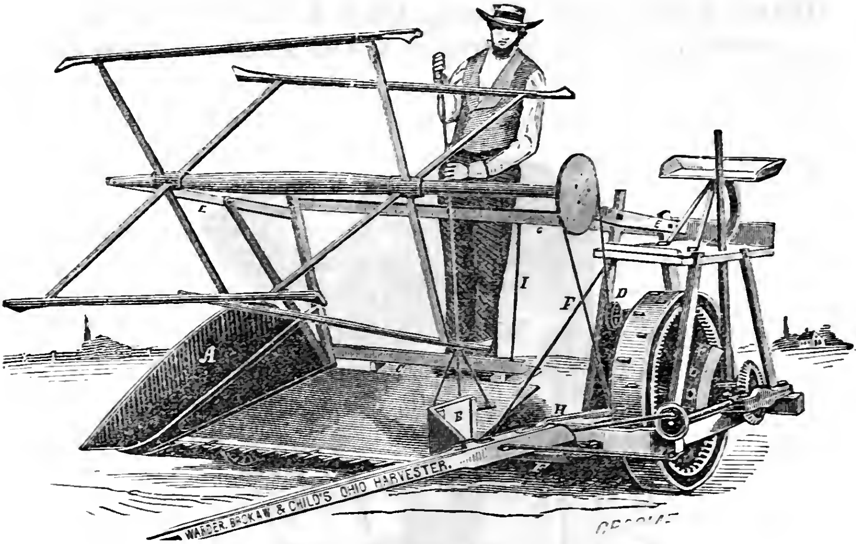
Hussey's Improved, entered by Minturn & Co., of Urbana, is a simple and substantial machine, not quite as portable or readily adjusted to different heights as some. Where the grass was heavy, it was cut with comparative ease; where it was very light the speed of the team required to be considerably increased.

HAMILTON HARVESTER, of Long, Black & Allstatter, of Hamilton, is a combined machine, constructed almost wholly of wrought iron.



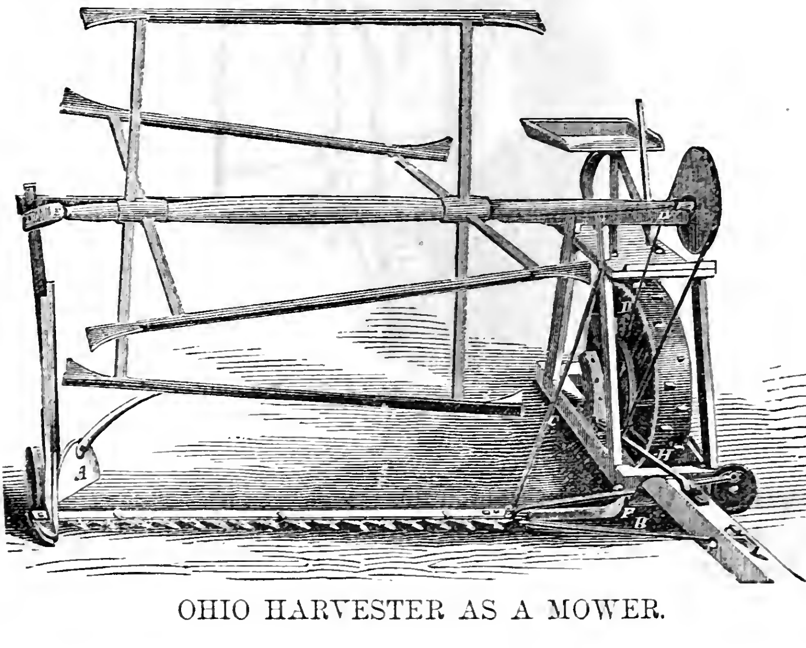
HAMILTON HARVESTER.

The quality of the workmanship in this machine, as well as the character of the material of which it is made, gives it every appearance of strength and durability.



OHIO HARVESTER AS A REAPER.

The Ohio Harvester, of Warden, Brokard & Childs, of Springfield, is a combined machine. By a change of position it varies the stroke of the knife so as to secure a more perfect adaptation to either grass or grain. There is also a change in the centre of balance, so that the absence of the platform and raker in mowing throws no additional weight on the necks of the horses. It did good work.



OHIO HARVESTER AS A MOWER.

H. F. Mann's Great Western Iron Mower, from Westville, La Porte Co., Ind., is exclusively a mower. It is constructed almost wholly of wrought iron, and well made. It is not adjusted to different heights ot cutting as readily as some, nor does it as readily adapt itself to uneven ground; but its work was well done.

J. J. Mann & Sons, also of Westville, Ind., entered a combined machine, which was not as successful in light grass and tangled clover as it appeared to be in grain. It is probably better adapted to cutting the prairie grasses than the cultivated.

Forbush's Improved, entered by Mr. Hazard, of Cincinnati, is a combined machine, which did excellent work as a mower. It was removed before the close of the trial, and therefore was not as minutely examined as it otherwise would have been.

Aultman and Miller's Patent, from the works of Ball, Aultman & Co., worked admirably. It is but a modification of the Ohio Mower, and is manufactured by the same firm. It is even more portable than the original, and adjusts itself to inequalities of surface with the same facility. The draft of this machine was lighter, absolutely, than any other exhibited, though Manny's and Hilts', from the greater width of cut, were or ligher drafts, relatively.

McCormick's Reaper, converted into a Mower, was entered by W. B. Silver, of Sugar Valley, Preble Co. It scarcely sustained as a Mower the high reputation it has achieved as a Reaper.

Hilts' Machine. This is a combined machine, differing essentially from all the preceding. It has double knives, acting like the blades of shears; over the knives there are no guards or other protection. This machine cut the grass perfectly, and with less draft in proportion to width of swath than any other on trial. The dampness of the grass gave no opportunity to judge of the liability of the knives to be seperated by the adhesion to them of gummy matter, as we should have expected, had the grass been dry. The want of guards, it was supposed would in many portions of the country detract from the durability of the machine.

REAPERS.

The trial of Reapers was conducted in a large field of wheat, the crop was fair, standing and uniform. The heavy grain was all unfit to cut; the committee was therefore constrained to form an opinion of the various machines as they appeared under the most favorable circumstances and without being able to subject any of them to a severe trial.

Atkin's Self-Raking Reaper ran finely and cut the grain perfectly. The almost human arm that does the raking, gathered the grain and laid the gavels as well as any of the hand rakers, and with as little scattering as any, except Hussey's.

KIRBY'S HAND-RAKER, for one, and also for two horses, cut the grain perfectly. The raker did not appear to be a practical hand, and gavels were not perfectly laid for binding.

WHITEBY AND FASSLER'S SELF-RAKER. The raking apparatus is extremely simple, but it failed to lay the gavels well, besides having the disadvantage of leaving them in the track of the team on their next through, therefore requiring it to be bound immediately.

WHITEBY AND FASSLER'S HAND-RAKER cut the grain well, and the raker has a good position, but the grain was not very well laid off.

MANNY'S cut the grain perfectly and the gavels were handsomely put off. This machine by being so readily raised or lowered in its course may not only be lifted over a stump or stone, but lowered so as to cut spots of lodged grain.

HUSSEY'S MACHINE, as improved by Minturn & Co., of Urbana, cut the grain well, but has the disadvantage of laying it in the next track of the horses; a sufficient number of binders must therefore be employed to keep up with the machine. The gavels, though not compact enough for convenience in binding, were more uniformly laid and with less scattering than by any other machine.

THE HAMILTON HARVESTER did the work well, the raker has a good position, and the raking was fairly done.

The Ohio Harvester made excellent work. The raker's position is very good, the grain was delivered handsomely.

J. J. MANN'S is a Self-raker of peculiar construction. It has a revolving canvass platform upon which the grain falls and is carried over the side of the machine and deposited in a concave receptacle, from which it is thrown by a revolving rake, managed by a boy, to regulate the size of the bundles. This machine operated well, and had the grain been considerably heavier, it probably would have performed still better.

THE ILLINOIS HARVESTER is worked by four horses, the cutting apparatus being before the team. It is designed to take off little more than the heads, clearing a space of ten or twelve feet in width; the heads of the wheat are gathered by a concave elevator, which deposits them in a wagon that must be so driven as to receive them from the Harvester. With this machine it seems impossible to avoid waste.

McCORMICK'S REAPER of two sizes cut the grain well, and the gavels were well delivered. The raker rides backward and appears to have a constrained and disagreeable position.

The Machine of A. Hilts, which works with double knives, cut the grain well. That part of the reel which strikes the grain, is of canvass which, it is claimed, occasions less loss than the common reel in over ripe grain.

A further comparative view of these machines may be obtained from the following tabular statement:

NAME OF MACHINE.	NAME AND ADDRESS OF MANUFACTURER.	CHARACTER.	WIDTH OF CUT.	DRAFT WHEN MOWING.	DRAFT WHEN REAPING.	COST.
1. Atkins' Self raker	R. Dutton, Dayton, O......	Combined.	5 ft. 2 in.	325lbs	275lb	$165 00
2. Allen's Mower.	R. L. Allen, Nos. 189 & 191, Water street, N. Y.......	Mower....	4 ft. 8 in.	287 "	......	120 00
3. Ohio Mower...	E. Ball, Canton, O	"	4 ft. 8 in.	300 "	......	125 00
4. Forbush's Improved.......	W. S. Hazard, Cincinnati, O.	Combined.	4 ft. 9 in.	350 "	......	....
5. Hamilton Harvester	Long, Black & Allstatter, Hamilton, O...........	"	5 ft 8 in.	375 "	250lbs	160 00
6. Hilts' machine.	A. Hilts, Springfield, O....	"	5 ft. 10 in.	325 "	225 "	160 00
7. Hussey's Imp'd	Minturn & Co, Urbana, O..	"	5 ft	......	225 "	115 00
8. Illinois Harv'r.	Haines, Hawley & Co., Pekin, Ill	Reaper ...	12 ft....	......	......	....
9. Kirby's Patent.	Agricultural Machine Works, Buffalo, N. Y...........	Combined.	4 ft. 9 in.	362lbs	200 lbs	120 00
10. Kirby's Patent, one-horse	Agricultural Machine Works, Buffalo, N. Y	....	....	......	......	100 00
11. Manny's Reaper and Mower.	Baldwin, Dewitt & Co., Cleveland, O............	Combined.	6 ft.....	350lbs	300lbs	140 00
12. H. F. Mann's Mower.......	H. F. Mann, Westville, La Porte Co., Ind	Mower....	4 ft. 6 in.	375 "	......	100 00
13. J. J. Mann & Son's self-rak'r	J. J. Mann & Sons, Westville, La Porte Co., Ind	Combined.	5 ft. 6 in.	......	300lbs	150 00
14. McCormick's Reaper	W. B Silver, Sugar Valley, Preble Co, O...........	" large..	6 ft.....	......	300 "	155 00
15. McCormick's Reaper	W. B. Silver, Sugar Valley, Preble Co., O	" small..	4 ft. 8 in.	......	275 "	145 00
16. Miller & Aultman's Patent.	Ball, Aultman & Co., Canton, O.....................	Mower....	4 ft. 8 in.	275lbs	......	125 00
17. Ohio Harvester	Warder, Brokaw & Childs, Springfield, O	Combined.	5 ft. 5 in.	425 "	275lbs	140 00
18. Whiteby & Fassler's Self-raker	Whiteby & Fassler, Springfield, O	"	5 ft.....	350 "	250 "	140 00
19. Whiteby & Fassler's h'nd rak'r	Whiteby & Fassler, Springfield, O	Reaper ...	6 ft.....	......	225 "	130 00

POINTS OF COMPARISON.

The work of many of the machines exhibited was so well done that, taking this alone into account, a decided choice would have been impossible; they differed widely, however, in regard to simplicity, strength, excellence of mechanical construction, portability, capability of adjustment to different conditions of crop and surface, ease of management, draft, cost, &c. From a careful consideration of these points and their relative importance, the committee had no difficulty in arriving at conclusions satisfactory at least to themselves.

AWARDS—MOWERS.

The committee is of opinion that the premium of $50.00 offered for the best mower, be awarded to Manny's machine, by Baldwin, Dewitt & Co., of Cleveland. None did better work, and with the exception of Mr. Hilts' machine, none had so light draft in proportion to width of swath. It is more readily adjusted to cut at different hights than any, and is more perfectly under the control of the driver, being easily raised in its course over any ordinary obstruction. It is easily managed, well made, and very portable.

The second prize of $30.00 is awarded to Ball's Ohio Mower. This machine worked admirably, is extremely portable, easily managed, and well made. Perhaps it may not be improper to state that Aultman & Miller's Patent, manufactured by the same firm, was by a part of the committee preferred to the Ohio Mower.

REAPERS.

The premium of $50.00, offered for the best reaper, is awarded to Atkins' Self-raker, exhibited by R. Dutton. This machine, while it cuts the grain perfectly, has in its ingenious raking attachment the advantage over hand rakers of dispensing with the labor of one person: in its manner of gathering and laying the grain it proved superior to other self-rakers.

The second prize of $30.00 is awarded to the Ohio Harvester, of Warder, Brokaw & Childs. This machine is well made, cuts well, and has an easy position for the raker.

COMBINED MACHINES.

The premium of $50.00 for the best combined machine is awarded to Manny's, of Baldwin, Dewitt & Co. As a mower, this machine was adjudged to be superior; as a reaper, it was scarcely surpassed. It is changed from one form to the other in less time and with less trouble than any other on exhibition.

The second prize of $30.00 is awarded to the Hamilton Harvester, of Long, Black & Allstatter. This machine performed well, both as reaper and mower, and is easily changed from one form to the other.

REMARKS.

We are unwilling to close this report without alluding to some of the incidental benefits which may probably result from the trial, in addition to the more prominent object of giving to the farming community an opportunity of judging of the comparative merits of the several machines.

The entire success and good economy of reaping and mowing machines, even on small farms, must have been satisfactorily demonstrated even to the most skeptical. It requires no arithmetician to see that the cost of cutting grass or grain by a machine is less than by hand, and it was equally evident that no scythe could make more beautiful work than some of the mowers, nor could any cradler have cut grain better than several of the reapers. But the great advantage is in the fact that the owner of a good machine can cut his crops when they are ready, and when, perhaps, men to cut in the old method are not easily obtained.

The manufacturers and exhibitors present at the trial had an opportunity of seeing comparative defects in their own machines, and comparative excellences in others, before unsuspected. We are mistaken if nearly every machine presented will not be in some particular improved, in consequence of such a comparison.

The number of really good machines on exhibition makes it apparent that no fortunate patentee can long enjoy a monopoly of the business; there will soon be too much competition. This will result in reducing the cost to the farmer to a point nearer the actual cost of construction.

Such a collection of variously constructed machines encourages the hope that when the special excellences of each are fully developed and known, a machine may be constructed combining more of these excellences than any one yet constructed, which will meet every reasonable want.

N. S. TOWNSHEND,
DAVID NEVITT,
JOSEPH BARKER
JOHN FERRIS,
E. G. DYER.

The citizens of Cincinnati manifested a lively interest in the preparation for, and the success of the State Fair, as the annexed article unmistakably indicates:

[From the Cincinnati Commercial of July 17, 1857.]

STATE FAIR MEETING

Pursuant to a call, was held in Merchants' Exchange, last evening, for the purpose of endeavoring to excite public interest in the approaching State Fair.

Jas. F. Cunningham, Esq., was called to the chair, and W. D. Bickham appointed Secretary.

Gen. Chas. H. Sargeant stated that at a previous meeting, he with others was appointed a committee to co-operate with the State Board of Agriculture, in providing and making arrangements to secure the success of the approaching State Fair. The Fair grounds have been selected, and the $3,000 promised by the citizens to the State Board of Agriculture had been raised and a portion of it is already in the hand of the State Board. The Fair is to be held on the Riddle property, where the old race course was formerly located. The ground is nearly enclosed, and will be in excellent condition by the time the Fair is held.

Mr. Stoms didn't think a meeting necessary to excite interest in the State Fair. The people all over the State are preparing for it, and it no doubt, will be the most successful ever held. He maintained that Cincinnati is the only place in the State where a State Fair should be held. It is the only place where visitors can be comfortably accommodated, and besides it is at the confluence of the three great States of Kentucky, Indiana and Ohio.

He said, it is true that a silly prejudice is harbored by other sections of the State against Cincinnati, but our obvious advantages will soon prevail against all opposition, and the time will soon come when the farmers, mechanics, inventors and stock growers, will confess that it is to their interests to hold the State Fairs here regularly.

General Sargeant also suggested that citizens can enhance the attractiveness of the Fair at this point, by contributing a private purse for the purpose of providing premiums, additional to those offered by the State Board, and confessed his willingness to contribute to such fund. To illustrate, he thought if a man who takes a premium from the State Board for a fine horse should receive a fine saddle or set of harness, in addition from citizens, it would excite an emulous feeling and would compensate them in some measure for their expense and trouble in bringing their stock and articles to this point for exhibition. He then submitted the following preamble and resolutions:

Whereas, The Agricultural Society of Ohio has by conference and advice with a committee of citizens, located the State Fair for 1857, in Hamilton county, and near the corporate limits of this city, we deem it proper, in further co-operation with the State Board, to render the occasion one of particular interest to exhibitors and visitors, that united action should be had on the part of our citizens, whereby all classes of business interested may concentrate their efforts in its behalf. In view of which, therefore, be it

Resolved, That the following committees be and the same are hereby created, viz:

An Executive committee of 13 who shall be charged with the duty of making all the necessary arrangements on the part of the citizens for the occasion of the contemplated Fair. They shall receive all moneys and contributions donated by citizens, and make such distribution of the same in the purchase of suitable articles, manufactured in Cincinnati to be distributed as additional premiums to exhibitors awarded premiums by the proper committees, or otherwise, as they in connection with the committee from the State Board of Agriculture may deem best calculated to promote the interest of the Fair.

A Finance committee, designated as follows: charged with the duty of soliciting and collecting subscriptions from citizens, for the object and purposes before mentioned.

A committee of five on Manufactures.

A committee of five on Merchants and Traders.

A committee of three on Banks, Bankers, Stock and Exchange Brokers.

A committee of three on Public Houses and Houses of Amusement.

A committee of three on Livery Stables, Hackmen and Omnibus lines.

A committee of three on Real Estate owners and Brokers.

A committee of three on Professional men.

A committee of three on Railroads and boatmen.

A committee of three on Insurance companies and agencies, Express and Telegraph companies.

Resolved, That inasmuch as the time is short between the present and the period when the Fair is to be held, (in September next) prompt and active exertions on the part of the several committees designated, is requested and that they at once organize and give the subject matter of duty assigned them their immediate attention. *Adopted unanimously.*

On motion, the chairman was directed to appoint the committees provided for in the above resolutions and report at a meeting to be held next Monday evening in Merchants Exchange.

It is with regret that we are compelled to state as a matter of truth, that all this interest manifested in behalf of the State Board, became dormant as soon as the article was published in the city dailies.

The Horticultural Society deemed it proper to hold a cotemporaneous Fair in the city of Cincinnati.

The Mechanics' Institute also held a cotemporaneous exhibition.

STATE FAIR.

The annual State Fair has become an *institution* with which the agriculturists of Ohio would not willingly dispense. It is visited by tens of thousands for the purpose of not only increasing the circle of personal acquaintance, but to become acquainted with all the improvements and inventions in those departments of industry in which they are immediately interested.

Since the world began, there has been no period of which we have any record, when there was so much and such appropriate machinery as at the present day. Year after year, not only are great and valuable improvements made in machinery, but entire new machines are invented. During the brief existence of the State Fair, a better idea can be obtained of machinery, special and in general, than can be in twelve months severe and arduous study from books. Those conversant with the elementary principles of machines are not unfrequently strongly impressed with the operating of certain machines at the Fair. This impression is nurtured, and day by day it waxes stronger and bolder in outline, until, after the lapse of a few months, the machine which took shape from a misty dimness in the inventor's imagination, now stands before us a substantial wood and iron machine, admirably adapted for the contemplated end. Thus is the State Fair a suggestive school for the thinking mechanic; beside being perhaps the best place in the world where so many actual machines—and not models merely—may be seen in operation in so brief a period of time. Are we claiming too much when we assert it as our candid conviction that a very respectable proportion of machines and implements, now in daily use, would not have been wrought, if Fairs had never been encouraged, or if Fairs had not encouraged the development of mechanism? A volume would not contain a catalogue with a brief description of every machine and implement which has been invented, or improved in Ohio since the organization of the State Board of Agriculture.

It has been asserted by those whose judgment we respect, that a Presidential canvass is an educational institution as well as a political one. In a much greater and far more exalted degree is a State Fair an educational process. The products of the most important industrial pursuits are presented at a glance. This single fact is fraught with important consequences. Every visitor can see, examine and judge for him or herself of the relative as well as absolute merits of these products. Comparisons involuntarily possess the thinking faculty of every thinking person, and every such one returns home with a store of food for thought for the next twelve months. The contact with so many persons is of itself a refining process, and no boor, however uncultivated, can leave the Fair Grounds without an impression of the true, the pure, and the beautiful, the reflection of which in leisure hours will be vividly reproduced, and at each successive reproduction, will exert an ameliorating and beneficial influence.

No one can possibly have a proper conception of the varied industrial and agricultural products and resources of a State, without visiting not only *one* State Fair, but by visiting consecutive State Fairs, in different localities of the same State.

The stock grower interchanges opinions with his co-laborer, and this interchange results in mutual benefits, which the observing anatomist may detect at the succeeding Fair. If there is any superiority in particular strains of animals, whose pedigrees have remained unsullied by intermixture with baser blood, then at the State Fair is this excellence to proclaim itself in a manner which needs neither oral nor written argument to convince the doubting; the appearance of the animals themselves being the requisite testimony.

The weather was exceedingly fine during the entire exhibition at Cincinnati, and visitors escaped the unpleasantness of an autumnal storm, which for several years preceding occurred during the exhibition. The number of visitors was perhaps as great as at any of the seven preceding Fairs. The neighboring States of Kentucky and Indiana were competitors, and in several instances bore away the prizes. Altogether, the eighth annual State Fair was eminently successful. Several departments were not as well represented as they in all probability would have been if local societies had not held contemporaneous exhibitions; but after all, these departments were rather collateral than of prime importance to the great interest of agriculture; all in which and on which agriculture is dependent for success was well represented.

[From the Cincinnati Commercial.]

Ohio State Fair for 1857—The Fair Grounds and Accommodations—Description of Halls and Modes of Transit.

The Eighth Annual Fair under the auspices of the Ohio State Board of Agriculture, will be inaugurated to-morrow, September 15th. Notes of preparation have been heard for many days. Committees, officers, artisans, and laborers have exerted themselves assiduously, and with successful enterprise during the past three months, in order to insure the success of the great annual exhibition of the productions of the West, and to enhance its interest in every department of mechanical, agricultural, and stock producing science. All circumstances thus far have co-operated to facilitate extraordinary exertions, and all extrinsic and intrinsic facts combined, are happy auguries of completest triumph in the enterprise which the Queen City and Hamilton county have engaged to manage to the satisfaction of the people of Ohio.

It is hardly necessary at this time to advert more particularly to the onerous duties that have been performed by those who assumed the responsibility of successfully engineering a work of such magnitude, and so difficult of execution. Suffice it to say, they have nobly accomplished their mission thus far, and in the end will have achieved the objects they have so zealously sought.

The first Fair, under the auspices of the State Board of Agriculture, was held in this city during the autumn of 1850. As an experiment, it was eminently successful, and we hope during the present to persuade and convince the people of Ohio, that notwithstanding the fact that Cincinnati is in the southwest pocket of the State, it is practically the center, and therefore the true location for all Ohio State Fairs hereafter to be held. Since 1850, the Board has held a general Fair annually in various locations, each of which has been successful pecuniarily, and likewise successful in developing the public mind to a realizing sense of the benefits to be derived from a comparison of the merits of productions in the various departments of agricultural and mechanical science; but not one has proved so satisfactory to the public at large as has been desirable, from the simple and undeniable fact that not one single city outside of Cincinnati has been, or is, competent to furnish comfortable accommodation to the vast multitudes of people who have visited or will visit such exhibitions. No necessity exists for illustrating this point. It is palpable, and addresses itself invincibly to universal experience and observation.

Our advantages are innumerable. But a few need be mentioned. Cincinnati is the commercial emporium of one of the finest agricultural districts in the world, and is the seat of extensive and various manufactories. Her Horticultural, Floral, Cereal and Vegetable productions are acknowledged to be unsurpassed, and her reputation as the seat of the wine growing district of the Western continent, is as extensive as civilization. The fame of her artisans, mechanics, and inventors, is co-extensive with the Union, and she is the grand focus from which radiates innumerable thoroughfares reaching into the heart of the country, towards every fractional point of the compass; and lastly, but not least, our hotels and hospitable citizens can and will comfortably, if not sumptuously, accommodate a greater number of guests than has yet been lodged under our protecting roofs.

THE FAIR GROUNDS

Have been judiciously selected. The superficial area enclosed by high and substantial fences, embraces a surface of thirty-eight acres. The southern portion consists of an elevated plateau, commanding a fine view of the level turfed plain which comprises the remainder of the enclosure, as well as a pleasing prospect of the beautiful valley of Millcreek, hedged in by lofty ranges of forest clad hills, diversified by elegant residences and rich gardens of fruit and flowers. The elevated portion of the grounds are protected by some fine shade trees, and carpeted by a heavy green sward, and the base of the bench is the brink of a perenial rivulet, which supplies a limpid current of cool water to quench the thirst of multitudes. Here and there are distributed prettily designed fountains, from which fantastic jets of water leap twenty feet high, into a pure and pleasant atmosphere, diffusing coolness and agreeable odors.

No site in the vicinity of Cincinnati could, perhaps, have been selected, so well calculated to exhibit the extent of the city. Nor could any other so easy of access have been chosen. The Hamilton pike flanks the eastern bundary—a broad, level avenue, which will accommodate countless vehicular conveyances. The Miami canal, on the upper side of the pike, furnishes another, and perhaps more pleasant, rout of transit. On the western side is the Cincinnati, Hamilton & Dayton Railroad, which will accommodate thousands, and drop them within a few rods of the sunset gate. On the same side is the famous "dirt" road, which is entered by diverging to the left at the Brighton House, and turning thence to the right, a few hundred yards beyond—or a more convenient route may be found by following Freeman street to its intersection with the "dirt" road.

EXHIBITING DEPARTMENTS.

The chief gate of entrance and the ticket offices are situated midway of the Fair grounds, on the Hamilton pike. At your right as you enter the stabling for live stock begins, makes a circuit of two-thirds of the area, and embraces six hundred stalls. Towards the northwest corner of the grounds you discover the live stock ring, precisely a third of a mile in circumference. On the southern verge of this, and situated so that the sun shall not dazzle the eyes of spectators, are tiers of seats for the accommodation of 8,000 visitors. A hundred feet or so to the southeast is Agricultural Implement hall, a frame structure 160 feet long by 28 in width, divided by a broad table. To the left of the main *entree* are three spacious halls for the Mechanical department, being altogether 400 feet long by 25 wide. About six hundred feet west you find a spacious round tent devoted to the display of Diary products. Not far off is a tent devoted to the uses of the Executive committee. Midway between the centre and the southern boundary of the grounds, about three hundred feet from the western limits, we encounter Power Hall, where will be heard the clash and clangor of multitudinous pieces of machinery, driven by the strong arm and hot breath of the Newark engine and boiler.

FLORAL HALL.

We now repair to the upper plateau. Here we find Floral Hall flanked on the western side by Pomological Hall, the Dining Hall of the Executive committee, the Board of Agriculture, and their guests, and lastly Burnett's *bijou*, where confections will be liberally dealt to the million for a reasonable compensation.

The Temple of Flora will be the cynosure of the fair grounds, and will doubtless shake the laurels from the crown of our pet Horticultural Society. It occupies a central position upon the highest point of the fair grounds, on the south side nearly midway between the eastern and western limits. We obtain a glimpse of it through a vista of unbrageous forest trees from the centre of the main level of fair grounds, and approach it in front; as we draw near an artificial pool and sparkling fountain, constructed artistically, in a pretty alcove shaded by old elms and weeping willows which incline from the table-land, starts up abruptly with turfy banks towards the south. We pause for an instant to admire the up-leaping jet and hear its musical pell mell in the limpid pool beneath, and then surmounting the ridge before us, we command a view of the lofty arched portal of Flora's Temple.

The vision then mounts upward and beholds a homely but apt symbol of the great exhibition. The dome of the portal is crowned with a huge wagon, piled up, like a mountain, with golden sheaves of wheat, and the mind is pleased with conceptions which arise from its sources when thus roused into action by such suggestive and illustrative types. And in triumph still waves the star spangled banner, floating with graceful dignity from an aspiring staff, as if rejoicing over a land "where the fruits and the flowers chase each other in unbroken circles through the year."

We now enter the Hall. A delicious aroma permeates the atmosphere and seduces the senses. Flora has assumed her most witching sceptre. Flowers, annuals, perennials, exotics, evergreens, boughs and blossoms, green sward, living waters, all combine to impart a complicity of charms, and to dazzle sense and fancy. The woodwork of the wide portal, fretted with garlands of evergreens, is forgotten. A broad path leads you direct to a pelucid pool in the center of the hall. You step softly upon the turfy fringe, and the bright spray from a fanciful fountain dashes upwards a thousand diamond sparkles in incessent showers. You wander around the circular path, your back towards the portal, and you inspect closely a fantastic rustic grotto of roots and fern, rocks and stumps, moss and tangled brushwood. Luxuriant flowers, fresh, green shrubbery, watered by a fountain cunningly concealed in the secrets of the grotto, excites your imagination. At your feet is a reservoir for the secret spring, and a fountain in its center spouts its jets twenty feet and more upward to fall back with musical patter to swell the mirror like pool into which you long to plunge.

Reader, it is very pretty; it is more, it is a fine work of art, such work as our Mr. G. M. Kern can do skillfully. It exceeds the Horticultural grotto in dimensions, and surpasses it in beauty. You will think so, and you will say, too, that our artists are not without taste. When you see the circular fountain with grassy fringe, the rustic grotto and its beauty, the grass plots and *oases* of flowers and shrubbery in Floral Hall, you will admire it.

We had almost forgot to mention that Pomological Hall is one of the right bowers of the Temple of Flora. It is a spacious apartment, being 140 feet long by 90 wide. Fine Arts Hall is 125 feet long by 40, and has a square, glass dome which reflects a beautiful photographic light upon the treasures of art displayed within.

The public will not fail to observe and appreciate the extensive and excellent preparations that have been made to acquit the people of Cincinnati gracefully of their responsibility. Yesterday a hundred hands were driving nails, and the musical clink of hammers kept time to the busy manipulations of a swarm of damsels who were weaving wreaths, and twining garlands for decorative purposes.

PROGRAMME OF THE EXHIBITION.

Order of exhibition for Wednesday, September 16, 1857:

EXHIBITION OF HORSES.

1. The exhibition of horses will commence at 10 o'clock, A. M., in the large ring, by the examination of *Thorough Bred Horses.*

2. The examination of *Horses of all Work* will commence at 2 o'clock, P. M., in the large ring.

3. Jacks and Mules will be examined in the small horse ring, in the northeast corner of the grounds, commencing at 11 o'clock, A. M.

EXHIBITION OF CATTLE.

The examination of Herefords will commence at 10 o'clock, A. M., in the cattle ring in the southwest corner of the grounds. The examination of Devons will follow that of the Herefords.

The examination of Durham Cattle will commence in the same ring at 3 o'clock, P. M.

Committees will commence the examination of articles in all the departments, excepting the first department, at 9 o'clock.

Committees on the several classes are expected to organize, and in connection with exhibitors, to be prompt in their attendance at the time indicated.

Seats around the main ring are reserved for the exclusive use of ladies.

ORDER FOR THURSDAY.

The gates will be opened at 8 o'clock, A. M., and close at 6 P. M.

Committees that have not finished their labors will resume duty at 8 o'clock.

Carriages may enter the ground and pass through, but in no case will they be permitted to remain on the grounds.

No person will be allowed to make exit from the main gate, unless with a vehicle or horse.

The exhibition of horses of all work will be resumed at 9 o'clock, A. M.

Draught horses will be examined in the small ring at 10 A. M.

After horses of all work are concluded, the following will be the order, viz:

1st, Roadsteads; 2d, Geldings and Mares; 3d, Sweepstakes for colts; 4th, Matched Horses and Mares; 5th, Sweepstakes for Horses and Mares.

The examination of cattle will be resumed at 9 A. M.

SHORT HORN ENTRIES.

1. James M. Trimble, Hillsboro, Highland county, white bull, Victor, 20 months old.
2. do do do heiffer, Queen (red roan), 2 years old.
3. do do do do Lady Gay (roan), 6½ mos. old.
4. do do do do Roenna (red and white), 6 mos.
5. David Wilson, Cincinnati, bull, Loid Eglinton, 4 years old.
6. Wm. Palmer, Bloomington, Clinton county, bull, Allen (roan), 6 mos. and 8 days old.
7. do do do heiffer, Diana (roan), 2 years old.
8. do do do do Snowbank (white), 2 years old.
9. do do do do Prairie Flower (roan), 4 mos. 4 days.
10. D. McMillen, Jr., Xenia, bull, Marquis, 5 years old.
11. do do calf, heifer, Daisy, 11 months old.
12. W. N. Chamberlin, Vienna ✕ Roads, Clark Co., bull, Knickerbocker (1746 A.H.B.), 2 ys.

13. Alfred Coulter, Bloomington, Clinton county, bull, Bellville (white), 25 months old.
14. do do do heifer, Elizabeth II. (red and white), 1 yr.
15. do do do do Lady Bell, 10 months old.
16. Jno. G. and Geo. Coulter, do bull, Duke of Darlington, 2 years old.
17. do do do Windsor, 1 year old.
18. do do do Challenger, 8 months old.
19. do do heifer, Eglantine II., 2 years old.
20. do do do Duchess I., 2 years old.
21. do do do do II., 11 months old.
22. Alex Waddle, South Charleston, Clark Co., bull, Lord Stanwick, 4½ years old.
23. do do do cow, Zealous, 7½ years old.
24. do do do heifer, Snowdrop, 2 years and 11 mos. old.
25. do do do cow, Mary (and calf), 7 years old.
26. E. Hankins, Sabina, Clinton county, bull calf, Wellington II. (roan), 1 year old.
27. Walter A. Dun, Wahoo, Madison county, cow, Lavender III., 6 years old.
28. do do do do Nelly Bly, 3 years old.
29. do do do heifer, Lady Kate, 1 year old.
30. do do do bull calf, Dacotha (suckling).
31. Geo. W. Gregg, Plainsview, Pickaway county, cow, Raspberry, 8 years old.
32. do do do do Beauty II., 6 years old.
33. do do do calf, White Rose, 5 months old.
34. do do do do Flora III., 3 months old.
35. Jas. H. Perrine, Lebanon, Warren county, bull, Young America, 15 months old.
36. do do do heifer, Jane Trimble, 17 months old.
37. Jas. Rankin, Jr., London, Madison county, do Sun Beam, 1 year old.
38. Charles M. Clark, Springfield, bull, New Year's Day, 4 years old.
39. do do do American Eagle, 10 months old.
40. do do cow, Easter Day, 4 years old.
41. do do heifer, Jenny Lind, 2 years 6 months old.
42. Stephen Easton, Union Village, Warren county, bull, Hearts of Oak, 4 years old.
43. Harness Renick, Circleville.
44. do do cow, Agatha, 3 years old.
45. do do heifer. Daisy II., 2 years old.
46. do do do Calm VI., 2 years old.
47. H. H. Hankins, Bloomington, Clinton county, bull, Locomotive, 4 years old.
48. do do do heifer, Emma II., 1 year old.
49. do do do do do III., 9 months old.
50. do do do bull, Sheffielder II., 8 months old.
51. do do do do Perfection, 8 months old.
52. do do do cow, Rosamond, 8 years old.
53. James R. Mills, Sabina, Clinton county, heifer, Lady Bon Berry, 11 months old.
54. Josiah Burnham (Agent for Whitewater Village Shakers), Preston, Hamilton county, bull, Buckeye, 1 year old.
55. do do Gray Eagle, 9 months old.
56. do heifer, Princess, 1 year old.
57. do do Butterfly, 1 year old.
58. do do Rose Bud, 1 year old.
59. do do Blossom, 1 year old.

60. Robert G. Corwin, Lebanon, bull, Crusader, 5 years old.
61. do do do Gov. Vance, 1 year old.
62. do do do Crusade, 1 year old.
63. do do do Gov. Trimble, 11 months old.
64. do do do Cœur De Leon, 6 months old.
65. do do cow, Scottish Blue Bell, 5 years old.
66. do do do Fashion, 5 years old.
67. do do do Alice, 5 years old.
68. do do heifer, Lothiana Belle, 18 months old.
69. do do do Duchess of Exeter, 9 months old.
70. do do do Florence Nightingale, 6 months old.
71. B. C. Bedford, Paris, Bourbon county, Ky., bull, Strafford, 2 years old.
72. G. M. Bedford, do do do heifer, Ivanora, 2 years old.
74. A. Hankins, Clarksville, Clinton county, bull calf, 8 months old.
75. Samuel Pyle, do do do Pathfinder.
77. James M. Trimble, Hillsboro, heifer, Rozelle, 1 year old.
78. do do cow, Highland Blue Bell, 5 years old.
79. Daniel McMillen, Jr., Xenia, Spotted Kirk, 10 months old.
80. Strawder McNeil & Pancake, Frankfort, Ross county, bull, Prince George, 2 years old.
81. Thomas K. Sexton, Washington, Fayette county, heifer, Spring, 1 year old.
82. H. H. Hankins, Bloomington, cow, Rossamond, 8 years old.
83. J. and G. Coulter, do do Eglantine I., 5 years old.
84. S. Eastman and A. Babitt (Agents for Union Village, O.), bull, Hearts of Oak, 4 yrs. old.
85. B. F. Bedinger, Walton, Boone county, Ky., heifer, Grace Aigiular, 2 years old.
86. F. W. Renick, Bloomfield, Pickaway county, bull, Winfield Scott, 3 years old.
87. do do do do Col. Sage, 6 months old.
88. do do do do Columbus, 4 months old.
89. R. G. Dunn, Wahoo, Madison county, heifer, Viola, 2 years old.
90. do do do 1 year old.
91. do do do do
92. do do do calf, 10 or 11 months old.
93. M. Fels, Cincinnati, bull, Clifton, 8 months old.
94. Geo. Davidson, Richmond, Wayne county, Ind., bull, King of Trumps, 2 years old.
95. Jacob Peirce, South Charleston, Clark county, cow, Roman XIII., 8 years old.
96. do do do do Evening Star, 7 years old.
97. do do do heifer, Star, 2 years old.
98. do do do cow, Cassandra, 16 months old.
99. do do do heifer, Flora, 10 months old.
100. do do do bull, Hawthorne, 14 months old.
101. do do do do Prince, 15½ months old.
102. do do do do Rob Roy, 14 months old.
103. do do do do Davy Crockett, 17½ months old.
104. do do do do calf, 5 months old.
105. do do do do Champion, 6 years old.
106. R D Hilts, Springdale, Hamilton county, do Cumberland, 2 years old.
107. Samuel Speer, Spring Valley, Greene county, do Billy Neff, 2 years old.
108. B. F. Hagler, Xenia, cow, Lucky, 6 years old.
109. do do heifer, Laura, 2 years old.
110. do do do Easter Eve, 1 year old.
111. R. A. Alexander, Midway, Ky., bull, Sirius.

112. R. A. Alexander, Midway, Ky , cow, Forget-me-Not.
113. do do do Duchess of Athol.
114. do do do Vellum.
115. do do bull, Albion, 1 year old.
116. do do heifer, Mazurka III., 1 year old.
117. do do do do IV., 1 year old.
118. Neal & Taylor, London, Madison county, heifer, Cedar Roan, 6 months old.
119. Charles T. Garrard, Paris, Ky., bull, Djalma, 2 years old.
120. Lewis Brown, Ernheim, Brown county, bull, Beet Ruter, 2 years 10 months old.

REPORT OF AWARDING COMMITTEE.

We, the committee appointed by your society to examine Short Horned Cattle, beg leave to submit the following report:

In the examination made by your committee, the following awards were made, viz:

BULLS.

Aged Bulls—New Year's Day, 4 years old, first premium, C. M. Clark, Springfield, O.....	$50
" Sirius, second premium, R. A. Alexander, Midway, Ky....................	30
Two years old and under three—Djalma, first premium, C. T. Garrard, Paris, Ky.........	40
" " " Strafford, second premium, B. C. Bedford, Paris, Ky......	25
One year old and under two—Albion, first premium, R. A. Alexander, Midway, Ky.......	25
" " " Crusade, second premium, R. G. Corwin, Lebanon.........	15
Best Calf—Sheffielder second, first premium, H. H. Hankins, Clinton county O...........	10
American Eagle, second premium, C. M. Clark, Springfield, O...........................	5

COWS AND HEIFERS.

Aged Cows—Duchess of Athol, first premium, R. A. Alexander, Midway, Ky.............	50
" Vellum, second premium, R. A. Alexander..................................	30
Heifers, two years old and under three—Viola, first premium, R. G. Dunn, Madison Co., O.	40
Ivanora, second premium, G. M. Bedford, Paris, Ky..................................	25
Heifers, one year old and under two—Mazurka IV, first premium, and Mazurka III, second premium, R. A. Alexander, Midway, Ky.................................... 25 and	15
Heifer Calf—Lady Gay, first premium, J. M. Trimble, Hillsboro'........................	10
" Lady Bon Berry, second premium, J. R. Mills, Clinton county..............	5

While we were confident that they were justly entitled to the premiums, we would not be understood to say that there were not a number of animals in each class which were very creditable, both to their breeders and the great family of cattle, to which they belong; in fact we feel that we would have been glad to have had more premiums to bestow, more particularly in the classes of aged, two, and one year old Bulls; also in those of aged Cows, two and one year old Heifers, in each of which your committee found great difficulty in deciding, and were sorry to send away such superior animals without premiums.

W. R. DUNCAN,
WM. WARFIELD,
L. G. MORRIS,
G. W. RENICK,
——— ANDERSON,

ENTRIES OF DEVONS.

1. C. A. Ely, Elyria, Bull, Duke of Devon, 8 years old.
2. do do do Wyandott, 2 years old.
3. do do do Governor, 2 years old.
4. do do do Victory, 1 year old.
5. do do Bull Calf, Lorain, 5 months old.
6. do do Cow, Victory, 11 years old.
7. do do do Jenny Lind, 10 years old.
8. do do do Delicate, 3 years old.
9. do do Heifer, Ida II, 2 years old.
10. do do do Lady III, 2 years old.
11. do do do Calf, 4 months old.
12. D. G. Barker & Sons, Greenwich Station, Bull, Echo, 6 years old.
13. do do Bull Calf, Curly, 10 months old.
14. do do Cow, Victoria, 6 years old.
15. do do Heifer, Red Lady, 3 years old.
16. Not on the ground.
17. Jno. Hadly, Clarksville, Cow, 4 years old.
18. C. A. Ely, Elyria, do Lilly.
19. do do Heifer, Dutchess, 2 years old.
20. do do do Victoria II, 2 years old.
21. do do do Jenny Lind II, 2 years old.
22. Jos. Cooper, Glendale, Bull, Eclipse, 7 years old.
23. do do Cow, Beauty, 6 years old.
24. do do do Knob Horns, 8 years old.
25. do do do Punch, 3 years old.
26. do do Calves, Cinderella, 6 months old.
27. do do do Cynthia, 6 months old.
28. N. W. Smith, Lebanon, Bull, Messenger, 6 years old.
29. E. & A B. Battelle, Newport, Bull, Shaw-been, 6 years old.
30. do do do Young Devon, 9 years old.
31. do do Heifer, Little Dorrit No. 2, 1 year old.
32. C. A. Ely, Elyria, Bull, Allegro, 2 years old.

REPORT OF AWARDING COMMITTEE ON DEVONS.

Your committee on Devon Cattle have discharged the duties assigned them, and report as follows:

There were on exhibition a very superior lot of Devons; thirty-two entries, thirty-one exhibited, to wit:

Bulls, 3 years old and over	5
do 2 years old and over	3
do 1 year old and over	1
Bull Calves	2
Cows, 3 years old and over	11
Heifers, 2 years old and over	5
do 1 year old and over	1
Heifer Calves	3

To which we have awarded the following premiums:

BULLS.

Aged Bulls—Duke of Devon, first premium, C. A. Ely, Elyria...........................	$50
Two years old and under three—Allegro, first premium, C. A. Ely, Elyria..............	40
One year old and under two—Victory, first premium, do do	25
Bull Calf—Curly, first premium, D. G. Barker & Sons, Greenwich Station..............	10

COWS AND HEIFERS.

Aged Cow—Beauty, first premium, J. Cooper, Glendale..................................	50
Two-year old Heifer—Lady III, first premium, C. A. Ely, Elyria......................	40
Yearling Heifer—Little Dorritt II, first premium, E. & A. B. Battelle..................	25
Heifer Calf—Cinderella, first premium, J. Cooper, Glendale...........................	10

Taking the stock together, as exhibited to your committee, they were good specimens of the Devon, and some of them very superior; they were all in good condition, not being overfed, and still, well kept. Your committee is of opinion that the Devon breed of cattle a kind that will keep in good condition, with less food and keeping than most other breeds. Your committee is also of the opinion that the Devon breed of cattle is worthy of being encouraged, and we think is entitled to second premiums,* as much as any other kind of cattle, and to meet this deficiency in your premium list, we have commended a few animals for premiums, which appear in this report. We do not wish to speak disparagingly of other breeds of cattle, all are undoubtedly good in their place and proper location, but for certain uses, and certain locations, taking no wider range even than the State of Ohio, we are satisfied that Devon cattle are a profitable and safe kind of stock to breed.

N. B. GATES,
F. DONALDSON,
EDMUND R. GLENN,
H. F. GIDDINGS,
L. BARBER.

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* The following we recommend as worthy of consideration, and to which we would cheerfully have awarded the premiums which we have commended:

COMMENDED PREMIUMS.

Eclipse, 3 years and over 4—first premium, J. Cooper, Glendale.
Shaw-been, second premium, same class, E. & A. B. Battele.
Jenny Lind, first premium, best aged cow, C. A. Ely, Elyria.
Young Devon, aged cow, second premium, E. & A. B. Battelle.

The number of Herefords on exhibitiom was somewhat larger than at the preceding Fair. This race of animals in Ohio appears to be confined entirely to the Western Reserve; and even the comparatively small number there, are not in the hands of American professional dairymen, but are owned by Englishmen.

ENTRIES OF HEREFORDS.

1.	Thos. Aston, Elyria,	bull, Fair Boy, 2 years old.		
2.	do	do	cow, Duchess, 7 years old.	
3.	do	do	heifer, Beauty, 1 year old.	
4.	do	do	do	Quality, 1 year old, (Grade.)
5.	John Humphries, Elyria,	bull, Prince of Wales, 4 years old.		
6.	do	do	heifer, Princess Royal, 2 years old.	
7.	W. H. Sotham, Owego, N. Y.,	bull, Charles II, 1 year old.		
8.	do	do	do	Ranger, 13 months old.
9.	do	do	cow, Mayflower, 8 years old.	
10.	do	do	heifer, White Rose, 3 years old.	
11.	do	do	do	Wood Lass, 2 years old.
12.	do	do	heifer calf, Wood Lark, 11 months old.	
13.	do	do	do	Prudence, 11½ years old.

REPORT OF AWARDING COMMITTEE ON HEREFORDS.

Your committee on Hereford cattle, would report but few animals exhibited. Those brought in, ranged from fair to middling; room for improvement, particularly in handling qualities. The following are the animals which in our judgment merited the awards:

BULLS.

Aged Bulls—Prince of Wales, first premium, J. Humphries, Elyria	$30
Two years old and under three—Fair Boy, first premium, Thomas Aston, Elyria	20
Yearling—Ranger, first premium, W. H. Sotham, Owego, N. Y.	15

COWS AND OXEN.

Aged Cow—Duchess, first premium, Thomas Aston, Elyria	30
Two years old and under three—Princess Royal, first premium, John Humphries, Elyria,	20
Yearling—Beauty, first premium, Thomas Aston, Elyria	15

Respectfully submitted,

G. W. HARROD,
S. MEREDITH,
JOSEPH COOPER.

The number of Ayrshires exhibited at the annual exhibitions has generally been very small indeed, but at the one just closed, none of this race were exhibited, although the premiums offered were precisely the same as for the Herefords. Whether the Ayrshires and Herefords will ever become as popular in Ohio as the Shorthorn and Devon, time alone can determine—many years must elapse, and the result of many successful experiments be brought to the notice of our stock growers before they will relinquish their partiality for the races now in favor.

WORK OXEN AND STEERS.

Oxen for draught are much more in favor with New Englanders than with Pennsylvanians, Virginians or Kentuckians; hence more work oxen may be found on the Western Reserve than in central or southern Ohio.

During the early settlement of the State, oxen were more readily obtained, maintained at less expense as well as with less care, and were capable of enduring greater fatigues than horses; hence, in heavily timbered regions, oxen were more used than horses for clearing, their gait being slower, they were better adapted for "breaking up new grounds." But as the country became more densely populated roads, turnpikes and plank roads, gradually displacing the "bridle path," "mud pike" and "corduroy," and as a necessary consequence the "2.40" roadster was substituted for the slow and laborious ox. At the exhibition at Cleveland 22 yoke of oxen were competing for the premium—the present year two yoke only were competitors. The entries were—

1. J. Searles, Columbus, one yoke of oxen.
2. Jos. Cooper, Glendale, one yoke of oxen.

REPORT OF AWARDING COMMITTEE.

The committee on Oxen have examined the only yoke of oxen on the ground (entry No. 2), and to which they accordingly award the premium.

JOHN STONE,
HARVEY CARPENTER,
CHAS. M. CLARK.

GRASS AND GRAIN FED FAT CATTLE.

The exhibition of fat cattle was not such as the public were justified in expecting, from the reputation that Ohio has as a stock growing State, and from the fact that fully 70,000 head of fat cattle are annually shipped east from the southern portion of the State; a very large proportion of the beeves are reared in the Scioto valley.

GRASS FED.

1. Wm. Palmer, Bloomington, Clinton county, cow, Red Rose, 3 years old.
2. H. Renick, Circleville, cow, Fat Fanny, vol. II., p. 330, A. H. B.

GRAIN FED.

1.	Wm. Palmer, Bloomington, Clinton county,			5 steers, 4 years old.
2.	do	do	do	1 bullock.
3.	do	do	do	1 fat cow.
4.	do	do	do	heifer, 3 years old, grass fed.
6.	Morgan Hays, Washington, Fayette county,			steer, fat, 5 years old.
7.	J. Searles, Columbus,			do do
8.	Morgan Hays, Bloomingsburg, Fayette Co ,			do do
9.	Wm. Palmer, Bloomington, Clinton county,			5 steers.
10.	G. W. Renick, Chillicothe, 2 steers, one 6 and other 7 years old.			
11.	George Davidson, Richmond, Wayne county, Ind.,			cow, Olive, 5 years old.
12.	do	do	do	bullock, Hanks, 5 years old.

REPORT OF THE COMMITTEE ON FAT CATTLE.

Best 5 Steers, 4 years old and over, grain fed.

Your committee have to report that there was only *one* entry for this premium, and they awarded the first premium to Wm. Palmer, of Bloomington, Ohio. The cattle were of the short horn breed, of fair size and shape, but scarcely so well fatted as stock should be to be exhibited in this class; their weights were as follows: 2,012, 1,957 1-2, 1,730, 1,650, 1,570.

Owner's Statement.

These five steers are entered as grain fed; two of them, the largest red steers, were fed cut-up corn two winters, and pastured in summer, and the last six weeks stabled in day time and fed corn or oats, and turned on pasture at night; the other three steers were fed on cut-up corn last winter, run on pasture this summer, and fed on grain the last six weeks. All run out both winters.

The large red cow had the same treatment as the red steers above.

I cannot tell the amount of grain consumed by each animal; they were fed in the usual rough way of feeding cattle in the Scioto valley. I suppose the whole cost of raising, to this time, would make them worth 3 cts. per pound, on the hoof.

The three year old red heifer was raised on grass, hay, and corn fodder; was in thin condition when turned to pasture the 15th of last April, and from that time till within a few days, has eaten nothing but grass.

WILLIAM PALMER.

Best Single Bullock, Grain Fed.

There were five entries in this class, but only four animals could be found. Harness Renick had two, Morgan Hays one, and G. Davidson one. The quality of the stock was such as to require a strict examination of each animal, and the committee not agreeing as to their relative merits, it was necessary to call in a fifth man to decide the matter; with his assistance, the first premium was awarded to G. Davidson's red bullock, and the second premium to Morgan Hays' white bullock.

Statement of Manner of Feeding Red and White Pied Steer, fat, owned by George Davidson, Richmond, Wayne County, Indiana.

His common feed, while young, was blue grass, pasture, and rough fodder, until two years of age; after that age, grazed during the summer, with a little meal and cut oats, and during the winter regularly fed with meal, although never fed to the full extent of his appetite. His age is five years past.

GEORGE DAVIDSON,
Richmond, Wayne County, Ind.

Mr. Morgan Hays requested me to state to the committee that his white steer has been fed on cut-up corn for the last two winters, and during summer has been fed on grass alone. He has no exact means of ascertaining the cost of raising.

WM. PALMER.

The following memoranda will probably prove interesting:

	WEIGHT	AROUND GIRTH.	AROUND FLANK.	FROM HORNS TO TAIL.	HIP TO SH'L-DER BLADE.
George Davidson's bullock.........	2546	9 ft. 1 in.	9 ft. 4 in.	7 ft. 6 in.	2 ft 8 in.
Morgan Hays' "	2447½	8 ft. 8 in.	9 ft......	7 ft. 10 in	2 ft 10 in.
G. W. Renick's "	2830	9 ft 4 in.	9 ft. 4 in.	8 ft. 5 in.	3 ft.
" "	2705	8 ft 11 in.	9 ft. 4 in.	8 ft. 2 in.	2 ft. 10 in.

Best Cow, or Heifer, Grain Fed.

There were two entries in this class, one by Wm. Palmer, of Bloomington, Ohio, the other by Geo. Davidson, of Richmond, Ind. To Mr. Davidson's entry—said to be a thorough bred short horn—the committee awarded the first premium, and they consider her a first rate specimen of this breed of cattle. The second premium was awarded to Wm. Palmer's cow. The weights, &c., were as follows:

	WEIGHT.	GIRTH.	AROUND FLANK.	FROM HORNS TO TAIL.	HIP TO SH'L-DER BLADE.
George Davidson's cow, Olive......	1967	8 ft. 1 in.	8 ft. 8 in.	7 ft. 4 in.	2 ft. 9 in.
William Palmer's cow.............	1865	7 ft. 9 in.	7 ft. 10 in.	7 ft. 3 in.	2 ft. 8 in.

R. AITCHESON ALEXANDER,
STRAWDER McNEILL,
GEO. M. BEDFORD,
Committee.

Statement of Manner of Feeding Fat Cow, "Olive," owned by Geo. Davidson, Richmond, Wayne County, Indiana.

"Olive" was kept as a breeding animal until three years old, when she proved barren; since that time has been grazed through the summer, with light feeding of meal, and during the winter regularly fed with meal. Age, five years.

GEORGE DAVIDSON,
Richmond, Wayne County, Ind.

The following is a list of the awards on

FAT CATTLE.

Steers, grain fed—best five, first premium to Wm. Palmer, of Clinton	$50
Best single bullock, grain fed—to G. Davidson, Richmond, Ind; weight of bullock, 2,546 lbs	15
Do. do., 2d prem. to Morgan Hays, of Fayette county; weight of bullock, 2,447½ lbs	10
Best cow or heifer, grain fed—to George Davidson, Richmond, Ind.; weight, 1,967 lbs	15
Second best do. do., 2d prem. Wm. Palmer, Clinton county; weight, 1,865 lbs	10
Best fat cow, grass fed, Fat Fanny, Harness Renick, weight, 1,848 lbs	10
Second do. do., 2d prem. Red Rose, Wm. Palmer, Clinton county; weight, 1,360 lbs	5

MILCH COWS.

Your committee on Milch Cows report that there were but two entries, and both of them were irregular in the opinion of the President of the Society, and from this cause, no premium was awarded. The rule of the Society states that fifty days must elapse between the first and second trial, and this requisition not having been complied with, no award could be made.

R. AITCHESON ALEXANDER,
STRAWDER McNEILL,
GEO. M. BEDFORD.

Young Splendor, red and white, the property of John Hadley, Clarksville, Clinton county, Ohio, calved 1851, got by Waterloo 2d (1082), out of Splendor, by Harrison (72); Clarksville by Lottery (2227), by Wonder (2853), by Wellington (678), Mars (412), by Ladrone (353), by Lake, Seymour's Sweepstakes. On the 10th of June, 1857, she weighed 1,010 lbs., and from the 10th to the 19th, she gave 399 pounds of milk, from which was churned 19 1-4 pounds of butter; from the 4th to the 13th of July, she gave 420 pounds of milk, which churned 17 pounds of butter. The cow run on grass all the time, and no other feed. She calved on the 10th of April, 1857.

This is to certify that I live with John Hadley, and believe the above statement is correct, as I saw all the milk weighed, and helped to make the butter. ADALINE MONELL.

Clinton County, ss:

John Hadley and Adaline Monell being duly affirmed, say that they regularly milked the above named cow, during the times stated above, and weighed correctly the same, and the amount of milk given by said cow, from the 10th to the 19th of June, was 399 lbs.; and from the 4th to the 13th of July, 420 lbs.; the butter made from the 399 lbs. of milk was 19 1-4 lbs., and from the 420 lbs. of milk, was 17 lbs.; and the above statement is correct, according to the best of their knowledge.

JOHN HADLEY,
ADALINE MONELL.

Affirmed before me, a Notary Public in and for Clinton county, Ohio, this 14th day of September, A. D. 1857.

JOSEPH McCRAY, N. P.

Queen Victoria, seven years old; native; weight, 1,220 lbs.; calved April 8, 1857. Quantity of milk for 10 days, commencing—

June 2, 517 pounds, or	51 7-10 per day.
Pounds butter	16½
July 22. Second trial, 450 pounds, or	45 "
Butter	12½ pounds.

The cow was kept on grass, as directions of catalogue; is owned by C. S. Gates, of Brooklyn, Cuyahoga county, Ohio.

Brooklyn Hay Scales, No. 690.—Weighed 1 cow for C. S. Gates. Gross, 1,220. S. STORER, Weigher.

BROOKLYN, Sept. 14, 1857.

State of Ohio, Cuyahoga County, ss:

Before me, Charles H. Babcock, a Justice of the Peace in and for said county, personally came Clark S. Gates, and Sarah Ann Gates, his wife, who made solemn oath that the above statement is true, and that they weighed the butter and milk aforesaid.

C. S. GATES,
SARAH A. GATES.

Sworn to and subscribed before me, this 13th day of September, 1857.

C. H. BABCOCK, J. P.

Sept. 28, 1857.

JOHN H. KLIPPART, ESQ.—

Dear Sir: My brother requested me to drop you a line in regard to the milch cows exhibited at the Ohio State Fair.

From the affidavits above, we were in favor of awarding the premium to John Hadley, of Clinton county, although his cow did not produce as many pounds of milk as the cow of Mr. Gates; but the milk of Hadley's cow yielded a larger amount of butter than Gates' cow; and we all concluded that the extra amount of poor milk was of no value.

But your published rules—which required fifty days to elapse between trials—it seems neither had complied with. I thought it possible that fifty days from the commencement of one trial to the other would be sufficient; but the President decided otherwise. If you think that both have complied with the rules, we were in favor of Hadley's cow; but if Hadley has not complied with the rules, and Gates has, then Gates would be entitled to the premium. But according to the President's decision in regard to the rules, neither is entitled to the premium.

I remain, yours, with great respect,

GEO. M. BEDFORD.

The exhibition, by Dr. Garlick, of Cleveland, of fine specimens of brook trout, in various stages of growth, was a very interesting feature of the Fair, especially to those who look to the future as well as the present, and believe in the full development of all the resources of our noble State.

The rearing of fish has recently attracted great attention in Europe, and especially in France and Scotland; their habits have been carefully studied by men of science, and this knowledge applied to practical and economical purposes. To us, who live so far in the interior of a vast continent, all economies in propagating and rearing fish possess a vastly increased interest. The necessity of fish as one of the articles of diet, is indicated by the craving for fresh fish by those who can procure them but seldom; and with an increased and increasing population, we can no more expect to procure an adequate supply, without skillful cultivation, than we can depend, as the pioneers did, on bear-meat and venison, without rearing domestic animals.

Dr. Garlick has condensed the result of his very valuable experience in a small volume, with the modest title of "A Treatise on the Artificial Propagation of certain kinds of Fish." This does not convey an adequate idea of the information contained in this interesting work, which we hope to see widely circulated, claiming as we do, with many others, to be decidedly "fishy" in our tastes.

B. C. BEDFORD,
JAS. T. WORTHINGTON,
A. E. STRICKLE.

In the class of sweepstakes on cattle there were sixty entries, being made up of cattle which had been entered in the previous classes; the following award was made:

SWEEPSTAKES.

Best bull, New Year's Day, sweepstakes, C. M. Clark, Springfield	$50
Best cow, Duchess of Athol, sweepstakes R. A. Alexander, Midway, Ky	50

HORSES.

THOROUGH BRED.

In the class of Thoro' Breds there were nineteen entries only. The awarding committee failed to furnish any report of the character and qualities of horses on exhibition in this class. The following is a list of the awards as reported by the committee.

G. B. Shepherd, Middletown, best stallion, Edwin Forest, 6 years old, first premium	$50
A. Labrot, South Covington, Ky , second best stallion, Nolan Arabian, 6 years, second prem.	30
do do best brood mare, Jenny, 12 years, first premium	30
Jacob Johnson, Franklin, Warren county, best filly, Miss Nattie, 3 years, first prem	10
Reber & Kutz, Lancaster, best stallion, Bronx, 2 years, first premium	15
do do best filly, Young Fashion, 2 years, first premium	10
A. Labrot, South Covington, Ky., second best filly, Daisy, 2 years, second premium	5
do do best stallion sucking colt, Timoleon, first premium	5

ROADSTERS.

In the class of Roadsters there were fifty-six entries—the following is a list of the awards as reported by the committee:

Joseph Cooper, Glendale, best stallion, Stockbridge Chief, 4 years and over 9 years, first premium	$50
I. B. Bailey, Springfield, second best stallion, Paragon Morgan, 4 years, second premium	30
do do best brood mare, 4 years old	15
Joab Scales, Covington, Ky., second best brood mare, 4 years old, second premium	15
David Egbert, Lebanon, best stallion colt, over 2 years, Wagner, first premium	15
Samuel T. Steddom, Lebanon, second best stallion colt, over 2 years, Jim Clay, 2nd prem.	10
David E. Beatty, Collinsville, Butler county best filly, over 2 years, first premium	10
D. Barber, Harmar, best stallion colt, over 1 year, first premium	10
Dr. J. Dulany, Florence, Ky., second best stallion colt, over 1 year, second premium	5
J. W. Boatman, Seven Mile, Butler county, best sucking colt, first premium	5
Joab Scales, Covington, Ky., second best sucking colt, second premium	3

DRAFT HORSES.

In the class of Draft Horses there were twenty four entries only.

The committee on Draft Horses were not furnished with pedigrees of the stock they examined; they were therefore governed by external appearances, to some extent, in awarding premiums. Developments of heavy loin and stout muscle were looked upon as favorable marks for

Draft Horses. The exhibition of Draft Horses was exceedingly fine, and in several instances, it was with difficulty a preference could be made. It would not, in our opinion, be any exaggeration to say that all the stock we were called on to view, was truly good; just such as the great agricultural interests of the State demand, and such as we trust they will cultivate. We submit the following awards:

John Hoggings & Bradford, Florence, Boone county, Ky., best stallion, Duke of Bourbon, 6 years, first premium		$30
J. W. Probasco, Cedarville, Greene county, second best horse, Young Highflyer, 5 years, commended, second premium.		
Wm. Bain, Xenia, best stallion, Hercules, 2 years, first premium		25
do do	best stallion, Young Napoleon, 3 years, first premium	20
do do	best filly, Lady Napoleon, 3 years, first premium	20
M. W. Graves, Florence, Ky, best Mare, 6 years, first premium		25
Wm. Bain, Xenia, best stallion, Young Napoleon, 1 year, first premium		15
do do	best filly, Lady Wallace, 2 years, first premium	15
do do	best stallion sucking colt, 1 year, first premium	10
do do	best mare colt, first premium	5

JAMES LOUDON,
B. C. BEDFORD,
R. WHEATON,
JNO. BRECKENRIDGE,

HORSES OF ALL WORK.

In the class of horses for General Purposes there were 90 entries, embracing some very superior animals of this description—it is much to be regretted that the committee did not deem the matter of sufficient importance to furnish the Board with a detailed report of their examination in this class. The following is a list of the awards made:

Seven Mile Stock Company, Seven Mile P. O., Butler Co., best stallion, Victor, 4 years, first premium	$50
Wm. Reed, Monroe P. O., Butler Co., second best stallion, Perfection, 4 years, 2d prem.	30
J. M. Stewart, Seven Mile P. O., Butler county, best brood mare, 8 years, 1st premium	30
R. C. Stewart, do do 2d best brood mare, 8 years, 2d prem	15
A. Creek, Liberty, Union county, best filly, Jenny Lind, 3 years, 1st prem	10
D. Barber, Harmar, Washington county, 2d best filly, Jenny Lind, 3 years, 2d prem	5
T. Rork, Seven Mile, Butler county, best stallion colt, Clown, 3 years, 1st prem	15
James Hopping, New Jasper, Green county, 2d best stallion, Uncle Tom, 2 yrs., 2d prem.	10
James Beatty, Millville, Butler county, best filly, 2 years, 1st prem	10
S. Williamson, Bethany, Butler county, 2d best filly, Kate, 2 years, 2d prem	5
Sam. McKee, Seven Mile, Butler county, best stallion colt, 1 year, 1st prem	10
Albert E. Mottier, Cove Dale, Hamilton county, 2d best stallion colt, 1 year, 2d prem	5
D. E. Beatty, Collinsville, Butler county, best mare colt, one year, first prem	8
C. Robinson, Jeffersonville, Fayette county, 2d best mare colt, 1 year, 2d prem	5
Sam'l McKee, Seven Mile, Butler county, best sucking colt, 1st prem	8

Wm. Reed, Monroe, Butler county, sucking mare colt................................ $5
Z. Brown, Darrtown, Butler county, second best sucking colt, 2d prem.................. 3
W. S. Laboiteaux, Carthage, Hamilton county, second best sucking colt.

The committee are in error awarding two first premiums and two second premiums on Sucking Colts.

MATCHED HORSES AND MARES.

There were 29 entries in the class of matched horses and mares; the awards were as follows:

Richard Nevins, Columbus, best matched horses, roadsters, Harry Neil and Danby, 1st premium.. $25
Geo. Creain, Cincinnati, best pair matched coach horses, 1st prem...................... 25
Wm. Wood, Cincinnati, best pair matched roadsters, (without regard to color,) 4 and 5 years, 1st prem.. 25
Corwin & Smith, Lebanon, best matched Mares, 5 and 6 years, 1st prem................ 25
J. T. Snodgrass, Mt. Healthy, best pair matched Geldings, draft, 1st prem............. 25

REPORT OF COMMITTEE ON GELDINGS AND MARES FOR HARNESS AND SADDLE.

Under the foregoing list there was exhibited a fine show of Geldings and Mares—there being eighty-seven entries. Your committee have agreed upon awarding premiums as follows:

GELDINGS AND MARES FOR HARNESS AND SADDLE.

T. Rork, Seven Mile, Butler county best Bay Mare, first premium........................ $15
George Creain, Cincinnati, best mare for light harness, 4 years, 1st prem................ 15
do do best mare for light harness, 4 years, 1st prem................ 15
do do best gelding for saddle, 6 years, 1st prem.................... 15
Wm. Wood, Cincinnati, best gelding, Bill, light harness, 4 years, commended.
Wm. Smith, Washington, Clinton county, gelding for saddle, commended.

We also recommend a premium to Wm. Wood for gelding for harness; al o a premium to Wm. Smith, ma:e for saddle.

N. B. GATES,
N. J. TURNEY,
H. P. COX,
F. DONALDSON.

At the suggestion of some of those engaged in rearing horses, the following was inserted in the premium list:

Best five colts, 3 years old and under, sired by any one horse; style, size and action to be specially considered.. $60
2d best do... 40
To the sire of the best five colts, as above specified ... .Silver Medal.
2d best five colts, as above specified .... "

There were six competitors for this premium, namely:

1. Alex. Neave, Springdale, Hamilton county, 5 colts, 3 years and under, from one sire.
2. G. B. Shepherd, Middletown, Butler county, 5 colts, out of Gilmore Bellfounder, 3 years and under.
3. Seven Mile Company, Seven Mile, Butler county, 5 colts, out of Victor, 3 years and under.

4. Indian Creek Stock Co, Ross, Butler county, 5 colts, out of Grey Highlander, 3 years and under.
5. Wm. Bain, Xenia, 5 colts, sired by Sir William Wallace.
6. Samuel Johnson, Dent, Hamilton county, 5 colts, sired by Shylock.

The following is a list of the awards:

SWEEPSTAKES FOR COLTS.

Indian Creek Stock Company, Ross, Butler county, best five colts, 3 years old and under, sired by one horse, Grey Highlander, first premium $60

Seven Mile Stock Company, Seven Mile, Butler county, 2d best five colts, 3 years and under, from one horse, Victor, 2d premium 40

SWEEPSTAKES ON HORSES.

In the class of Sweepstakes on Horses there were 56 competitors. The awards were made to—

Joseph Cooper, Glendale, Hamilton county, best stallion, Stockbridge Chief, 9 years, 1st premium $50

George Creain, Cincinnati, mare Fan, 7 years, 1st premium 50

REPORT OF THE COMMITTEE.

The display in this ring was certainly as fine as at any previous State Fair, and the exceeding closeness of the competition occasioned much difficulty in determining precisely where to place the award. The most serious obstacle which met your committee in the outset, was the necessity of having to place in direct competition with each other, the *aged horse*, with his maturity of form, and qualities fully defined, and the *colt*, whose future development and excellence is at most a matter of promise and hopeful conjecture.

To obviate this difficulty, therefore, and to protect the younger animal from the injustice which must surely result to him by this unequal competition, your committee would suggest the propriety of thus classifying the sweepstake premiums, requiring the *matured* and *undeveloped* horses to compete among *themselves*, and not, as now, with *each other*.

Best stallion,	4	years old	and over,	of any breed.
do	3	do	under,	do
Best mare,	4	do	over,	do
do	3	do	under,	do

Respectfully submitted,

F. DONALDSON,
GEO. CREAIN,
S. A. CAMPBELL,
J. D. CLARK,
JOHN FERRIS,
Committee.

In the class of Jacks and Mules, there were 35 entries, being a considerable increase on those of the previous exhibition. Mules are perhaps in greater favor in the southern portion of the State than in the northern. At the exhibition at Cleveland, in 1856, there were 25 animals entered for competition, and of this number 5 only were owned north of the National road, whilst out of 38 animals at the recent exhibition, one only (from Miami county) was owned north of the National road.

Recently, mules have been substituted for horses in omnibus lines in Cincinnati, and are steadily being introduced on farms, and there is no doubt they will yet be much more extensively introduced.

The following is a list of the awards:

R. D. Hilts, Springdale, best Jack, 2 years old and under 3, Monterey, 1st premium....	$25
R. D. Hilts, do., best Jack 1 year old and under 2, 1st premium........................	15
Mary Rogerson, South Charleston, 2d best Jack, 1 year old and under 2, 2d premium....	10
David Meek, Owensville, Clermont county, best Jennet, 3 years old and over, Star of the West, 1st premium..........	20
William H. Polk, Sabina, Clinton county, 2d best Jennet, 3 years old and over, Tippecanoe, 2d premium..........	10
Phillips & Jordan, Cincinnati, best pair mules, 2 years old and over, 1st premium........	20
R. D. Hilts, Springdale, Hamilton county, 2d best single mule, 1 year old and over, 2d prem.	5
Samuel Picking, Marathon, Clermont county, best mule colt..........................	5
Hoggins, Gravis & Co., Florence, Ky., 2d best Jack, 3 years old, Charley, 2d premium..	20

SHEEP.

At the exhibition at Cleveland, in 1856, the fine sheep were allowed to compete with each other; the Saxons with Merinos and Silesians. This arrangement was by no means satisfactory to exhibitors, and there were, consequently, very few entries in this class. At the recent exhibition, there were two classes of fine sheep, "Saxons and their grades," and "Merinos and their grades." The Silesians were entered in the class of Saxons, under the belief that Silesians are the offspring of the Saxon race, although several of the exhibitors of Silesians strongly urged the propriety of permitting the "Silesians" to compete by themselves. There were 23 entries in the class of Saxons, comprising 18 bucks, 10 lambs, and 35 ewes.

The following is a list of the awards:

SAXONS AND THEIR GRADES.

Karr & Starr, Carey, Wyandotte county, buck over 2 years old, 1st premium..............	$25
Alexander Black, Greencastle, Ind., Saxon buck, mark R, 2 years old, 2d premium.......	15
Karr & Starr, Carey, buck, 1 year old, 1st premium......................................	20
do do 2d do	10

I. F. Willis, London, Madison county, 5 ewes, 2 years old, 1st premium	....	$20
Karr & Starr, Carey, Wyandotte county, 5 ewes, 2 years old, 2d premium	....	10
do do do 1 year old, 1st do	....	20
A. E. Strickle, Washington, Ohio, do do 2d do	....	10
Karr & Starr, Carey, Wyandotte county, 5 lambs, 1st premium	....	15
A. E. Strickle, Washington, Ohio, do 2d do	....	10
Karr & Starr, Carey, fleece of Saxony wool, commended.		

In the class of "Merinos and their grades," there were 37 entries, comprising 32 bucks, 45 ewes, and 20 lambs. The following is a list of the awards:

MERINOS AND THEIR GRADES.

Karr & Starr, Carey, Wyandotte county, Silesian buck, over 2 years old, 1st premium	.....	$25
I. T. Fulton, Sidney, Shelby county, Merino buck, 2 years old, 2d premium	.....	15
Karr & Starr, Carey, Wyandotte county, Silesian buck, 1 year old, 1st premium	.....	20
Wm. Spence, do do Merino buck, 1 year old, 2d premium	.....	10
Karr & Starr, do do Silesian Merino ewes, over 2 years old, 1st prem.	..	20
I. T. Fulton, Sidney, Shelby county, 5 Merino ewes, 2 years old, 2d premium	.....	10
Karr & Starr, Carey, Wyandotte county, 5 Silesian Merino ewes, 1 year old, 1st premium	..	20
I. T. Fulton, Sidney, Shelby county, 5 Merino ewes, 1 year old, 2d premium	.....	10
do do do 5 Merino lambs, 1st premium	.....	15
I. F. Willis, London, Madison county, 5 Spanish lambs, 2d premium	.....	10

REPORT OF COMMITTEE ON MERINOS AND THEIR GRADES.

To the Board of Agriculture of Ohio:

The undersigned committee on "*Merinos and their grades*" have, pursuant to the request of your Secretary, consented to make out a report more in detail than the one made out and signed by our committee.

The show of sheep in our department was respectable in quantity, quality, and style, for under the term "grades," exhibitors seemed to think they had a right to enter and show everything that was half blood, Merino or Silesian; thus we had in competition Spanish Merinos, Silesians, and crosses between each of them, and Saxons.

This was not satisfactory to some of the exhibitors, as they claimed that the term "grades" should not apply to any other stock than Merinos; but the committee decided that anything that was as much as half blood Silesian and Merino would come under the appellation of grades, and proceeded to make their awards on this basis.

In justice to exhibitors, we say that they furnished the committee with every facility in their power to make our duties as pleasant as the powers furnished them would permit. There were thirty-seven entries, which embraced ninety-seven animals.

The greater number of these were prime animals in their class, at any Fair that we have attended, and so far as we are concerned, we believe we have never seen any exhibition that equaled this, in form and style of the animal, and wool, all taken together.

The difficulties that grew out of the indefinite meaning of the term grades, as applied to Merino sheep, and the partial dissatisfaction that resulted from the decision of the committee, as above stated, calls for a more definite rule for the future. The sheep men of Ohio think—or at least some of them think—that all classification should be abandoned, or such a classification of the various fine wooled sheep should be adopted as would keep the different kinds from being shown together. For, if under the term "*grades*," all kinds are permitted to be shown together, it is certainly a great farce to attempt distinctions, when the verbage used to define those distinctions are either misunderstood or misinterpreted by your committees.

We deem it an additional duty incumbent on us, to say one word in conclusion in regard to the accommodations furnished to our sheep men, in contrast with those of bulls, jacks, &c.

A. E. STRICKLE,
N. C. McFARLAND,
JOHN MUNDELL,
SAMUEL MYERS.

LONG-WOOL SHEEP.

There were 41 entries of Long Wooled Sheep, comprising 103 animals as follows: 31 bucks, 45 ewes, and 27 lambs. The following is the list of awards:

Geo. M. Bedford, Paris, Ky., buck over 2 years old, 1st prem	$25
Robert McMillan, Paris, Ky., Cotswold buck, 2 years old, 2d prem	15
F. J. Gray, Cynthiana, Ky., Cotswold buck, two years old, 1st prem	20
Thomas Aston, Elyria, buck, 1 year old, 2d prem	10
F. J. Gray, Cynthiana, Ky., 5 Cotswold ewes, 2 years old, 1st prem	20
Thomas Aston, Elyria, 5 ewes, 2 years old, 2d prem	10
do do 5 ewes, 1 year old, 1st prem	20
Toms & Wooton, Elyria, 5 ewes, 1 year old, 2d premium	15
Robt. McMillan, Paris, Ky, 5 lambs, 1st prem	15
F. J. Gray, Cynthiana, Ky, 5 lambs, 2d prem	10
Robt. McMillan, Paris, Ky., 5 Cotswold ewes, 1, 2 and 3 commended.	

In the class of middle wooled sheep there were 24 entries, comprising 77 animals, as follows: 15 bucks, 42 ewes, and 20 lambs. Annexed is the list of awards:

MIDDLE-WOOLED SHEEP.

R. A. Alexander, Midway, Ky., Southdown buck, over 2 years old, 1st prem			$25
Toms & Wootton, Elyria, buck 2 years old, 2d prem			15
do	do	buck 1 year old, 1st prem	20
Lester Bartlett, Westfield, Morrow county, buck 1 year old, 2d prem			10
R. A. Alexander, Midway, Ky., 5 Southdown ewes, over 2 years old, 1st prem			20
Toms & Wootton, Elyria, 5 ewes over 2 years old, 2d prem			10
do	do	5 ewes, 1 year old, 1st prem	20
Lester Bartlett, Westfield, Morrow county, 5 ewes, 1 year old, 2d prem			10
do	do	do 5 lambs, 1st prem	15
Toms & Wootton, Elyria, 5 lambs, 2d prem			15

There were 7 entries comprising 19 animals in the class of Fat Sheep. The premiums were awarded to

Toms & Wootton, Elyria, 1 fat sheep, 1st prem	$5
F. J. Gray, Cynthiana, Ky., 5 fat lambs, 1st prem	10

The display of Swine in both the class of Suffolks and other small breeds, and that of large breeds, was not so large as at the previous exhibitions. The fact that Cincinnati is the greatest pork market in the Union, led many to presume that there would certainly be a greater display of Swine in "Porkopolis" than anywhere else. There were 36 entries, comprising 26 adult animals, and 11 litters of pigs, in the class of Suffolks and other small breeds. In the class of Large Breeds there were 22 entries, comprising 17 adult animals and 5 litters of pigs. The following list embraces the awards:

LARGE BREEDS.

J. W. Clarke, Reading, 1st prem. on Chester White Ryefield and Grozier boar, 1 year old;	$15
Geo. Garlinghouse, Delaware county, 2d prem on same	10
Isaiah G. Scobey, Mt. Carmel, Ia., 1st prem. on same, under 1 year old	10
Geo. Garlinghouse, Delaware county, 2d prem. on same	5
Jeremiah Beatty, Butler county, 1st prem., breeding sow, 2 years old, same	20
Isaiah G. Scobey, 2d prem. on same	10
Geo. Garlinghouse, 1st prem, 1 year old, same	15
S. W. Mooney, Pleasant Ridge, 2d prem., same	5
Isaiah G. Scobey, 1st prem., 5 pigs of same litter, same breed	15
James H. Perrine, Warren county, 2d prem, same litter, same breed	5

SUFFOLK AND OTHER SMALL BREEDS.

J. Burgoyne, Cincinnati, boar, Bob, 3 years old, 1st prem			$20
Lester Bartlett, Morrow county, boar, Giles, 1 year old, 1st prem			15
E. &. B. Bassett, Milan, Erie county, boar, Billy Syphax, 10 months old, 1st prem			10
John Hadley, Clarksville, Clinton county, sow 2 years old, 1st prem			20
do	do	do sow 1 year old, 1st prem	15
Joseph Moshier, Mt. Gilead, Morrow county, Suffolk sow, 5 months old, 1st prem			10
do	do	do litter of 5 pigs, 5 months old, 1st prem	10

E. & B. Bassett, Milan, Erie county, litter of 3 pigs, 4 months old, commended.

Joseph Moshier, Mt. Gilead, Morrow county, imported Suffolk boar Ajax, 2 years old, commended.

POULTRY.

The poultry on exhibition is annually decreasing in numbers and varieties. There is no hazard in asserting that Ohio is not only convalescent, but thoroughly cured of the "Hen Fever" with which she several years since had been seriously afflicted. The subsidence of the excitement has made it very manifest that poultry has not deteriorated, although the improvement has by no means been commensurate to the expense. The number of entries of poultry at the State exhibitions were as follows: 1850, 25 entries; 1851, 47 entries; 1852, 71 entries; 1853, 73 entries; 1854, 100 entries; 1855, 78 entries; 1856, 82 entries; 1857, 24 entries. The awards were as follows:

G. T. Smith, Mansfield, best pair China Fowls	$3
Alexander McGill, Mt. Healthy, Game Fowls	3
Jos. Moshier, Mt. Gilead, best pair Dorkings	3
Matthew Barnott, Cincinnati, best pair Polands	2
G. T. Smith, Mansfield, best pair Black Spanish	2
Joseph Moshier, Mt. Gilead, best pair Cross-breeds	2
J. W. Clark, Reading, Hamilton county, best pair turkeys, premium	2
Joshua Dye, Abington, Wayne county, Ind., best pair China Geese, premium	2
Jos. Moshier, Mt. Gilead, best pair Ducks	2
M. Fells, Cincinnati, best exhibition of Pigeons	5
G. T. Smith, Mansfield, best and largest exhibition of poultry owned by one exhibitor	10

REPORT ON POULTRY.

When I learned through your annual announcement, and by your circular that I was expected to act as chairman of your committee on this important subject, I hesitated, indeed was extremely reluctant to enter upon the responsibilities of my office, and should have shrunk from the task imposed by it, but for the reflection that if every one should fail to perform the more delicate and difficult duties of the society, that it would materially impede your progress. But, be assured, on entering upon my duties, like President Taylor, it is with many misgivings as to my capacity, and it is with great diffidence that I presume to advise with the house wife in reference to what gender, age or tribe she should supply her table; with the farmer in reference to the varieties with which to stock his barn yard, or the fancier his hennery. It is due, however, to those associated with me, as well as to myself, who had come the distance of two hundred miles to report the results of our grave deliberations, to state that we expect our decisions like that in the Dred Scott case, to be final, and to settle all points discussed, and that did the all absorbing one of the day—over the left.

It is presumed by your committee that it is expected of them to notice the chief characteristics of the different varieties of poultry. Briefly, then, our opinions are as follows:

The Game Chicken is celebrated chiefly for its courage, as its name indicates. The cocks seldom let an opportunity for getting into a difficulty pass without improving it, and the hens scalp each other's young for amusement.

The Dorking has the reputation of being both good layers (the pullets,) and excellent for the table, and to a certain extent deserve the character they enjoy.

Of the Spanish we can scarcely speak authoritatively, at least. Of the Poland it may be said, that in beauty it is unrivalled. The pointed breast, the flowing plume, decided colors and proud mind of the cock excites the envy of his compeers, and challenges the admiration of all. The pullets too, are justly prized for the richness of their plumage and symetry of form. They also are considered good layers and have little disposition to cluck, but when they do assume maternal cares, they are faithful to their charge and have a disposition so amiable as to enable them to perform creditably the delicate and somewhat difficult duties of step-mothers. But with all these advantages they possess some imperfections; they are delicate and sensitive, and consequently feel keenly differences of temperature. They are often frost bitten, and seldom lay in cold weather when eggs are in the greatest demand. They are also more liable to disease than other varieties, and when attacked do not often recover.

Of the China fowls, much has been said pro and con. They have been both above and below par; but the truth, doubtless, lies between the two extremes. Among the advantages of this variety, are, that their young, from their rapid growth, are much sooner fitted for the table than those of the smaller kinds, and no one, unless "forewarned" and prejudiced, would mistrust a difference in taste or texture. Again, from their great size and corresponding amount of animal heat, they are enabled to resist successfully a low temperature, while the smaller chickens are hovering in protected situations to keep up vitality, in which they too often but indifferently succeed. They are, I know, accused of ridiculous traits of character, such for instance as that they lay two or three eggs a day; that their legs fall asunder when their heads are cut off; and, though neither last or least, to avoid giving them credit for early rising, it is alleged that from their exceeding altitude, their horizon is on a different plain from other folks. Now, perhaps it is unnecessary to assure any one that these accusations are exceedingly fanciful—mere creations of the imagination; but such is the case. I do remember a single and melancholy instance of *awkwardness*, resulting in a dislocation of a cervical vertebræ, and consequent death to one of this variety, from a *huge* but *unsuccessful* attempt to crow.

Turkeys are noted for being difficult to rear, and exceedingly proper for thanksgiving dinners; geese for "fuss and feathers;" ducks for filth; pigeons for lice; and Guinea fowls for the difficulty which they give the children to find their eggs.

It might not be amiss to notice the origin and extent of the "hen fever," technically so called; but suffice it to say that it has prevailed endemically, epidemically, contagiously and sporadically, and that no class was exempt from its attacks, and no situation was protected from its ravages. Had premonitory symptoms ourselves, of the Shanghai type. But we must hasten on, and lest we forget it, will now advert to a few of those diseases proper to poultry.

And of these, a kind of inflammation of the eyes, integuments of the head, throat, &c., lice, if these may be called a disease, and the gaps, may be mentioned as the more important.

For the first, the best remedy with which we are acquainted is alcohol, and the vermin are effectively destroyed by the red præcip. ointment. The only way to cure the *gaps* is to remove the small double-headed worm from the windpipe, which produces that gasping for breath which suggested the name for this difficulty. They vary in length from one-sixteenth to three-fourths of an inch; in diameter from that of a hair to the size of a pin. One is sufficient to produce all the distressing symptoms, but half a dozen or even more are frequently found adherent to the mucous membrane of a single trachea.

As the usual method of internal medication is entirely useless, the only question is, how shall we remove or destroy them? I have tried three methods: 1st, the application of mercurial ointment; 2d, tracheotomy; and 3d, removing them with a horse hair. The first will destroy the parasite, and the patient too, generally; the second will frequently succeed, but is rather a nice and difficult operation to perform on a chicken, and will hardly pay; the third and last is easy in its performance, and will succeed nine times out of ten.

Perhaps, before we close, to manifest our interest in the general welfare of the feathered tribe, we should defend them against unjust accusations, and demonstrate the fallacy of by-words that long usage and common consent have clothed with the force of aphorisms. In such a defence the "blue hen" and her progeny demand a special effort, for 'tis said, you know, that the former

> —— "Lays two eggs every day,
> And Sundays she lays three;"

thus intimating that through excessive worldliness she neglects the more important, if not the surer concerns of life, and that the Sabbath, more entirely than any other day, she devotes to worldly cares. And men buy the "blue hen's chicken" upon the same principle that the father had his son christened Charlie—because he never knew one of the name that was not a "real devil!"

Now, from actual observation, we pronounce these allegations slanderous, and challenge successful contradiction.

The declaration, also, that a "hen's time is nothing," and the imputation of cowardice in the oftentimes repeated expression of "chicken-hearted," are quite as susceptible of refutation. And as for the Shanghai coat, this is itself a libel, for it is all tail and no waist; while that from which it professedly derives its name is just the reverse—all body and no tail!

Of the exhibition of poultry we cannot say very much, yet we may say for the exhibitors, especially Messrs. Moshier and Smith, that they manifested a commendable spirit in their endeavor to add interest and variety to the Fair.

Of the ferrets that showed with the poultry, we may say that like the executive committee, probably we were at loss what position to give them among the feathered tribes. They look exceedingly *varmently*, and very likely would be quite as dangerous about the barn as the rat, since they too are fond of chickens.

As chairman of the committee on poultry, I am conscious that I owe the Society an apology for presenting such a paper; and to tell the truth, when I sat down to fulfill the requisition of the Society, I had no intention of caricaturing a report; but as an extenuation of my offence, I may mention that this is the fourth time I have been called upon to report on chickens, within the last five years, all because I purchased an unlucky Shanghai at an unlucky time. Many, I fancy, will agree with me that the penalty is not proportioned to the misdemeanor.

Notwithstanding this, I do not wish it understood that I consider the subject beneath my attention, for everything—how remotely soever—connected with the agricultural interests of our State, is assuming an importance which an interest so great demands; and a report on poultry, as trivial as it may appear, might very properly embrace a discussion, to some extent, of those nicer questions of animal chemistry and economy that have been for some time past occupying so much attention. To these, now, we can scarcely advert, but will merely remark that it would be well to remember that the product of the poultry yard depends very much upon its management. If your fowls are furnished liberally with material from which to manufacture eggs, for instance, they will furnish you, in turn, a generous supply. And this material is the constituent principles of eggs. Now an egg, we are informed, consists of the yolk, which is a phosphorous and oily substance, principally; of the white, which is pure albumen; of the fibrinous membrane, which incloses the white, or lines the shell; a bubble of air rich in oxygen; and lastly, the shell, which is carbonate of lime. The hen does not create these principles, but simply separates them from her food, and combines them into the form of an egg. Her food, therefore, should represent these several ingredients, and should consist of lime, animal substances, starchy and oily preparations, &c., &c. Nor is this separative and non-creative character peculiar to the hen alone; it is common, alike, to the whole animal and vegetable creation. The cow is but the machine by which we *collect* the butter with which her food abounds. The expert chemist can accomplish the same result. Our pork too is *really* grown in our corn fields, while the hog is the means, simply, of putting it into a tangible shape. But "there *is* nothing new under the sun;" and the grass and corn, in their turn, are but different forms of bodies continually existing, and which, by the peculiar process of vegetation, have been eliminated from the earth and atmosphere. It is true, that to human penetration it may not be quite clear why eggs are not spontaneous to grain bins; why butter, in plates full, does not nestle among the grass; why ham and rib, ready for the table, do not grow upon corn stalks; or, at least, why hogs are not as nearly indigenous to Ohio as they are to the West, the present El Dorado of the world, where 'tis said the only intimation needed is to plant in her generous soil—a pig tail!

But in the varied and continual changes of those protean bodies of creation, ever tending to our comfort, convenience, and sustenance, the infidel may admire the precision of those necessary laws of self-existent matter, but the christian philosopher sees in them the benevolence and wisdom of the Infinite.

It may be thought that my postscript, like a woman's, is the most important part of the document.

WM. BEEBE.

SECOND DEPARTMENT.

In the class of Plows there were seventy five entries.

REPORT OF COMMITTEE ON PLOWS.

Your committee have been delighted with the fine display of plows that were presented to us for inspection.

It has been said by some (and perhaps truly,) that the mechanical department of our Fair was not what it should have been, but certainly it was not deficient in plows.

There were sixty-nine entries, nearly all of which were worthy of special notice.

From the utter impractibility of testing the plows by actual work in the ground, we may have made some awards that would have been otherwise, could we have put them on trial.

The general purpose plow that received the premium, had some things about it that struck us very favorably.

First—the ease with which it could be changed from two to three horses. Second—the roller on the point of the beam to regulate the depth; and third—the perfect manner in which it cleaned its furrow.

The plow for clay soil, taking into consideration its general symmetry and proportion was perhaps the most perfect specimen exhibited. The other classes were very fine indeed.

Before closing this report permit us to suggest the propriety of testing plows in the same manner that we do our reaping and mowing machines. Have a time and place appointed (say in April or September) and put them to actual work. We think awards could be made with more certainty and the public good advanced.

All of which is respectfully submitted.

D. E. BEATY,
C. LAMKIN,
JOHN SWIGERT, } Committee.

AWARDS ON PLOWS.

Beard & Sinex, Richmond, Ind., best plow for general purposes	$10
Garrett & Cottman, Cincinnati, best plow for clay soil	10
Raymond, Roberts & Co., Cincinnati, best plow for light sandy soil	10
do do do best plow for black muck	10
Beard & Sinex, Richmond, Ind., best sward plow for black muck	10
Garrett & Cottman, Cincinnati, best subsoil plow	10
do do do best side-hill plow	10
do do do for general purposes	Com.
do do do for black muck soil	do

Geo. C. Miller, Cincinnati,	for clay soil	Com.
do do	for light sandy soil	do
do do	for one horse	do
do do	for shovel plow	do
A. Peacock & Son, do	for sod plow	do
do do do	for subsoil plow	do
Samuel Yearsley, Higginsport,	hill-side plow	do

The awards were made on plows before the assortment exhibited by J. L. Gill & Son, of Columbus, arrived on the ground.

AGRICULTURAL IMPLEMENTS.

In the class of Agricultural Implements there were ninety-six entries—the committee made the following awards:

G. B. Griffin, Harrisburgh, Pa., corn stock roller and cutter, 1st prem	Silv. Med.
B: Kuhns & Co., Dayton, wheat drill, 1st prem	do
Edward Townley, Cincinnati, frame bee hive, 1st prem	Dip. & $2
R. G. Smith, Carthage, best harrow, 1st prem	do
J. W. Correy, Crawfordsville, Ind., best corn planter, 1st prem	do
Wilder, Hyde & Robinson, Cincinnati, best and most numerous variety of agricultural implements, 1st prem	Silv. Med.
Beard & Sinex, Richmond, Ind., best corn cultivator, 1st prem	Dip. & $2
W. Willard, Cincinnati, best churns, 1st prem	do
H. B. Hill, Mainville, best washing machine, 1st prem	do
C. B. Lewis, Portsmouth, best wheelbarrow, 1st prem	do
J. B. Johnson, Cleveland, best 6 hoes, 1st prem	do
H. A. Roe, Madison, best cheese vat and heater, 1st prem	Dip. & $15
Caswell, Price & Co., Geneva, best scythe snaths, 1st prem	Dip. & $2
R. G. Smith, Carthage, corn coverer	Com.
L. H. Smith, Columbus, Vanmark's self fastening portable fence	do
J. P. Cramer, Schuylerville, N. Y. cultivator teeth	do
Baldwin, De Witt & Co., Cleveland, rotating harrow	do
S. G. Tufts, Mainville, portable fence	do
J. C. Paxton, Marietta, Parker's apple pearer	do
J. C. & C. L. Pond, Cleveland, washing machine	do
F. H. Dutton, Marietta, grain cradle	do
A. Earle, Covington, Ky., portable fence	do
J. G. Hunt, Cincinnati, portable fence	do
G. W. Newlove, Delaware, bee-hive	do
D. E. Fenn, Tallmadge, farm or carriage gate	do

AGRICULTURAL MACHINES.

In this classs there were ninety-six entries. The following machines obtained either premiums or commendations from the committee:

Gillett & Sawyer, Columbus, broadcast seed sower, 1st prem	Silv. Med.
Elmers & Forkner, Cincinnati, Young America corn and cob mill, 1st prem	do
H. & F. Blandy, Zanesville, portable steam saw mill, 1st prem	do
Wilder, Hyde & Robinson, Cincinnati, best horse power for general purposes, 1st prem.	do
Sheffler, Vandersall & Co., Plainfield. Ill., horse power corn sheller	do

Owens, Lane & Dyer, Hamilton,		best threshing machine	Dip. & $10
do	do	best horse rake	Com.
Baldwin, Dewitt & Co., Cleveland,		best corn husker	do
A. Eckert, Trenton,		brake for stone cutter	do
S. P. Castle, Urbana,		stump extractor, 1st prem	Silv. Med.
Blackford & Obitt, Lorain county,		fanning mill, 1st prem	do
Mansfield & Whiting, Ashland,		clover seed huller, 1st prem	do
Thomas Mast & Co., Springfield,		cider mill	Com.
Wm. Wimmer, Union county, Ind.,		hedge trimmer	do
G. W. Youst, Cincinnati,		corn and cane harvester	do
Thomas McFarlen, Salem,		corn sheller	do
Thomas Palmer, Cincinnati,		hand corn husker	do
Wm. Palmer,	do	Pratt's apple pearer and slicer	do
Gaskill & Wright,	do	Coleman's farm mill	do

REPORT OF COMMITTEE.

In this class there were 113 entries.

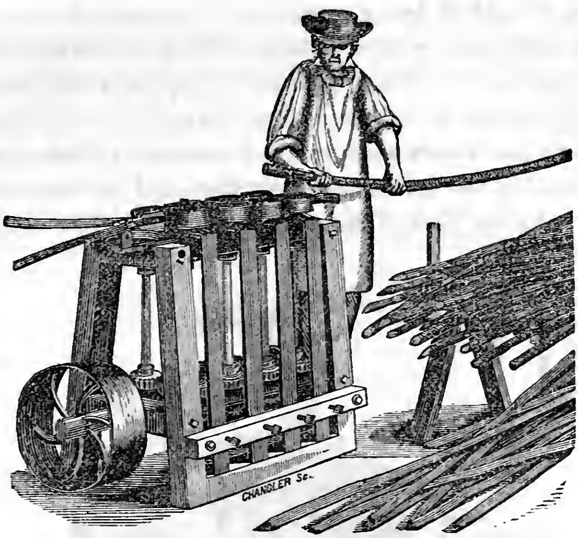
Your committee on Machinery, Engines, &c., have endeavored to perform the task assigned them, to the best of their ability, though they desire to state that the burthen was an onerous one, for the reason that the class embraced too large a variety of articles, also, the number of entries was very large. We have awarded premiums as your regulations specify.

We commend the following entries: No. 8, as a new invention, and worthy of adoption by millers generally, worthy a silver medal. No. 48, an improvement on balance valves for steam engines, by Robt. D. Gray, is one of the greatest inventions that has come under our notice, and is worthy of the highest commendation your society can give, either by premium of silver medal and diploma, or otherwise; entry No. 56, a machine by American Hoop Machine Co., for splitting and finishing round hoops for coopers.

These are new and novel machines, and attract universal attention. They consist of two parts, a splitter and a shaver.

The splitter is peculiarly adapted to the splitting of the pole just as it comes from the woods, with all of its knots, crooks, and irregularities, and will split poles of all sizes, from one-half inch up to five inches in diameter, splitting each pole into as many hoops as may be desired, and precisely with the grain of the wood.

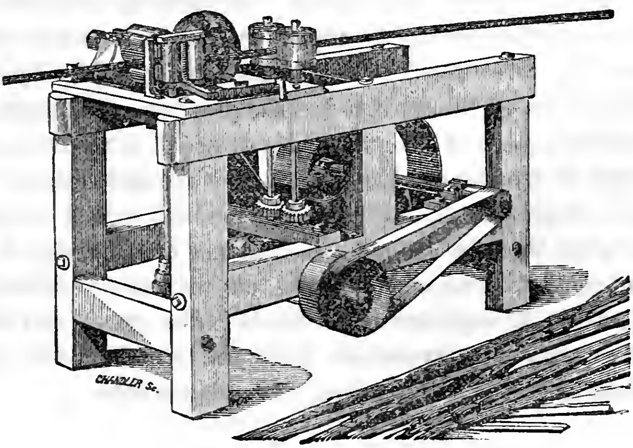
The shaver is adapted to shaving hoops for all of the different purposes for which the round hoop is used, from the lightest to the heaviest cooperage in use; also crimps the hoop ready for the cooper's use, at the same time that it shaves it.



SPLITTING MACHINE.

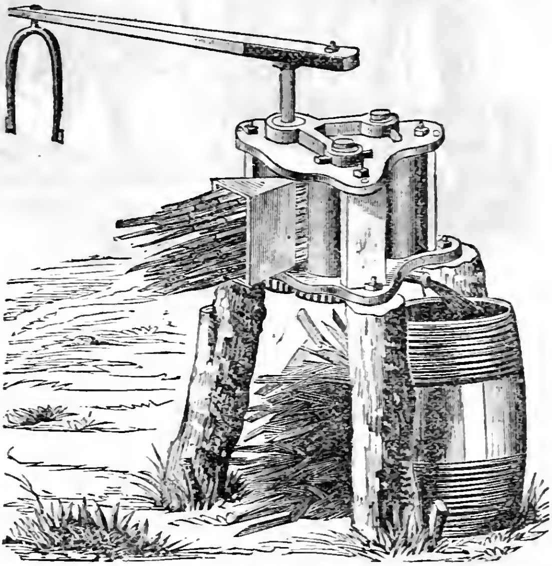
Their work is most complete in point of finish and celerity, three men being able to do the work with the machines that twelve men can do in the ordinary way.

The machines are simple in construction; not liable to get out of repair; appear to take but little power to operate them, and seem to be of much promise in economizing and facilitating that branch of the coopers' business.



SHAVING MACHINE.

On entries 69 and 70, being apparatus for the manufacture of sugar from the Chinese sugar cane, your committee would direct especial attention to this apparatus, also for boiling sugar and syrup from the juice of the cane. The mill was composed of three rollers, eleven by twenty-four inches, and extracted with two horses some two and one-half gallons per minute. It was then placed in the defecators or clarifiers and lime water applied until it ceased to color the blue of litmus paper to pink. Fire was then directed



CHINESE SUGAR MILL.

to it, which, together with the lime, caused the fecula to coagulate and rise to the top in a thick green scum. As soon as the juice has been brought to a boiling point, or nearly so, the scum ceases to separate further and the clear liquid below is drawn off carefully by means of a pipe at the bottom of the clarifier into the first pan or evaporator. There are two clarifiers made of sheet iron, one of which in rapid operations can be constantly in operation. The series of evaporators consists of three. The first the sugar pan directly over the fire, the second larger, and the third still larger than the second. The process of skimming is from the sugar pan into the second, and from this into the third, and from the latter to the stop tub. A large amount of fecula is disengaged and rises to the top in the process of evaporation, which is exceedingly rapid, more so perhaps than in that of the Southern or Louisiana cane.

It is a source of regret that no cane entirely matured was offered for experiment on the grounds, as had such been procurable, results more satisfactory would have doubtless followed. That made use of show no more than 5 to 8 deg. of Beaume's saccharometer, whereas, it should have averaged at least 12, and even up to 15 when grown on rich uplands. Our small sample exhibited 10 deg. of Beaume's saccharometer. It may be well to remark here that too strong, rich land, composed of vegetable remains and alluvions, are not as favorable to the development of the saccharine qualities as rich uplands and knolls or ridges. In the former situations the growth is more rank but has a greater preponderance of water and less sweetness. Experiment proves that the defication is most perfect when the lime is applied to the cold juice and the heating of the latter succeeds that operation, and persons should be careful to neutralize all the acidity of the liquid.

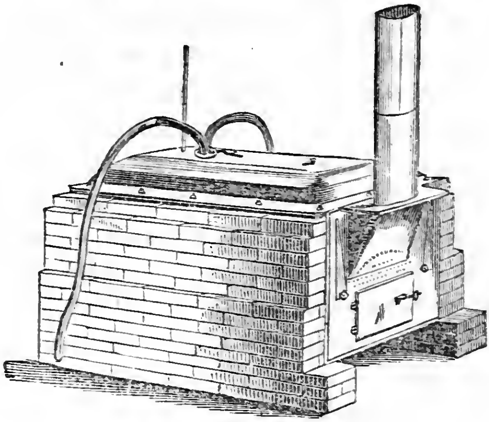
In the setting of the pans the brick jambs around and above the top of these latter are expected to serve as space for the foam of the boiling syrup to rise in during the rapid ebullition and evaporation. These were first cemented with a composition of brick dust and molasses, which failed of the desired effect. They were next covered with a thin coating of cement made with clean river sand, lime, plaster of Paris and hydraulic cement, which proved to answer the required purpose.

In conclusion your committee would express their satisfaction at the result of these experiments by which some thirty gallons of syrup of an excellent quality were produced on the ground, and at same time congratulate the country that a new and valuable staple has been added to our domestic productions in this Chinese sugar cane.

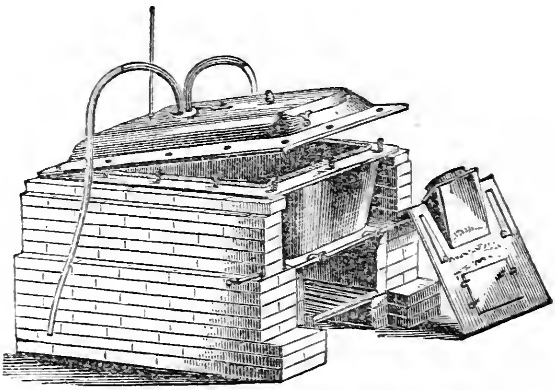
There were a number of entries, as follows: On steam gauages, entry No. 1 and 52, the latter being on three different kinds; steam pumps, entries Nos. 44 and 111; and on pumps, elevators, &c., entries Nos. 59, 80, and 81, which we consider noticable by the society and the public, but our time would not admit of an examination that would warrant us in a decision as to the best.

We have passed quite a number of articles that came under our class, after a due examination and consideration, as unworthy of notice; understanding the objects of the Society to be for the promotion of producers of articles of superior merits.

Entry No. 71, being an agricultural boiler, it would perhaps be well to award a silver medal on the three entries, viz: 69, 70, and 71.



BOILER READY FOR USE.



BOILER WITH FRONT PLATE AND COVER TAKEN OFF.

Your committee also report that they feel that the Society are under obligations to Hedges & Free, of Cincinnati, for the experiments they made on the ground, on the production of sugar from the Chinese sugar cane.

JOHN L. GILL, Jr.,
N. C. PEPPER,
JAMES LEFFELL.

Cincinnati, Oct. 7, 1857.

To the Ex. Com. of the Ohio State Board of Agriculture:

Gentlemen: The undersigned being appointed a special committee at the late State Fair, to examine and report as to the qualities and performance of Shawk's patent steam fire engine "Niagara," exhibited at the Fair grounds, cheerfully comply with your request to furnish a statement of the performance of the engine on that occasion.

The trial was made September 17, 1857, the engine being drawn by four horses from the grounds, up quite a steep grade, and on a common dirt road, to the Miami Canal, where she was placed in position to take water. The fire was then lighted in the furnace, and the following is the result:

Time from the first smoke appearing at the top of the stack until steam whistle sounded, *one and a quarter* minutes.

Time from first appearance of smoke until the machinery moved, just *three* minutes.

Time from first appearance of smoke until water was thrown through about one hundred feet of large hose (an inch and a half stream), a few seconds less than *four* minutes.

The wind was blowing briskly at the time, and from the position of the engine with reference to the canal, and a bridge near which it stood, it was necessary to throw the water somewhat against the wind, and up an inclined piece of ground on the opposite side of the canal.

The greatest distance thrown through one hundred feet of hose, and an inch and a half nozzle, was two hundred and thirty-nine feet from the end of the nozzle. This point (239 feet) being, however, some twenty feet higher than the engine, of course on level ground the water would have been thrown considerably further. The spray was thrown many feet beyond the point we measured to—say thirty feet.

In regard to the structure of the machinery and capacity of the engine, we submit a statement furnished us by Mr. Shawk.

The steam cylinder is 7 3-8 inches in diameter, and 26 inch stroke; the steam cylinder and pump are mounted on a cylinder made of boiler iron, which contains the water tank for supplying the boiler, and the steam room or dome, for the steady flow of steam to the engine.

To the frame is attached the running gear, platform, railways and fire-box. The boiler is made of tubing, and consists of one continuous pipe, from where the water enters, to where the steam emerges into the steam receiver.

The largest diameter in the boiler is only two inches, and is, in consequence, perfectly safe from explosion, for if one of the tubes shove open there would probably be no more harm done than in lifting the safety valve of a common engine.

The steam is made in such abundance, and with such rapidity, that the cylinder can be constantly kept supplied to discharge at the rate of 22 lbs. of water every minute! The engine is direct acting, and the valves are moved by steam. We recommend your committee to make Mr. Shawk the best award in your power.

JOHN C. SCHOOLEY,
A. W. GILBERT,
J. L. VATTIER,
Committee.

COLUMBUS, O., Oct. 30, 1857.

To the State Board of Agriculture:

GENTLEMEN: The undersigned having been appointed, at the late State Fair at Cincinnati, a special committee to examine a "Patent Horse shoeing Machine," entry 13, class 38, exhibited on the Fair grounds, and to report thereon, would respectfully state—

That the apparatus was examined, and found to be ingeniously arranged, simple, substantial, not liable to get out of repair, and admirably adapted to the purpose designed.

The undersigned would also state that the machine seemed to them peculiarly well arranged for suspending a horse or other animal, with broken leg, for the purpose of a cure, being so constructed that any part of the body of the animal could be supported at pleasure, without inconvenience or risk.

In this particular, as well as its principal adaptation, it is heartily commended.

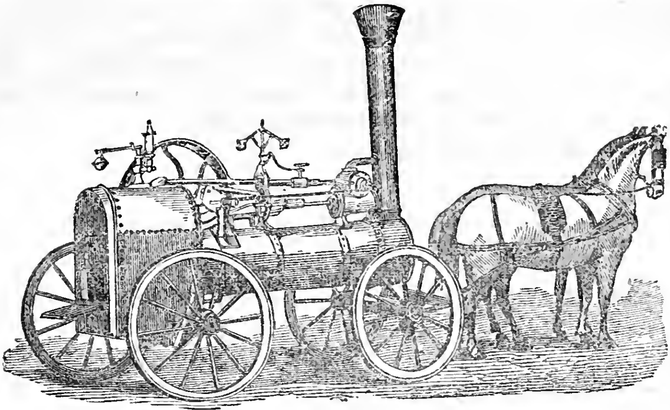
CHAS. J. WETMORE,
JOHN L. GILL, JR.

A special committee to examine Water Elevators for cattle, report entry No. 43 to be essentially simple and feasible for general use, little liable to become deranged, and as a mechanical contrivance, of practical utility, worthy of commendation by the Board of Agriculture. The price—$50—seems high, and impolitic on the part of the makers. The contrivance was examined by the undersigned, in connection with the Corresponding Secretary, who he presumes will assent to the above.

HENRY S. BABBITT.

Summary of premiums awarded, and articles commended in class of

MACHINERY, ENGINES, ETC.



PORTABLE ENGINE—NEWARK MACHINE WORKS.

Newark Machine Works, Newark, portable engine, best	$25
J. G. Hunt, Cincinnati, garden engine, best	Silver Medal.
Mattice & Penfield, Willoughby, drain tile and water-pipe making machine, best	Dip. and $15
E. H. Pendleton & Co., Cincinnati, portable flouring mill, best	Diploma.
James M. Jay, Canton, morticing and boring machine, best	do
George Parks, Cuyahoga Falls, smut machine and combined separator, best	do
Traber & Aubery, Cincinnati, Fairbanks' cattle scales, best	do
do do Balance for common use, best	do
J. C. Wetmore, do Grain and fruit dryer, best	do
Theo. W. Ferrin, do Shingle machine, Creager's patent, best	do
Robert D. Gray, Newark, improvement in steam engines, best	Dip. & Med.
O. W. Seely, Albany, N. Y., brick making machine, best	Diploma.
T. J. Alexander, Westerville, lath machine, best	do
Jacob Shuey, Dayton, flour packing machine, best	do
Joseph Sollenberger, Higginsport, wagon and carriage make, best	do

The following entries are commended:

Isaac R. Spank, Buffalo, Va., flour cooling apparatus.

D. S. Hunt, agent, Cincinnati, Queen's patent portable forge.

Mason & Blackney, Springfield, Vanderwater's turbine water wheel.

Robert D Gray, Newark, balanced steam valve.

American Hoop Machine Company, Fitchburg, Mass., hoop splitting and shaving machines.

J. A. Alden, Cleveland, match machines.

J. D. Ottstot, Springfield, saw gummers.

Samuel W. Soule, St. Louis, Mo, self-loading cart.

A. McKenney, Oberlin, Abbott's upsetting machine.

John C. Schooley & Co., Cincinnati, refrigerator, wardrobe, shower baths and bathing tubs.

Hedges, Free & Co., Cincinnati, range and sugar boilers and apparatus.

do do agricultural boiler.

George Baker & Co., Norwalk, iron planer, lathes, geer cutter, drill and lath chucks.
S. C. Mendenhall, Richmond, Ind., hand loom, for general purposes, and for weaving seamless bags.
Hennington & Mooney, Richmond, Ind., windmill for general purposes.
J. Robingson, New Brighton, Pa., water elevator—hand.
A. Sumner & Co., Cincinnati, Wheeler & Wilson's sewing machine.
E. C. Winchester, Buffalo, N. Y., Jones' self-inking hand printing press.
R. B. Bullock, Elyria, Russell's improved method of separating head and tail blocks for saw mills.
M. C. Root, Toledo, stove pipe and conductor making machine.
H. & F. Blandy, Zanesville, steam engines.

PHILOSOPHICAL, CHEMICAL, SURGICAL AND DENTAL APPARATUS, INSTRUMENTS, ETC.

There were 26 entries in this class, to which the following awards were made:

Henry Ware,	Cincinnati,	best set mathematical and philosophical instruments....	Silver Medal.
S. Wardle,	do	best specimens dentistry...........................	do
Henry Ware,	do	level, theodolite, telegraph apparatus, optical instruments, surveyor's compass.............................	Diploma.
Marsh, Corliss & Co.,	Cincinnati,	artificial leg, elastic stocking, club foot apparatus, bow leg apparatus, double self-adjusting truss, single do do, single radical cure do, double do do....................................	Commended.
J. A. Von Moshzisker,	Cincinnati,	artificial eyes	do
Dr E. Conway,	Dayton,	dental lamp and furnace	do
S Wardle,	Cincinnati,	case of gutta percha clasps for artificial teeth	do
W. W. Wilson,	Pittsburgh, Pa.,	sun dial....................................	do

Entry No. 26 was not made until after the committee had reported, when the undersigned was appointed to examine the same, and report thereon. The following is the result:

W. W. Wilson, of Pittsburgh, Pa., exhibited a sun dial, which is at once the most simple "time measurer" extant. The dial made by Mr. Wilson has engraved upon its face the equation of time, with all the variations during the year, indicating the changes for each five days, and capable of adaption for any latitude. The mode of construction insures uniformity and exactness in producing the dial plates, the original being accurately engraved, and copies produced by the process of electrotyping; the surface is then electroplated with silver. Upon the lower face of the plate there is also inserted a circular mirror, which indicates by reflection the course of the clouds.

This beautiful instrument is adapted for gardens, lawns, parks, public places and buildings, and private residences; it is a very useful instrument for manufacturing establishments, and indeed to all persons desirous of keeping *true time*. As an ornament, it might occupy the place of a piece of statuary in private grounds; and it only surprises your committee that an accurate dial like that of Mr. Wilson's has not come into more general use. We commend it very highly, and would suggest the award of a diploma by the Board.

H. S. BABBITT.

In the class of Fine Worked Metals, four entries only were made. Notwithstanding the chairman of the committee is of opinion that articles which should have been exhibited on the fair grounds, of this class, were chiefly exhibited at the Mechanics' Institute; it appears that even *that* Institution failed to command a respectable display—there were (according to the Institute report,) EIGHT exhibitors in this class, some of them extensive importers and hardware jobbers, and they were permitted to exhibit wares not only of foreign States, but of trans-Atlantic manufacture. The Institute Awarding Committee were not very harmonious, as appears from the following extract from page 69 of their report:

"In consequence of the committee, to whom was referred class 14, *refusing* to make a report on the merits or demerits of the articles embraced in this list," &c., &c.

All thanks are due to the competitors in this class who exhibited at the State Fair, because they prove to the world that Ohio has fine workers in metals, even though they prove to be "country blacksmiths."

FINE WORKED METALS.

Samuel Yearsly, Higginsport, best of all mechanical tools and cutlery.............. Diploma.

REPORT OF COMMITTEE.

The committee on Fine Worked Metals have attended to their duty and submit the following report:

1st. The display of articles which should have been on exhibition in this class was made at the "Mechanics' Institute," showing that, to "Cincinnatians" there is *no* "Ohio," the entries are therefore meagre.

2d. The articles shown by Saml. Yearsley were the products of his own industry, the handiwork of a country blacksmith, beautiful specimens of his skill, and worthy the award of a "diploma" for the "best exhibition of all mechanical tools and cutlery," which we take pleasure in bestowing.

H. S. BABBITT,
Chairman of Committee.

THIRD DEPARTMENT.

TEXTILE FABRICS.

It was confidentially expected that there would be an excellent display of Mill Fabrics, for the reason that the Queen City enjoys a reputation of manufacturing articles of this class on no small scale. In the class of Silks and Silk Fabrics there were six entries only; in Mill Fabrics there were eight. The following is a list of the awards:

Isaac E. Jones, Newport, Ky.,	variety of ladies' dress silks, 1st prem		$5
do do	variety of vestings	Com.	
do do	variety of cravats and h'dkfs	do	
Mrs. Ann McElroy, Zanesville,	lot of sewing silk, prem		3

MILL FABRICS.

Auguste Doeller, Cincinnati, 3 pieces rituals	Com.

Messrs. G. Maxwell and J. Shillito & Co., Cincinnati, made a very commendable exhibition of imported rugs, carpets, &c.; diploma recommended to each party.

In the class of Household Fabrics there were forty entries only. The display in this class is annually decreasing. Scarcely fifty years have elapsed since Ohio was a dense wilderness—when she was admitted into the Union the steamboat was unknown,—the locomotive was an enthusiast's dream; but to-day the steam engine performs more than three fourths of the *kinds* of labor which fifty years ago was performed by the hand, besides performing several hundred kinds of labor which only became known by the introduction of steam. Every department of industry has applied to the steam engine for relief from manual drudgery, whilst the progress of none has been absolutely denied,—that of the plowman is held in abeyance only—others are doubting the propriety of dispensing with manual labor entirely and supplying the place with machinery. Were the change to be immediate and universal there is no doubt that the introduction of machinery would prove to be a curse rather than a benefit—but the displacement of manual labor is gradual only, (although comparatively rapid,) so that the displaced laborer still finds his services, although in a new direction, in active demand.

What a vast amount of female labor has been superceded by the spining machine, power loom, knitting and sewing machine. So far as the employment of females in the farmer's house is concerned, the wives and daughters of the future farmers of Ohio cannot realize the condition of those who lived during the first half century of its existence in this State. We hope the day is not far distant when the farmer's wife shall be relieved from all drudgery, and can devote her time more to the mental and physical education of her offspring, and the cultivation of science, arts and literature.

The following is a list of awards made in this class:

HOUSEHOLD FABRICS.

Walker Wilson, Independence, Ky., 1 pair woolen blankets, 1st prem	$5
do do do do 2d prem	3
do do 10 yards jeans, 1st prem	5
F. A. Sahwenker, Cincinnati, oil cloth and table cover, prem	3
do do oil cloth window shades	Com.
do do 10 yards oil cloth and table cover	do
do do 4 yards oil cloth stand cover	do
John Elliott, Lottridge, 10 yards brown linen, 1st prem	$5
W. Wilson, Independence, Ky., 15 yards tow cloth, 2d prem	3
do do 10 yards linen diaper, 1st prem	5
Mrs. S. Wilson, College Hill, 10 yards linen diaper, 2d prem	3
Mrs. A. J Lacey, Laceyville, 15 yards rag carpet, 1st prem	5
Mrs. J. A Sutton, Newton, hearth rug, 1st prem	5
Lester Bartlett, Westfield, double carpet coverlet, 1st prem	5
Walker Wilson, Independence, Ky., double carpet coverlet, 2d prem	3
William Breese, Newport, Ky, woolen coverlet, made by a lady 72 years old	Com.
Mrs. Ann McElroy, Zanesville, pair woolen hose, 1st prem	$2
Mrs. A. J. Lacey, Laceyville, pair woolen hose, 2d prem	1
Walker Wilson, Independence, Ky., pair woolen mittens, 1st prem	2
Mrs. S. Wilson, College Hill, fringed mittens, 2d prem	1
Mrs. E. McDonald, Carthage, knit fringed wool gloves	Com.
Wm M Clark, Liberty, Ia, stocking yarn, 1st prem	$2
W. Wilson, Independence, Ky., woolen shawl, prem	2
Mrs. Julia A. Sutton, Newton, door mat, prem	2

WORKED METALS.

In the class of Worked Metals and Hardware there were sixty-five entries only. The following articles received premiums or commendations:

W. R. Fullerton, Cincinnati, patent wire fence, prem	Diploma.
Phillips & Jordan, do boiler plate	do
do do sheet iron	do
do do bar iron	do
A. Elliott, Yellow Springs, alarm lock	Com.
D. E. Fenn, Talmadge, gate fastenings, prem	Diploma.
do do gate hinges, prem	do
S. D. Brown, do union shuttle hinge	Com.
Thomas Southwell, Carthage, specimen horse shoes, diploma and prem	$2
J. Spratt, Cincinnati, imported candle holding stick	Com.
S. T. Clemens, do card of carriage bolts	do
do do machine plow bolt	do
Long, Black & Allstatter, Hamilton, reaping machine sickles; same, machine knives	do
J. D. Hartshorn & Co, Cincinnati, bright planished tin-ware,	do
G. G. Tench, do 2-4 iron folding bedstead; same, 3 foot do do; same, child's do do; same, 2-4 iron do do	do
Wm. Bowman, Cincinnati, ladies' patent preserving cans	do
H. Miller, do egg beater	do

J. A. Watrous, Green Springs, bag fastener		Com.
A. Frankenberg, Columbus, soda fountain and water cooler		do
Sargent & Foster, Shelburne Falls, Mass, bits and gimlet; same, patent brace		do
C. M. Yerk, Tiffin, copper ware, diploma; same, set tin fruit cans		do
H Gaston, Oxford, metalic roof		do
J. P. Stevens, Brunswick, Welton's leading cattle clasps		do

VEHICLES.

There were 22 vehicles on exhibition, to which the following medals were awarded:

I. & B. Bruce, Cincinnati, family carriage	Silv. Med.
G. C. Miller & Sons, Cincinnati, top buggy; same, trotting wagon	do
P. S. Lishawa, do omnibus	do
Cregar & Phillips, Sharonville, two-horse farm wagon	do
Blanchard & Brown, Dayton, buggy wheels and bent materials for buggies and carriages	Com.
W. S Chapman, Cincinnati, elastic anti rattling shaft and fastener	do
I. & B. Bruce, do large express wagon	do
Roberts & Curtis, do light buggy	do
Boyer, Simonton & Co., Cincinnati, lot wheels, hubs and spokes	do
Cregar & Phillips, Sharonville, 1 one and two-horse spring wagon	do
Blanchard & Brown, Dayton, hubs and spokes, seat and corner sticks for buggy	do
N. W. Selly, Carroll county, patent single tree	do
H. Rogers, Mt. Healthy, spring market wagon	Silv. Med.
J. Sollenberger, Higginsport, patent carriage brake	do

CABINET WARE.

There were sixteen entries in the class of Cabinet Ware. The following are the awards:

S. J. John, Cincinnati, extension table, prem	$3
G. G. Tench, do arm chair, (office,)	Diploma.
Antoine Steinawer, Cincinnati, center table	do
T. Kelsall, do 2 desks, 1 back seat, 1 primary bench	Com.
G. G. Tench, do folding chair, 5 cane chairs, baby jumper	do
E. Y. Robbins, do baby jumper	do
Gillett & Sawyer, Columbus, elliptic spring bed bottom	do

COOPERS', CARPENTERS' AND BASKET MAKERS' WARE.

The "Coopers and Carpenters" made fifty-one entries and received the following premiums, and commendations:

Columbus Tub & Pail Co., Columbus, pine ware	Diploma.
Tyler & Barrett, Cincinnati, cedar ware	do
A. Vieth, do window shades	do
Ryan & Farthing, do osier willow manufacture	$3
O. Kittridge, Dayton, baskets of split stuff	Diploma.
A. Larison, Hamilton, flour barrels	do
J. D. Cotton, Marietta, grain measures	do
Tyler & Barrett, Cincinnati, butter firkins	do

S. C. Belden, Hamilton, corn brooms			$2
G. G. Tench, Cincinnati, child's wagon			Com.
Ryan & Farthing, Cincinnati, clothes baskets			do
do	do	market baskets	do
J. D. Cotton, Marietta, oak measures			do
E. Bless, Minerva, Ky., self rocking cradle			do
J. McHannon, Lockland, brush handles			do
do	do	mop handles	do
do	do	broom handles	do
do	do	bone buttons	do
Jos. Sollenberger, Higginsport, auger handles			do
do	do	training post for vines	do
O. Kittridge, Dayton, double bottom baskets			do

SADDLERS, SHOEMAKERS, &c.

Curriers, Saddlers and Shoemakers made forty-nine entries. Annexed is a summary of the awards:

T. P. Haldy, Cincinnati, gents' boots, premium			Diploma.
G. Lewis,	do	ladie's shoes, premium	do
Rowe, Park & Co., Cincinnati, carriage harness			Silv. Med.
J. C. Shackelford & Co,	do	coach harness	Diploma.
Rowe, Park & Co.,	do	lady's saddle	do
H. Kessler,	do	buff upper skins	do
Jeffrey Seymour,	do	leather belting	Com.
do	do	leather hose	do
Long & Warner,	do	black bridle	do
do	do	tan bridle	do
do	do	water-proof kip	do
do	do	buff upper leather	do
do	do	split upper leather	do
James Thompson,	do	leather belting	do
Rowe, Park & Co.,	do	variety of saddlery	do
do	do	variety of harness	do
Jos. Trottman,	do	leaping horn side-saddle trees	do
do	do	men's saddle trees	do
do	do	trotting saddle trees	do
H. Kessler,	do	black buck-skins	do

Tailors, Paper-Makers, Book-Binders, Furriers and Printers, collectively, made eight entries. The awarding committee state that they "regret the small number of entries in this class. We are happy, however, to be able to say that the articles presented are highly meritorious." Awards were as follows:

Barwise & King, Cincinnati, clothing	Diploma.
C. Clark, Cincinnati, specimen printing	do
John C. Buerckle, do, fur cap	do
John C. Buerckle, do, fur gloves	Commended.
John C. Buerckle, do, otter skins	do
J. McHannon, Lockland, Ohio, book-folder	do
Ogleby, Barnitz, Titus & Erwin, Middletown, Ohio, book and cap paper	Diploma.

There were six entries in the class of Glass, Crockery, &c., on which the committee report as follows:

Terra Cotta Burial Cases, are articles having superior merits for beauty, cheapness, and durability, and we would recommend the award of a silver medal.

Ornamental Brick appears to be a cheap and substantial article for the fronts of buildings, and is intended to supercede stone, but much cheaper.

Asphaltic Roofing, an article that should have properly come before another committee wherein there was competition.

F. U. STOKES,
N. C. PEPPER.

Being appointed special committee to "hunt up," examine and report, upon entry No. 5—"pressed brick," which were not found by the regular committee, soon ascertained that O. W. Seely had some of the most beautiful specimens of brick that were ever presented, and which he had in connection with a working model of the machine by which they were pressed. The pressed brick are fully entitled to the premium offered, and we heartily commend them to the attention of the Board.

H. S. BABBITT.

The following are the awards:

T. Brewer, Cincinnati, yellow Rockingham ware, 1st premium	Silver Medal.
Mamice & Penfield, Willoughby, O., sample of drain tile, 1st premium	do
G. W. Shell & Co., Cincinnati, Terra Cota burial cases, 1st premium	Commended.
Do do ornamental brick	do
O. W. Seeley, Albany, N. Y., brick pressed from dry clay	do

In the class of Chemicals there were fifty-six entries, the premiums and commendations were given to the following:

J. C. Baum, Cincinnati, prussiate of potash	Diploma.
William Wood & Co., do, castor oil	do
Do do, colored paints	do
Miami Powder Co., Xenia, Ohio, gunpowder	do
R. W. Cornish, Pittsburgh, oil polish blacking	do
L. H. Sargent, Cincinnati, salt	do
J. H. Prince, do, cathartic pills	Commended.
Thos. Bruton, New York City, kerosine oil, solidified milk	Diploma.
Harrison & Wilson, Cincinnati, ground coffee, spices, and baking powder	do
American Fire Proof Roofing Company, Hamilton, O., Mastic Roofing	Commended.
Childs & Co., Cincinnati, elastic fire and water proof roofing	do
Going Brothers, do, syrups, wines and cordials	do
James J. Butler, do, writing fluid	Diploma.
Thomas S. Butler, do, blacking	do

Cower & Beckley, Cincinnati, patent cement roofing	Diploma.
J. C. Appenzeller, do, extract coffee	do
J. C Parr & Co., do, writing fluid	do
Simeon B. Williams, do, fine cut chewing tobacco	do
M Werk & Co, do, 50 varieties fancy and toilet soaps	do
J. C. Parr & Co., 3 bottles black ink	do

There were six entries in the class of metal, wood and stone; the awards were to

Blanchard & Brown, Dayton, Ohio, turned hubs, spokes and seat sticks	Diploma.
Hand, Innes & Whitehouse, Cin, marbelized mantel and grate	do
Collins & Co., Dayton, Newhall post banisters, and counter legs	Commended.
Wilder, Hyde & Robinson, Cin, Lake Huron grind stone, by power	do
Wilder, Hyde & Robinson, do, Lake Huron grind stone, by hand	do
J. J. O'Toole, do, marble head stone	Diploma.

The class "Stoves Castings, &c.," contained fifty-eight entries only—the committee remark "this class was very indifferently represented."

The special committee upon Cooking Ranges, report as follows:

There is but one entry, viz: E. B. Blunt, of Cincinnati, who exhibits what he denominates a Patent Kitchener. It has so many excellent points that it would be difficult to improve upon it. The Range exhibited was 24 ft. in length, and valued at $800; several sizes are made, some as small as three feet long, asking but $50. The principle of their construction ensures ventilation in baking meats, by a very simple arrangement, and in all the sizes except the smallest there are separate ovens for pastry, &c. There is an apparent objection to these Ranges on account of their cost which vanishes when their obvious durability is considered, as they will last for many years. The consumption of fuel required is surprisingly small. Mr. Blunt assures us that a family range of 4 feet, 6 in. long, having two ovens, and all the necessary apparatus, will consume but one bushel of bituminous coal per day.

H. S. BABBITT.

The awards were as follows:

Chamberlain & Co., Cin., charter cook stove for wood fire, 1st premium	Dip. & Silver Medal.
Chamberlain & Co., do, banner cook stove for coal fire, 1st premium	do
Chamberlain & Co., do, magic parlor stove	Silver Medal.
Reynolds, Kite & Tatam, do, apparatus for warming public buildings	do
Traber & Aubrey, Mt Savage Furnace, Ky., pig iron	Diploma.
G. W. Coffin & Co, Cincinnati, church bell	do
G. W. Coffin & Co, do, steamboat bell	do
E. B. Blunt, do, kitchen range, highly commended	do
Thomas Burton, New York city, Ferry's patent door spring	Commended.

FOURTH DEPARTMENT.

FLOUR AND STARCH—SIX ENTRIES.

Samuel Snively, Hamilton, best barrel of flour	Diploma & $5
O. & S. Salladay, Wheelersburgh, Scioto county, 2d best do	do 3

In the class of Butter, Bread, and Lard, there were thirty-three entries:

REPORT OF COMMITTEE ON BUTTER, BREAD, LARD, ETC.

Your committee on Butter, Bread, and Lard, report that they have attended to the duty assigned them, and in submitting their report, would beg leave to say that the butter, though not as many entries as they would expect at the State Fair, was so good, and so little difference could be perceived in the quality, that your committee found great difficulty in deciding which was best; but after much tasting, &c., have awarded to Mrs. S. Cresswell, of Cedarville, the first premium; to Mrs. J. E. Mottier, of Covedale, the second premium for the best 10 lbs. butter; to Mrs. F. Burns, of Carthage, first premium on best 25 lbs. butter made in June; to Mrs. J. F. Hughes, of Princeton, second premium on ditto.

PAUL ANDERSON,
F. G. CAREY,
G. GRAHAM,
O. KITTRIDGE.

LIST OF AWARDS ON BUTTER, BREAD, AND LARD.

S. Cresswell, Cedarville, best 10 pounds butter	$10
J. E. Mottier, Covedale, 2d best do	10
Mrs. F. Burns, Carthage, best 25 pounds butter	20
J. F. Hughes, Princeton, 2d best do	10
H. Havens, East Orange, Delaware county, best 50 pounds butter	20
W. Harbison, Cedarville, best 10 pounds lard	5
J. Bulle, Cincinnati, best bakers' bread	5
G. Hunter, do 2d best do	2
Sarah Hander, Miamitown, best domestic bread	5
F. Southwell, Carthage, 2d best do	2
H. McCash, do best bread by girls 11 years old	5
Mrs. Kingsbury, College Hill, best corn bread	2
C. & L. Jacobs, Cincinnati, best 6 loaves bread	Silver Medal.
do do best beef tongues	do
do do best dried beef	do

CHEESE.

In the class of Cheese there were eleven entries. The following statements were made by the successful competitors:

B. ANDREWS' STATEMENT.

To the Chairman of the Committee on Cheese:

SIR: I hereby submit a statement in writing, as required by the rules of the State Board of Agriculture.

I enter for competition two cheese, over one year old, made August 8th and 10th, 1856. I also compete for the best and largest lot over one year old. In this lot I present three cheese.

For best cheese under one year old, I enter three cheese, made June 1st, 2d and 3d, respectively. For best large lot under one year old, I enter 30 cheese, made on the following days, to wit: May 23d, 24th, 25th, 26th, 27th, and 28th. June 1st, 2d, 3d, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, being 13 cheese made in regular succession. June 17th, 18th, 19th, 20th, 21st, 22d, and 23d, being seven cheese made on seven successive days. July 1st, 2d, 14th, and 15th.

My dairy consists of forty cows. My cheese are made from two milkings—evening and morning milk put together. No addition of cream was made.

Method of preserving and preparing Rennet.—I kill my calves at five or six days old, on a full stomach, and as soon after sucking as a perfect coagulation has taken place, and before perceptible digestion has commenced, which will be in from 1 1-2 to 2 hours. I take the clean contents of the stomach (curd and whey) and salt it by itself. The stomach I salt well, and stretch on a hoop and dry. To prepare it for use, I take six well cured rennets, and a portion of the curd and whey above mentioned, and put the whole into a large stone jar, adding about one quart of water to each rennet, and more salt than will dissolve. After standing two days it is fit for use. Stir every day, and use just enough to coagulate the milk in proper time, and no more.

I use Parker's self-acting press. Press firmly two days, turning once each day.

After pressing, the cheese goes to the dressing-table, where it is bandaged and stained on each face. The next day it goes to the curing room, where it is thoroughly rubbed with warm whey oil, turned and rubbed once a day, while new; after partially cured, turn once in two days, keeping the room well aired and dry.

I ask the members of this committee to make a careful examination of my cheese. I have presented a large number of cheese made upon regular succeeding days, which is the best criterion from which to judge of the quality and flavor of cheese. Accident may produce, now and then, a good cheese, but can never produce uniform and reliable results.

Respectfully yours, B. ANDREWS.

LINDENVILLE, Ashtabula Co., O.

H. F. GIDDINGS' STATEMENT.

The two old cheese here exhibited by me were made in the month of August, 1856, from the milk of 30 cows; and the cheese under one year old, in June and July last, from the milk of 34 cows.

Each cheese was made from two milkings—night and morning—with no addition of cream.

The rennet is prepared for use by soaking half a dozen rennets 24 hours, in about a gallon of soft water, with as much salt added as will dissolve; the rennets are then taken out and dried, and afterwards soaked again. Enough of this liquor is added to coagulate the milk in about 45 minutes.

The cheese is pressed 48 hours, in a self-acting press, during which it is turned twice—once after pressing an hour or two, and again after 24 hours' pressing.

After it is taken from the press, a rim of thin sacking is put around the edge, and the upper and under sides slightly stained with a preparation of Annatto. The rim and sides are afterwards dressed with whey oil, and turned as often as necessary.

H. F. GIDDINGS.

WAYNE, Ashtabula Co., Sept. 12, 1857.

AWARDS ON CHEESE.

H. F. Giddings,	Lindenville,	best cheese one year old	$10
B. Addrews,	do	2d do	10
H. F. Giddings,	do	best 6 largest lot over 1 year	20
B. Andrews,	do	best cheese under 1 year	10
H. F. Giddings,	do	2d best do	10
B. Andrews,	do	best and largest lot under 1 year	10

HONEY, SUGAR, PICKLES, ETC.

There were 45 entries in the class of Honey, Sugar, Pickles, &c. The awards were as follows:

J. W. Clark, Hamilton county, 1st premium, best pear preserves.
do do best raspberrry preserves.
Edward Townley, Cincinnati, 10 pounds honey, first premium.
Mrs. W. D. Kelley, Ironton, best preserves; best raspberry do; best peach do; best tomato pickles; best onion do; best sweet do.

J. W. Clark, Hamilton county, best sweet pickles.
D. A. Pease, Hamilton, best gallon Chinese sugar syrup.
Jane H. Green Carthage, best butternut pickles.
Benjamin Conrad, Highland, best citron preserves.
George S. Roll, College Hill, best cucumber pickles.

GRAIN.

In the class of Grain there were 26 competitors. The following is the committee's report:

The display in wheat was fair, many new varieties from the Patent Office being exhibited; but the exhibit of other grain was not very good. There were entries of buckwheat, flax-seed, hops, timothy seed, clover seed, Kentucky blue grass, and red-top. Your committee make the following awards:

1st. Best bushel of wheat, entry No. 18, D. Isgrigg, Cheviot. For white flint wheat, the contest was very close between this and a sample of white Pirk wheat, entry No. 23, exhibited by F. G. Carey, College Hill. But the white flint wheat was heaviest by actual weight.

Your committee would commend entry No. 7, a sample of barley, exhibited by William Carey, College Hill; being the best in quality, but not in quantity sufficient to command a premium. Your committee very highly recommend entry No. 4, by F. G. Carey, College Hill, consisting of a fine display of forty varieties of wheat.

WILLIAM STOMS,
HENRY RIDENOUR,
D. C. MORROW.

The following is a list of the awards on grain:

D. S. Isgrigg, Cheviot,		best bushel of wheat	Silver Medal.
John Thomson, Cumminsville,		best bushel rye	do
Joseph Mock, Columbus,		best bushel oats	do
F. Parker, Cumminsville,		best bushel barley	do
	do	best Indian corn, 2 bushels ears	do
E. Warden, Cincinnati,		best collection Indian corn	do
F. G. Carey, College Hill,		display 40 varieties wheat	Highly Com.
William Carey,	do	sample barley	Commended.

NATURAL MINERALS.

In the class of Natural Minerals were eleven entries.

REPORT OF THE COMMITTEE.

The committee on Natural Minerals report, of the minerals on exhibition, only eleven entries were made; of these, only six were on the stand. Our own State was represented by only *three* of these, viz:

One box of bone dust, in two compartments, one of chippings, the other of saw dust; one barrel of salt, and one bag of marl. Certainly a very meagre representation of minerals from the great state of Ohio.

This is an interest which is now imperfectly appreciated, but whose importance every year will demonstrate.

Your committee, not having proper tests at command, can express an opinion founded only on a superficial examination of the specimens submitted for inspection. A specimen of crystalized salt, which reached the ground too late for entry, made by S. B. Pruden, Athens, O., the committee deem very superior.

F. G. CAREY,
T. B. HUDSON,
R. S. BOSWORTH.

The following is the opinion of the committee as to the merits of the articles:

Samuel Sanders, Guyandotte, Virginia, iron ore, apparently rich.

Same, cannel coal, excellent, worthy of premium.

Same, bituminous coal, fine, not superior.

J. A. Camp, Sandusky, marl, very good.

Pomeroy Salt Company, Pomeroy, 1 bbl. salt, superior, worthy of premium.

J. McHannon, Reading, bone dust for manure, respectable.

FIFTH DEPARTMENT.

There were 106 entries in the class of professional list of Flowers, and eleven only in the class of Amateurs. It is to be regretted that the committee on the professional list did not see proper to make a detailed report.

REPORT OF COMMITTEE.

The committee on Amateur list of Flowers regret to see so few articles entered by the floral amateurs of the State, especially in the vicinity of Cincinnati, celebrated as it justly is for its appreciation of nature's beauties in this department. The committee cannot silently pass over a beautiful arrangement and execution of pressed flowers, forming a boquet of gems of that kind, retaining much of their original form and coloring entered as No. 5, by Mrs. J. G. Neil of Columbus. The committee consider this highly deserving of a diploma or medal.

EDWARD J. HOOPER,
Chairman of Committee.

The following are the awards:

W. Heaver, Cincinnati, 2d best display of verbenas in pots, 2d premium; best petunias in pots, 1st premium; best phloxes in pots, 1st premium; 2d best 12 varieties of dahlias, cut, 2d premium; best display of verbenas, cut, 1st premium; best variety roses, cut, 1st premium; best miscellaneous, cut, 1st premium; best pair hand bouquets, cut, 1st premium; 2d best pair French bouquets, cut, 2d premium; best 15 inch vase pyramid, 1st premium.

Mrs. Jno. M. Millikin, Hamilton, 2d best and largest display of dahlias, 2d premium.

S. W. Pomeroy, Graham's Garden, best collection of plants, premium, $5.

W. Heaver, Cincinnati, collection of fuchsias, commended, $3.

J. Dunlap, Cincinnati, 2d best 6 varieties of stove and green house plants in bloom, 2d prem; same, best 12 varieties do do do, 1st premium.

Sayers & Hutchinson, Cincinnati, best display in varieties of dahlias, and best 12 do do, 1st premium on each; same, 2d best display of verbenas, and do do cut flowers, 2d premium on each.

A Pfeifer, Cincinnati, best display of asters in variety, 1st premium.

Toepfert & Beck, Cincinnati, 2d best variety of cut roses, 1st premium.

R. B Bowles, do, 2d, 20 varieties of green house plants in bloom, 2d premium; same, best varieties of fuchsias in bloom, 1st premium; same, 2d best display of asters in variety, 2d prem.

W. Heaver, Cincinnati, best 20 varieties of stove and green-house plants in bloom, 1st prem; same, best plants of variegated foliage, 12 varieties, 1st prem

Geo Ankenbauer, Cumminsville, 2d best 12 varieties in bloom, 2d premium; same, best and greatest variety of aloes, cactus and other succulent plants, 1st premium; same, 2d best variety of fuchsias in pots, 2d premium; same, best variety petunias, 2d premium; same, best display of asters in variety, 1st premium; same, best floral ornament, 1st premium, $5.

F. Pentland, Cincinnati, best and greatest variety of verbenas in pots, 1st premium; same, best 6 stove and green house plants, 1st premium.

J S. Cook, Cincinnati, 2d best variety of cactus, or other succulent plants, 2d premium; same, 2d best geraniums in bloom, 2d premium; same, best hand pyramid bouquets, 2d premium; same, best convex or French bouquets, 1st premium; same, best pair vase bouquets, 15 inches high, 2d premium.

T. Knott, hand bouquets, premium $2.

Geo. Ankenbauer, floral garden engine design, commended

Toepfert & Beck, collection of plants, commmended.

James Howarth, collection of plants, commended.

James Howarth, victoria regia, commended

A. Craig, collection of evergreens, commended.

Anthony Pfeifer, collection of plants, commended.

AMATEUR FLOWER LIST.

S. F. Carey, College Hill, 2d best basket of flowers, 2d premium.

do do best pair of vases of flowers, 1st premium.

O. Kingsbury, do basket of flowers, commended.

Mrs J. G Niel Columbus, bouquet of pressed flowers, commended.

N Hamlin Cincinnati, best arranged basket of flowers, 1st premium.

Mrs Jno. M Millikin, Hamilton, best and largest display of dahlias, premium.

do do 12 best varieties of dahlias, premium.

Mrs Jno. M. Millikin, best and largest display of verbenas, premium.

APPLES.

There were forty-nine entries in the class of Apples. R. Buchanan, of Cincinnati, exhibited 64 varieties of good apples—but as they were on exhibition only and not entered for competition, no award could be made. They were highly creditable to Mr. B. as a cultivator and practical Horticulturist.

The following is a list of the awards:

M. McWilliams, Cincinnati, best basket of ten varieties, 1st prem.
C. S Eversole, Madisonville, display in variety and quality, recommended.
J. E Mottier, Covedale, best 6 varieties of winter, 1st premium.
C. S. Eversole, Madisonville, best 10 varieties, half bushel, 1st prem.
H Heffelbower, Monclovia, display of 6 varieties, recommended.
W. Cooper, Springfield, 2d best 6 varieties, 2d premium.
J. V. Petticolas, Mt. Carmel, best display in variety and quality, 1st prem.
L. Nicholson, East Rockport, 2d best 10 varieties, 2d premium
G. Pardue & Sons, New Martinsburgh, display in variety and quality, recommended.
W. E. Mears, Mt. Washington, best 6 varieties, 1st premium.
W. E. Mears, do best 6 varieties winter, 2d prem.

PEACHES, PEARS, QUINCES AND PLUMS.

In the class of Peaches, Pears, &c., were eighty-seven entries, to the following of which the annexed awards were made:

M. McWilliams, Cincinnati, 2d best 10 varieties of pears, 2d prem
P. S. Bush, Cincinnati, best Brutus red gage plums, 2d prem.
do do best yellow egg plums, 2d prem.
S. F. Carey, College Hill, best peck of 1 variety pears, 1st prem.
Mrs Mary R. Jeffries, College Hill, best 10 varieties pears, 1st prem.
S F. Carey, College Hill, best 3 varieties pears, 1st prem.
Jno. E. Mottier, Covedale, best 5 varieties pears, 1st prem.
W. Cooper, Springfield 2d best 5 varieties, 2d prem.
F. Wilson, Cincinnati, best plate, not less than 12 each, plums, 2d prem.
C. L. Gano, Sharonville, best 6 varieties of peaches, 1st prem.
C L. Gano, Sharonville, 2d best plate, 1 variety peaches, 2d prem.
E. J. Hooper, Newport, Ky., best 3 varieties, 5 each, pears, 2d prem.
L. Nicholson, East Rockport, best 6 varieties of peaches, 5 each, 2d prem.
L. Nicholson, do 2d best and greatest display of peaches, 2d prem.
J. P. T. Miller, Sharonville, best plate of one variety peaches, 1st prem.
W. E. Mears, Mt. Washington, best 12 quinces, 1st prem.
F. G. Carey, College Hill, 2d best 12 quinces, 2d prem.
W. Heaver, Cincinnati, 2d best display in variety and quality of pears, 2d prem.
do do 2d best peck of one variety of pears, 2d prem.
J. P. T. Miller, Sharonville, best and great st display of peaches, 1st prem.
Thorp, Smith & Hanchet, Syracuse, N. Y., display in variety and quality of peaches, com.
Ellwanger & Barry, Rochester, N. Y., best display in variety and quality of pears, 1st prem.
do do do best 3 varieties, not less than 6 each, plums, 1st prem.
do do do best plate, not less than 12 spec., plums, 1st prem.

There were eight entries only of Grapes; the awards were as follows:

H. H Duhme, Cincinnati, best plate of Catawba,................................Commend.
E. Kleinschmidt, Storrs, best 3 varieties do, ... 2d prem.
W. Heaver, Cincinnati, best plate of foreign, ...1st prem.
do do best display of foreign,..................................1st prem.

Nine entries were made in the class of Melons, Raspberries, &c.

The awarding committee on Melons and Raspberries report that the three specimens of water-melons submitted to their consideration were remarkably fine.

No. 7, exhibited by Mr. Jessup, was quite large and decidedly the finest flavored melon we ever tasted, and we awarded it the first premium. No. 2, exhibited by Mr. Balsley, were large and more compact than No. 7. and though finely flavored, they were not quite so delicious as No. 7. No. 9, exhibited by Mr. Pauly, were, in the opinion of some of the committee, better flavored than No. 2, but being deficient in size we awarded the second premium to No. 2.

In the class of Muskmelons the exhibition was equally good with the water-melons, and we awarded the first premium to No. 3, and the second o No. 5, both exhibited by Mr. Jessup. J. K. Green, Robt. Buchanan and Dr. Warder exhibited fine specimens of Raspberries, which deserve special commendation, but as no one exhibited the quantity required by the rules of the society, we were unable to award any premium.

ROBT. G. CORWIN.

AWARDS ON MELONS AND RASPBERRIES.

R. Warder, Cincinnati, best Catawissa raspberries..............................Commended.
M. P. Bolsley, North Bend, Ky., best 6 ice-rind melons......................... 2d Prem.
A. J. Jessup, College Hill, O., best 6 Turk-cap Citron.......................... 1st Prem
do do best 6 nutmegs................................ 2d Prem.
F. Jessup, do, best 6 mountain sweets.. 1st Prem.
John K. Green, Carthage, Ohio, best Ohio ever-bearing raspberries..............Commended.

In the class of vegetables were 130 entries.

The committee on vegetables have endeavored to perform the duties assigned them, and awarded premiums as marked herein. We would commend to the favorable consideration of the Board, entry No. 117, as being very fine; we would also make honorable mention of entry No. 111.

Permit us to say that, so far as our department is concerned, we consider the show almost a failure, being surpassed both in quantity and quality. by almost any county fair in the State. While the exhibition by the Cincinnati Horticultural Society, has never been equaled in the West.

What the causes are which have produced this result your committee do not feel called upon to decide. In a year of unprecedented abundance and excellence in our department, we have an exhibition in the Queen City of the West which could be easily surpassed by many farmers in the State. Meagre premiums will not ensure a full display in any department. and the now liberal policy adopted by the Horticultural Society, has drawn to it many articles which would otherwise have been shown in this department.

G. S. INNIS,
WM. B. CULBERTSON,
HENRY RIDENOUR.

AWARDS ON VEGETABLES, ROOTS, ETC.

J. W. Clark, Reading, Ohio, best 12 ears yellow field corn, premium	$2
S. F. Carey, College Hill, 12 turnip beets	Recom'ded.
Do do 2d best display of potatoes	2d Prem
Do do best half bushel of potatoes	do
F Parker, Cumminsville, O., display of pumpkins, premium	$5
Do do 12 ears sweet corn, premium	2
Andrew Beck, do, best half bushel sweet potatoes	1st Prem.
G. S Rail, College Hill, Ohio, peppers, display in variety and quality, premium	$2
O. Kingsbury, do, 12 ears white corn	Premium.
H. Rodgers, Mt. Healthy, O, half peck white bunch beans	do
R. H. Warder, North Bend, Ohio, best display of corn in variety, 6 ears each, prem.	$5
A. J Jessup, College Hill, pumpkins, prem	2
J K Green, Carthage, 12 sugar beets, prem	2
J Mock, Columbus, O., best display of potatoes, 1st prem $5; ½ bushel potatoes, 1st prem, $3; bushel of potatoes, commended; peck of tomatoes, prem, $2; 3 drum head cabbages, $2; ½ peck onions, prem. $3; display of squashes, prem, $3; best display of vegetables, prem	15
J. Kuhlin, Cin., O., 12 long blood beets, prem, $2; 12 parsnips, prem, $2; 12 carrots, prem, $2; ½ peck of Lima beans, prem	2
A. J Jessup, College Hill, Ohio, display of vegetables	Com'nded.
Edward Morris Cumminsville, Ohio, 10 egg plants	do

SIXTH DEPARTMENT.

There were 85 entries in the class of Paintings, Drawings, &c.

The exhibition of objects of art was very meagre as compared with former fairs. The premiums awarded are noted in the proper places. Many articles on exhibition the committee considered as coming within the rules which forbids us to award premiums to articles of inferior merit. Of designs for farm buildings, &c., there were none on exhibition; a good bridge model was duly noticed. The chief feature of the exhibition was the display by Mr. Porter of a very fine collection of photographs, colored in oil. This new and beautiful art was well and adequately represented. which we regret to say, was not the case in other branches of oil painting.

Some landscapes by Frankenstein and other artists of high repute, not entered for premiums, filled up some of the gaps which would otherwise have existed on the walls.

The specimens of sculpture in marble by Charles Bullitt, is of a high style of art; and the statue in wood by Mr. A. Bullitt, is very well carved; this was *all* in sculpture.

The specimens of carving in ivory by C. H. Smith of Dayton, were of very delicate workmanship, and we regretted we could only give him a commendatory card.

The landscape of Lichens, contributed by Mr. J. G. Neil, is exquisite in design and execution.

The photograph of the Louvre, contributed by J. B. Earnshaw, is also very fine.

Respectfully submitted,
JAS. T. WORTHINGTON,
CHARLES ANDERSON,
MISS MARY ANDERSON,
MISS SOPHIA VAN METRE.

AWARDS ON FINE ARTS.

W. S. Porter, Cincinnati, best life sized photograph	silver medal & $10
Do do 2d best photograph	diploma & 5
Geo H. Knight & Co., do, best architectural drawing	diploma.
Middleton, Wallace & Co., best lithography	silver medal.
E. M. Gregory, Cin., model of a bridge	diploma & $5
Charles Bullitt, do, best sculpture	diploma.
A. Bullitt, do, best wood carving	do
John D. Williams, Columbus, best pen drawing	do
C. H. Smith, Dayton, engraving on ivory	Commended.
George Akenbauer, Cumminsville, puzzling monument	do
W. S. Porter, Cincinnati, cabinet sized photograph	do
F. Dieckman, do, model of bridge	do
A. Cowley, Pittsburgh, commercial penmanship	do
Do do penmanship	do
Miss A. E. Cox, Cincinnati, Grecian painting	do
J. B. Earnshaw, Columbus, photograph building	do
J. E. Cheney & Co., Rochester, N. Y., photograph portrait, 2d best	do
J. D Williams, Columbus, off-hand penmanship	do
Mrs. J. G. Neil, do, landscape of Lichens	do

In the class of Needle, Shell, and Wax Work there were 98 entries—the following articles were awarded either premiums or "honorable mention:"

Miss Rosetta Ebert, Hamilton, Butler county, best ornamented needlework	$3
Mrs. Thomas Davis, Hamilton best worsted embroidery	3
M. J. Pyle, College Hill, best ottoman cover	3

Mrs. C. M. Wilder, Cincinnati, best table cover	$3
Paintings, Thomas Burton, Cin., best specimen of wax fruit	3
Duff's system of book-keeping, (Pittsburgh, Pa.,)	Commended.
Mrs. L. A. Smith, Cumminsville, best group of flowers	$3
M. J. Louderbeck, Cincinnati, best variety of worsted work	3
Luke Ferraby, Worthington, Franklin county, best white quilt	3
Joshua Johns, Lebanon, best stitch work quilt	3
Mrs. B. H. Brown, Cincinnati, best worked camp mat	3
Miss Rosetta Ebert, Hamilton, best worsted collar	3
Miss C. Richwine, Rochester, N. Y., best ornamental shell work	3
Mrs E. O. Jones, N. Orleans, best silk embroidery	3
Mrs. E. Earhart, Hamilton, best worked veil	3
Mrs. Mary Ball, Dayton, 2 fancy leather work frames	Commended.
Wm. McKelvey, Glendale, bed spread cover	do
Mad. A. Braucher, Cin., framed tomb of Washington	do
Miss Rosetta Ebert, Hamilton, Butler county, 1 pr worked sleeves	do
Do do do worked pocket handkerchief	do
Mrs. C M. Wilder, Cin., 1 hearth rug	do
Do do 1 pair linen pillow slips	do
D. B. Walcott, Cin., 1 pair elk horns	do
Mrs. Dr. H. Schults, do, 1 card of 8 reticules	do
Mrs. M. Moses, do, worked card box	do
C. H. Smith, Dayton, ornamental bead work	do
Mad. Stiebel, Cin., chenille head dress	do
John Garrigan, Detroit, sea shells	do
Miss Unwin, Toronto, C. W., 4 bead mats	do
do do knit tidy	do
Mrs. J G. Neil, Columbus, embroidered breakfast coat	do
O. Kingsbury, College Hill, patch-work Bible cushion	do
Mrs. T. B. Anderson, Hillsborough, ladies' crotchet cap	do

In the class of Musical Instruments there were seven entries. The following awards were made:

Truax & Baldwin, Cin., best grand piano	Silver Medal.
Do do best melodeon	Diploma.
L. G. Freeman, Chevoit, best violin	Silver Medal.

OPINIONS OF THE PRESS.

The State Fair.

[From the Ohio Farmer.]

The grounds were tastefully laid out, occupying the low lands of Camp Washington. The ground is slightly broken, which added to the beauty of the general design. Small groups and single specimens of trees are scattered over the ground; numerous fountains threw jets of water in the air, and many wells supplied abundance of water for cattle, &c.

The arrangements were in general good, but all the buildings were not ready soon enough; they should have been finished a few days earlier. This is, however, a fault of very common occurrence on such occasions. We heard of no complaint in regard to the facilities for making entries, and this department was kept open until Tuesday night, some entries being even made on Wednesday morning. There was plenty of room in the several Halls, and the stalls for cattle and horses numbered some six hundred. The sheep and hog pens were not so commodious as they might have been; these were all filled.

The ring for the exhibition of cattle was large, but it was not as good as that of the Cleveland Fair, the soil being clay, and somewhat moist in places. On the outside of this ring was placed a large stand for the accommodation of ladies. A fine band enlivened the place with music, and here and there were scattered refreshment stands, with soda fountains and fruit in abundance.

The attendance was large. Accommodations for the immense influx of strangers was not, so far as we could discover, provided by the citizens of the Pork city, the hotels doing this business alone. We shall have more to say of this.

HORSES.

The exhibition of thorough-breds was larger than usual; but in Black Hawk and Morgan horses, and aged roadster-stallions and mares, it was far inferior to either of the last three Fairs.

JACKS AND MULES.

In this department, there was the best exhibition we have yet seen in Ohio.

SHEEP.

The number of sheep on exhibition was very small as compared with previous exhibitions, but the quality was very superior.

SWINE.

The quantity was small, the quality good.

DAIRY AND FARM PRODUCTS.

This was a branch of our State industry that every one thought would be well represented, but it was not the case. In a region of country famed for its great and extremely productive farms, it required no great stretch of the imagination to call before the mind's eye heaps of these staples of our rich land; but what was the reality? Very few exhibitors were there, and the anticipated heaps of these staples were of course not there either. We do not mean to say that there was nothing in this department to attract attention, for much of what was shown was really superior; but the quantity was wanting. There was some very good cheese, and very good looking honey, but there is little doubt but many a County Show will beat the State Fair in dairy and farm products within the next three weeks.

FRUITS AND VEGETABLES

Were not so largely shown as might have been expected. The apples and pears were good, many superior. Peaches, a few good ones, but as scarce as they were last year, at the Cleveland Fair. Grapes, few, not having ripened. Plums, nearly over, and of course not abundant. There were pretty fair samples of tomatoes, melons, squashes, and the various products of the garden; but there was room enough for six times as much more. In the rich Ohio river bottom, there are gardens enough to fill a dozen such tents with the most choice specimens of vegetable growth; and the gardeners there have skill enough. All, therefore, that was necessary, was to bring on the articles, and the Show, in this respect, would have been one of the best.

AGRICULTURAL IMPLEMENTS.

These were not equal in quantity to the show of last season. Altogether, this part of the exhibition was worthy the attention of visitors, whether farmers or not.

POULTRY.

This was a decided failure, in numbers, and general quality of birds. If there are good birds in the vicinity of Cincinnati, few of them were brought to the State Fair.

POWER HALL.

This building was small, but sufficiently large for the articles exhibited. There were a number of power agricultural machines on the ground, but little that was new.

MECHANICS' HALL.

Much might have been expected in this department from the mechanics of Cincinnati, were it not for the well-known overshadowing selfishness of many of the self-elected leaders in this branch of State industry. At the first Fair held in that city, this selfishness contributed not a little to render the first of our State Fairs less attractive than it might have been. The same feeling preponderated at this Fair, and it is well known to us, and many others, that members of that Institute did all in their power to build up their own exhibition on the ruin of this department of the State Fair. This disposition was slightly manifested by certain parties at the Fair in Cleveland, and during the winter we were made aware of the intention which has just been carried out. There is no use in denying this assertion, for we have the best evidence of the fact in the uttered words of a member of that body, to ourselves, admitting that such was the case. Now this may be all right in the eyes of the gentlemen composing the Mechanics' Institute, but we doubt much if the mass of our citizens will look upon it in the same light. We doubt, also, if it will conduce to the ultimate benefit of the Institute, as such short-sighted policy always injures those who use it. We glanced rapidly over the articles exhibited in the Mechanics' Hall, as there was little which could claim the term new. The building devoted to carriages was occupied with several well finished articles in this line, but nothing extra. Such articles can be seen every day in any of our first class manufactories. Furniture was not there in any great quantity, and we saw much better articles in the warehouses of the city. Nearly everything was so inferior in quality and quantity to that which was shown at the previous Fair, that we felt thoroughly chagrined. And it is almost needless to say that we were not alone in this feeling. That Cincinnati could have done much, and did little in this department, was patent to every one on the grounds.

FINE ART HALL

Was a failure, partly from being too large, and partly from want of exhibitors. There were some fine photographs painted in oil, to be seen, but not enough of them. Some landscape paintings of autumn scenes, the back views of which were a little too distinct. There was a well carved Crucifixion, in wood, and a sleeping boy, that were praiseworthy. A few crayon sketches, and other small articles, made up the exhibition in this department. But the blank walls had a killing effect on our admiration of details, the general effect being so miserable.

FLORAL HALL

Was a gem in design, and far exceeded anything of the sort we ever saw. The building was a light frame, open on all sides, and the ground within was laid out in gardenesque style, with walks cut in the lawn. In the center a handsome fountain threw up a jet of water from a basin, with gentle sloping banks, and in the water floated the broad leaves of a Victoria regia. At one end of this garden spot, and separated from the central fountain by a broad walk, stood an artificial piece of rock-work, whose rugged sides were clothed with fine specimens of evergreens, ferns, and lycopods. Rare flowers grew from the clefts of the rocks, mingling their brightness with the dark green of the evergreens, and loading the air with perfume; from the overhanging rocks trickled a bright little stream, which fell into a miniature lake at the base—the latter ornamented with a fountain.

In appropriate beds, were placed masses of rare green-house plants in pots: in this department the professional men of Cincinnati did well. The general effect of the whole design, with the disposition of the plants and flowers, was that of a well-kept garden, or rather conservatory: and all who visited it, seemed to be well pleased, and in fact delighted. Round the central fountain were placed two semi-circular tables, for the exhibition of cut-flowers. This was the only failure in the flower department, the show being quite meagre: one blossom, however, caught our eye; this was a fine specimen of the gorgeous flower of the *Cactus grandiflora*, and, along with some fine bouquets, was sent by Gen. Carey, of College Hill, Hamilton. A tasty little temple, formed of flowers, stood in a corner. The miniature walks and grounds around it were paved with verbenas and other pretty flowers. There were other pretty designs to be seen.

At the opposite end of the building was a large arch, the ornaments of which were composed of the products of the farm and garden. Tastefully arranged and ornamented groups of horticultural and agricultural implements occupied the panels, and the top of the arch bore a real wain, loaded with golden sheaves of grain, while over all floated the National banner. The arch, and other parts of this Hall, were decked with evergreens in festoons.

This Hall was laid out, and is under the superintendence of M. G. Kern.

DOMESTIC HALL.

This hall was large and commodious, better had it been much smaller, for it presented "a beggarly array of empty benches." We anticipated that the ladies of the southern part of Ohio would exhibit the products of that skill and taste, which they no doubt possess. We were disappointed, as but few seemed to take interest enough in the matter, to bring forward those articles which their more northern sisters delight to exhibit, such as beautifully worked quilts, and needlework, in all its branches. Ladies! ladies! you must do better next time.

DR. GARLICK'S FISH.

The Doctor had a whole department to himself, and was the nucleus of an admiring circle. During the short time we remained near him, we heard many funny questions put, which the Doctor answered with the greatest good nature. One man stuck to it that the brook trout shown were pike, and that he had caught just such kind of fishes. And a worthy lady thought they were swimming in some sort of air. As there were no competitors in fish, we suppose the trout got a first premium, although entered for sweepstakes.

[From the Cincinnati Enquirer.]

The State Fair.

The grand exhibition of the art and productions of our people closed yesterday. The time of the exhibition was quite too brief to satisfy the popular desires, for the interest in it continued to the last moment, and the eager throng which has constantly poured along the roads leading to the ground, like an avalanche, gathered force and volume with every day and hour of its progress.

Some idea of the number of visitors may be formed by reference to the receipts for tickets, which, we learn, were on Thursday $9,000, and on Wednesday $7,000—making the number of visitors who entered the grounds over thirty thousand per day. And yet there were nearly as many outside as inside. Such receipts, under good management, ought to more than reimburse the expenses of the Fair. They demonstrate the great popularity of such exhibitions, and the admirable location of Cincinnati as the place for holding them. There is hardly a city in the United States—certainly there is none in the West—where so large an assemblage of the people, especially of the yeomanry of the country, can be so rapidly and cheaply gathered as in the Queen City. Our great railroad facilities may thus be made the most valuable accessories and means of increasing our wealth and prosperity.

We cannot estimate too highly the wealth and benefits which a city receives from the influx of strangers and sojourners. We are too much accustomed to regard mere trade and produce as the only elements of a city's prosperity. They are, of course, essential; but, after all, as our most valuable import consists in the energy and industry—and even of the mere material wealth—of the great crowd of hardy immigrants which pour into our country from the Old World, so, too, a city may find its highest policy in attracting and its largest source of wealth in entertaining multitudes of visitors and strangers intent on business or pleasure. Let a calculation be made of the sums expended and goods purchased by the ten thousand persons per day, that have rushed to our city during the past week, and it will be found to overtop the product of several of our most valuable trades. Hence the duty and importance of increasing these attractions and giving most liberal encouragement to even the amusements, and much more to the arts, which delight and gratify the popular taste and imagination. There can be no better investment of the funds of the corporation than in judicious expenditures on even the amusements of the people. Not only as an attraction for strangers, but as the means of drawing the minds of our people from ignoble and vicious gratifications, and supplying them with elevating and expanding recreation, should this policy be adopted and liberally pursued.

The exhibition of the last week shows that Cincinnati, if true to herself, is destined to be the Leipsic of the West of America, as the old German town is of Eastern Europe. It is only necessary for her people and corporation to do their duty—to adopt a more liberal policy in increasing the brilliancy and attractiveness of such exhibitions, and rendering the sojourn of strangers more comfortable and less expensive—to secure this high and enviable position.

It would be, doubtless, unjust and invidious to dwell with much emphasis on the many unfavorable features of an exhibition got up in the crude and hasty manner of the State Fair. But they should not be lost sight of as lessons of wisdom for the future. There were many discomforts and confusions, all of which may be excused on the ground that the Fair was a mere temporary encampment instead of being a fixture. Cincinnati can well afford to expend several hundred thousand dollars to procure complete and proper fair grounds, where it would be to the interest of the largest majority of the people of the State that State fairs should be held yearly. These exhibitions draw crowds which cannot be entertained in the smaller towns of the State. It is more convenient for the countryman to come hither than to sojourn in a village near to his residence. Here, too, is the center of the mechanical and manufacturing industry and skill of the West, and the specimens in that department of human achievement cannot well be transported to distant points. To secure this great benefit to our people, both of the State and city, it behooves our Council to profit by our recent experience, and move promptly in maturing a plan by which proper grounds and buildings may be secured for the holding of permanent and regular annual State Fairs at Cincinnati.

[From the Ohio Cultivator.]

Ohio State Fair for 1857.

Ever since we returned from the State Fair at Cincinnati, we have been revolving in our mind what we should say about it, and the more we cogitate, the more do we hate to put pen to the subject, and could wish to draw a mantle of oblivion over the whole affair. Not but that there was a great deal to commend, and make one feel proud of, but that along with this there was so much, to say the least, unsatisfactory. We have the charity to believe that most of those charged with the getting up of the exhibition, did as well as they knew how to do.

Another and a worse cause of unsatisfactoriness was in the almost utter want of sympathy from the citizens of Cincinnati. There was no organized local arrangement for disposing of stranger visitors, who could not find room in hotels, and parties of gentlemen and ladies were obliged to sit out the night, with no better protection than the friendly sky above them, to be preyed upon by gouging landlords, gouging omnibus men, and the bitingest kind of Cincinnati mesquitos. We are sorry to chronicle this of the Queen City, but the truth compels it. This is the sum and substance of what we have to say on the shady side of this matter. Let us look at the bright side.

The collection of first class short-horn cattle we have never seen equaled anywhere, and an inspection of the list of awards will show where they came from. The same is true of thorough-bred horses. The show of horses as a whole was superior, while in the useful class of roadsters, it was not so good as last year. The two lots of colts shown by the Butler County Stock Company, by Highlander and Victor, were superb, and the Hercules family, by Mr. Bain, of Xenia, were a capital collection. There were many other notable specimens of horse flesh which, if we should begin to name, we would not know where to stop. For particulars, see list of awards.

C. A. Ely, of Lorain, has a lot of prize Devon cattle, that will take the cups wherever they go. These and the Herefords on exhibition were the same that we noted as being at Louisville the week before.

The sheep department was handsomely filled, though not so large as it has been sometimes. The best lots are indicated by the awards. The Silesians of Messrs. Karr & Starr, of Wyandotte county, were up to the best sample of that popular breed. The show of long and middle wooled sheep was excellent, probably never equaled in the State before, embracing as it did the choicest animals of Ohio and Kentucky. Swine were respectably but not largely represented, and poultry made rather a small show.

Implements and machines were in many respects quite superior. The plow makers of Cincinnati were on the ground with their fine steel plows. Beard & Sinex, of Richmond, Ind., made a brave and noble show of plows and cultivators. J. L. Gill & Son, of this city, were delayed in getting their stock of plows upon the ground in season to compete, but when they do compete they make their mark; and in this connection we forehint to the public, that they will soon bring out a plow that will run its nose into the ground, to say the least. Mattice & Penfield, of Willoughby, O., had a drain tile making machine that is ahead of anything of the kind yet brought out. There were a variety of things for husking corn: the simplest is an iron spur upon a leather palm, to go on the hand—a very handy invention. There were several rotary machines for husking, which we suppose may be nearly as effective as a hatchet, to cut off the husk at the butt, and let the ear fall out. For cutting up corn from the hill for harvest, there was a long rakish looking machine, like a dray, with a shear working on one side, and a carrier to take the stalks back for binding. It looks like too much of a machine for what it will do. An implement for this purpose is very much needed, and we have had many inquiries for one that will work, but as yet the demand is not met by any invention that we know of that has been successfully brought out. Mr. Blakeslee, of Ashtabula, had his leveling scraper, lately illustrated in the Cultivator, and we think very well of it. R. G. Smith, of Carthage, had a good hay press, a thing much needed in this country. These are the principal novelties and notables among the machinery, that we judge of most special interest to farmers at this time. Of course there were besides these many of the well known and standard implements, that every good farmer should have, for which consult the list of awards. Hedges, Free & Co. had a full rigged apparatus for making sugar from the Chinese cane—mills, boiler, kettles, etc.—where they showed the public how it was done, and how it tasted when it was done; and the people saw and tasted, and went away satisfied that the thing will work.

The departments of Domestic Manufactures and Fine Arts, were a failure past redemption. Floral Hall was a beautiful place, and in the fancy, the gem of the exhibition. The fruits were tolerable, and the vegetables as a whole, intolerable. Dairy products good, but scarce. There were nice cheese from old Ashtabula.

The members of the State Board, the Treasurer, the Secretary, and their assistants, were more than diligent, obliging, and watchful. Few people can appreciate the amount and quality of labor that these have to perform at such a time. The attendance on Wednesday and Thursday was large, and the receipts we learn were above $21,000. The expenses were disproportionately large; we suppose there will be a surplus after paying all.

The success of our future State Fairs now becomes a matter of serious concern. We heard many of the most substantial friends of the cause in the State, express themselves strongly in favor of a permanent location of the Fair. We have never argued in favor of this measure, nor thought it advisable, while any considerable minority of the people were opposed to it, but the signs of the times seem to point very significantly to this as the best thing now to be done. It will obviate an annual waste of some $4,000 for fixtures. The grounds will always be ready in time, and in better fix. Stock men can put up stables with comfortable lofts for their men, and a great many conveniences secured that the lack of now causes a good deal of swearing and discomfort. This is a thing to be seriously thought of before the next annual meeting, and discussed at that time in an unselfish and liberal spirit, to subserve the permanent good of the cause.

MEETING OF THE BOARD IN STATE AGRICULTURAL ROOMS,
Columbus, O., Dec. 8, 1857.

Present, ALEX. WADDLE, President; L. Buttles, Treasurer; J. M. Millikin, Recording Secretary; B. Stedman, A. Krum, R. W. Musgrave, John K. Green, Luther Smith, T. S. Webb, J. H. Klippart, Corresponding Secretary. Absent, G. W. Barker.

The Board having been called to order by the President, on motion, the commended list of premiums was taken up, when the following premiums were awarded:

L. T. Vanschoiach, Richmond, Ind., 3 year old stallion. *John Halcorn*, in class of horses of all work, first premium, $20.

W. H. Hawkins, Clarksville, Clinton county, Ohio, on 3 year old stallion, *Lonely Star*, class, horses of all work, second premium, $15.

The above awards were made by the regular committee, but not reported in their list of awards.

John Hadley, Clarksville, Ohio, milch cow, first premium, $50. Hadley's cow gave, in the first ten days of the trial, 399 pounds of milk, producing 19 1-4 pounds of butter. Second ten days, 420 pounds of milk, and 17 pounds of butter. Total, 829 pounds of milk, and 36 1-4 pounds of butter.

C. S. Gates, Brooklyn, Cuyahoga county, Ohio, milch cow, second premium, $30. Gates' cow gave, in the first ten days of the trial, 517 pounds of milk, producing 16 1-2 pounds of butter. Second ten days, 450 pounds of milk, and 12 1-2 pounds of butter. Total, 967 pounds of milk, and 28 pounds of butter.

Neither of the above two parties having literally complied with the rules in such cases, the regular committee on awards did not feel authorized to make any decision; hence this decision by the Board.

W. S. Labeiteaux, Cincinnati, second premium, sucking mare colt, $3.

Wm. Ostler, Cumminsville, exhibition of ferrets, $5.

John Augsburger, Butler county, corn stalk cutter, silver medal.

Baldwin, Dewitt & Co., Cleveland, Hogle's rotary harrow, silver medal.

F. D. Leonard, Yellow Springs, hay press, silver medal.

Sam'l Male, Cincinnati, cider mill, corn sheller, and vegetable cutter, silver medal.

Thos. McFarland, Salem, Ohio, hand power corn sheller, silver medal.

D. S. Hunt, Cincinnati, Queen's patent portable forge and bellows, diploma.

I. R. Shank, flour cooling apparatus, silver medal.

American Hoop Machine Co., Fitchburg, Mass., hoop machines, sil. med.

J. C. Schooly, Cincinnati, refrigerators, &c., diploma.

Hennington & Mooney, wind mill, diploma.

A. Sumner & Co., Cincinnati, Wheeler & Wilson sewing machine, dip.

C. E. Winchester, Buffalo, N. Y., Jones' self inking hand printing press, diploma.

M. C. Root, Toledo, stove pipe and conductor making machines, dip.

O. W. Seely, Albany, N. Y., Ustick's brick machines, diploma.

Hedges, Free & Co., Cincinnati, sugar mill, and range of boilers, sil. med.

Geo. Baker, Norwalk, Ohio, iron machinery, silver medal.

S. C. Mendenhall, Richmond, Ind., hand loom, silver medal.

John Robingson, New Brighton, Pa., water elevator, silver medal.

R. B. Bullock, Elyria, Ohio, head and tail saw mill blocks, silver medal.

A. Shawk, Cincinnati, steam fire engine, *Niagara*, silver medal.

Marsh, Corliss & Co., Cincinnati, surgical instruments, diploma.

E. Osmond, Cincinnati, clasp for artificial teeth, diploma.

Dr. E. Conway, Dayton, dental furnace, diploma.

W. W. Wilson, Pittsburg, improved sun-dial, silver medal.

Mrs. E. C. McDonald, Carthage, knit gloves, $2.

T. W. Schwenke, Cincinnati, exhibition of oil cloths, $2.

Wm. Bruce, Newport, Ky. (for the maker), double coverlet, $3.

James Spratt, Cincinnati, improved candlestick, diploma.

S. T. J. Coleman, Cincinnati, carriage bolt and clips, diploma.

Long, Black & Allstatter, Hamilton, machine sickles and mowing knives, silver medal.

Phillips & Jordan, Cincinnati, exhibition of iron, silver medal.

Sargeant & Foster, Shelburne, Mass., gimlets, brace, &c., diploma.

Blanchard & Brown, Dayton, Ohio, wheels, hubs, and spokes, diploma.

I. & B. Bruce, Cincinnati, express wagon, silver medal.

Royer, Simonton & Co., Cincinnati, wheels, hubs, &c., diploma.

Cregan & Phillips, Sharonville, one and two horse engine, silver medal.

Joseph Shollenberger, Higginsport, carriage brake, diploma.

N. N. Selly, Carroll county, patent single-tree, diploma.

J. McHanna, Lockland, Ohio, broom handles and bone buttons, diploma.

F. Hartman, Cincinnati, display of willow ware, silver medal.

Ryan & Farthing, Cincinnati, willow clothes baskets, $3.

J. C. Buerkle, Cincinnati, dressed furs, diploma.

J. C. Parr & Co., Cincinnati, inks, diploma.

Miami Powder Co., Xenia, powder, diploma.

Thomas Kelsall, Cincinnati, school desks and seats, diploma.

Gillett & Sawyer, Columbus, Howe's Elliptic Spring Bed Bottom, dip.

Antoine Stineower, Cincinnati, centre table, diploma.

Hand, Innis & Whitehouse, Cincinnati, display of grates, diploma.

E. B. Blunt, Cincinnati, patent kitchener, diploma.

Chamberlain & Co., Cincinnati, superior display of stoves, silver medal.

C. & L. Jacobs, Cincinnati, corned mess beef, silver medal.

Wm. Harbison, Cedarville, Ohio, bread by girl under 12 years of age, $2.

F. G. Carey, College Hill, 40 varieties of wheat from Patent Office, silver medal.

James Howath, Cincinnati, Victoria Regia, $5.

Mrs. J. G. Neil, Columbus, bouquet of pressed flowers, silver medal.

Mrs. J. G. Neil, Columbus, landscape of lichens, silver medal.

R. Buchanan, Cincinnati, display of apples, diploma.

Thorp, Smith & Hanchett, Syracuse, N. Y., display of fruit, silver med.

C. H. Smith, Dayton, carving in ivory, silver medal.

Mrs. F. G. Carey, College Hill, needle work, $2.

Miss Rosetta Ebert, Hamilton, embroidery, $3.

Wm. Addis, Cincinnati, gentlemen's linen goods, silver medal.

M. Werk & Co., Cincinnati, exhibition of fancy soaps, silver medal.

A. R. Innis, Columbus, best one-half acre of potatoes (196 bu.), $20.

H. Ridenour, Columbus, 2d best one-half acre potatoes (105 bu.), $10.

H. Ridenour, Columbus, best 5 acres wheat (206 bu.), $40.

Joseph Mock, Columbus, best one-fourth acre sweet potatoes, $12.

Joseph Mock, Columbus, best one-fourth acre onions, $12.

J. R. Cable, Athens county, best acre of oats (98 bu.), $20.

Thos. Gardner, Lawrence county, 4 7-10 acres of beans (200 bu.), $20.

J. Brady, Oxford, Ohio, Essay on Drainage, $50.

J. Kirkpatrick, Cleveland, Ohio, Essay on Insects Beneficial to the Farmer, $50.

Statements of applicants for Premiums on Crops.

ONIONS.

The ground has been used for onions three or four years; has been manured each year; in the fall of 1856 I plowed the ground and spread about one inch of pond muck; in April 1857 put the seed in the ground, being of the red Wethersfield variety; planted in drills about eight inches apart; covered seed with fine muck; then I got two boards about 5 feet long, laid one down then stepped on it, then laid the other, and so on all over the piece; kept the weeds all pulled out; the yield was 46 1-2 bushels.

JOSEPH MOCK.

First premium of $12 awarded.

The above forty-six and a half bushels was raised on a fraction less than eight square poles, being all I could measure; some being sold in market before.

CULTIVATION OF SWEET POTATOES.

The ground is black loam; some of the ground had some manure on three years since; the most of the ground has never had any manure on. In the fall of 1856 the ground was plowed deep; in the spring of 1857 it was plowed again, and made into hills about three feet apart, each way, and one plant put in each hill, that had been raised in a hot-bed; the weeds kept out by hand and hoe, and hilled up once.

Preparing the ground and making hills	$2 00
Plants and planting	8 00
Hoeing and hilling	3 00
Digging and marketing	20 00
	$33 00
Average price $1.25 per bushel, 154½ bushels	$192 12
Expenses deducted	33 00
Balance on hand	$159 12

Premium of $12 awarded.

STATEMENT OF CULTIVATION OF POTATOES.

The ground on which I raised these potatoes was new ground which was chopped off and partly cleared about three years. Last spring I cleared the ground and plowed from six to eight inches deep; planted the potatoes in hills about two and a half feet each way; put two small potatoes in each hill; about the fifteenth of May went through twice with cultivator and twice with the shovel plow; no other labor until digging.

EXPENSE.

Plowing the ground, (half acre)	$1 00
Preparing the ground and planting	2 00
About four bushels of seed	5 00
Cultivating and plowing	2 00
Digging and getting in	3 00
	$13 00
Sold twenty-five bushels for	$12 50
192½ bushels on hand, worth 50 cents	64 75
	$77 25
Cost deducted	13 00
Balance on hand	$64 25

JOSEPH MOCK.

POTATO CROP.

The soil upon which this crop of potatoes was raised was a mixture of black loam, clay, sand and a little gravel subsoil, principally clay with some gravel, harrowed and cross-plowed about the first of April, (the plowing from 5 to 8 inches deep;) harrowed once more, then marked out the ground one way with a shovel plow, making the rows about 3 feet apart; planted April 23, 3 1-2 bushels. Planted in drills dropping the potatoes or pieces from 8 to 12 inches apart. As soon as some of the potatoes began to break the ground, we took a two horse harrow and harrowed across the rows, which leveled the ground and killed all the weeds out of the rows. As soon as they were nicely up we cultivated and hoed them; as soon as the tops were nearly large enough to fall down, we laid them by, by giving them one good plowing.

Expense of culture of half an acre of Potatoes.

To plowing ground twice	$1 00
" harrowing three times	50
" planting	1 25
" cultivating, hoeing, &c.	2 00
" digging	4 00
" marketing	7 00
" 3½ bushels small seed potatoes	3 50
	$19 25

Profit or Increase.

By 95½ bushels at 44 cts. per bushel	$42 02
" 10 bushels of small potatoes on hand	2 50
	$44 52
Expenses	19 25
Profits	$25 27

HENRY RIDENOUR.

STATEMENT OF A. R. INNIS.

My soil is a rich loam, underlaid with clay; no manure; first plowing; previous use, meadow and pasture.

CULTIVATION, ETC., OF HALF AN ACRE. *Dr.*

To one-half day's plowing (breaking up)	$1 00
" one day's preparing ground and planting, self and hand, with team, ½ day.	2 50
" three bushels of seed, at $1 50 per bushel	4 50
" one day's cultivating and hoeing	1 00
" one-half day's cutting weeds	50
" one day's harvesting, self and three hands	4 00
Whole cost of crop, exclusive of rent of land	$13 50

Cr.

By 196 bushels of potatoes, at 50 cents	$98 00
Expenses	13 50
Net profit of one-half acre	$84 50

The above potatoes were planted on the 1st day of May last, in drills about 3 1-2 feet apart; hills in rows, about 18 inches apart; seed (which was Neshannocks) cut very small; quantity used, at the rate of six bushels per acre; planted in the old style of dropping by hand, and covered with hand hoes. The above is correct.

A. R. INNIS.

EXPENSE OF RAISING BEANS.

Ground plowed twice, harrowed once, 4 7-10 acres	$9 50
Seed beans, 4¾ bushels, at $2 per bushel	9 50
Cultivation once through, 1¼ days	1 87
Pulling beans, 9½ days, at 87½ per day	8 25
Hauling, threshing, and cleaning	14 75
Hauling to market, 6 loads at 25 cts. per load	1 50
	$45 37
Beans sold, 200 bushels at $1 per bushel	$200 00
Expenses	45 37
Net profit	$154 63

This ground was manured three years ago, 30 loads per acre.

THOMAS GARDNER.

CROP OF OATS OF ONE ACRE—EXPENSE OF CULTIVATION.

One-half day's plowing	$1 25
Sowing and harrowing	75
Harvesting	2 00
Threshing	5 00
Three bushels seed	1 20
	$10 20
Raised 98 bushels of oats—measured in sealed half bushel—and sold them at home for 25 cts. per bushel	$24 50
Expenses	10 20
Net profit	$14 30

The above crop of oats was raised on one acre of sandy clay soil, upon which there had been corn crops the two prior years. I used no manure whatever in the cultivation of the oats. I plowed the ground nine inches deep, sowed the seed (three bushels) broadcast, and harrowed them in on the 29th day of March last.

JAS. R. CABLE.

WHEAT CROP IN 1857, ON FIVE ACRES AND EIGHT RODS.

The soil upon which this crop of wheat was raised is of a black loam, mixed with some clay, sand, and gravel; subsoil, clay loam and gravel; hauled on sixty two-horse loads of partially rotted barn-yard manure, and spread it evenly; commenced plowing August 22, 1856, and finished the following week; plowed from 6 to 8 inches deep; sowed September 9, seven bushels of seed; harrowed twice with heavy two-horse harrow; the two previous crops were corn, then oats. As to the value of manure, I could not answer to any certainty, as I have known none sold in the neighborhood, but say 25 cts. per load for two horses.

	Dr.
To sixty loads of manure, at 25 cents per load	$15 00
" 3 days' hauling, at $2 00 per day	6 00
" 2 hands loading, " 1 00 " 3 days each	6 00
" 2 " spreading, 1 00 " 1 "	2 00
" 3½ days' plowing, 2 00 "	7 00
" 7 bushels seed	8 00
" ½ day's sowing, at $1 00 per day	50
" 1½ " harrowing, 2 00 "	3 00
" 4 " cradling, 1 50 "	6 00
" 4 " binding, 1 00 "	4 00
" 4 " raking, 50 "	2 00
" 1½ " hauling into the barn, at $2 per day	3 00
" 1½ " loading, at $1 per day	1 50
" ¾ " mowing for 2 wagons, at $1 per day	75
" threshing 206¼ bushels, at 4 cents per bushel	8 25
" 12 hands, one-half day each, at $1 per day, helping thresh	6 00
	$79 00

	Cr.
To 206¼ bushels, worth 75 cents per bushel (not sold)	$154 68¾
	79 00
Net profit	$75 68¾

HENRY RIDENOUR.

The President appointed Messrs. Smith and Webb to examine the accounts of Mr. Green, as acting members of the Executive Committee.

Messrs. Stedman and Krum were appointed a committee to examine the account of the Treasurer of the Board.

Messrs. Waddle and Millikin were appointed a committee to examine the account of the Corresponding Secretary.

Messrs. Green and Webb were appointed a committee to examine the statements of applicants for premiums on field crops.

Messrs. Smith, Krum, and Millikin, were appointed a committee to examine the essays entered for premiums.

A communication from Messrs. Burnet and Guille, soliciting a re-imbursement from the State Board for losses incurred in Refreshment Hall, on the Fair Grounds, was on motion laid on the table.

On motion of Judge Musgrave, it was

Ordered, That the first premium for pens of five yearling ewes, in each class, shall be $10, and the second premium $7; and that the Treasurer shall pay the premiums awarded at the last Fair accordingly.

The committee appointed to examine the account of Mr. Green, acting member of the Executive Committee, reported that they had examined the account, and find it correct, and that there is a balance of $5 94 due said Green. Amount received for the sale of lumber is $2,992 64. Report accepted and committee discharged.

The committee appointed to examine the account of the Treasurer, reported that the account and vouchers of the Treasurer were correct; and that the balance in his hands at the present date is $6,929 69. Report accepted and committee discharged.

The committee appointed to examine the account of the Corresponding Secretary, reported the account correct, and that there was due him $229 08, for miscellaneous expenses incurred by him. Report accepted and committee discharged.

On motion of Major Millikin, it was

Resolved, That it is indispensably necessary that a better system of keeping the accounts of the Corresponding Secretary and Treasurer of the State Board be adopted.

Resolved, That for the purpose of effecting said object, the Treasurer shall keep his accounts as follows:

I. He shall charge himself with all moneys received from all sources, and shall specify from whom, when, and on what account the same was received.

II. He shall pay out money on the order of the Secretary or President only, or on premiums awarded.

III. He shall, in crediting himself with moneys paid out, specify the year for which the money was expended.

Resolved, That the Secretary shall open and keep a full and perfect set of Books, which shall specify fully to whom, when, and on what accounts money is paid; and in doing so shall observe the following rules:

I. He shall draw orders for all sums of money expended, specifying in the order and on his Books for what the order is drawn, and in what fiscal year the debt was contracted.

II. He shall also open separate accounts in a journal provided for that purpose, and charge the several orders to the several accounts; and shall post said several charges into a Ledger, so that the expenditures in each department in each year can be readily ascertained.

Resolved, That the fiscal year of this Board shall commence on the first day of December, and shall close on the 30th of November in each and every year.

Resolved. That it shall be the duty of the President to give an order to the Corresponding Secretary, for his salary up to the first inst., and for his account which has been examined, and that the President shall thereafter, every three months from said first of December, issue his order for said Secretary's salary, and for such expenses which may have been paid by him, and which may be approved by the President, during every period of three months thereafter.

On motion, the Board adjourned, *sine die.*

Proceedings of the Ohio State Agricultural Convention, which met at Columbus, December 9th and 10th, 1857.

PHONOGRAPHICALLY REPORTED.

The delegates from the different county organizations of the State, met in Convention in Concert Hall, at 10 o'clock, and were called to order by the President, ALEX. WADDLE, Esq., who announced the first order of the day to be the enrollment of delegates. Two gentlemen presented their certificates, and claimed the right of representation for Clermont county. In view of this, and on motion of John K. Green, of Hamilton county, a committee of three, consisting of Messrs. Reber, Sears, and Glover, was appointed by the Chair, to whom the subject of the contested seat was referred.

A delegate, addressing the Chair, stated that there was a gentleman in attendance, who represents an independent organization, and who is not, in all legal probability, entitled to a seat in this Convention; yet the Society of which he is the representative is doing valuable service for the cause of agriculture, and he would, therefore, move that Mr. Cannon, of the "Union Agricultural Society," be invited to participate in the discussions of this Convention.

Mr. Ladd, of Jefferson, moved to amend, so that the privilege would extend to individuals, as such. This gentleman is the President of an independent organization, and for this reason he was opposed to the motion.

Mr. Musgrave, of Crawford, would inquire, before that motion was put, if it is the intention of this Convention to encourage independent organizations? Would it not be better to ask, first, what effect these organizations will have on the regularly constituted County Societies; and if the effect be deleterious, then it is best to give them no encouragement. He did not see how any individual could come into this Society, and claim a seat, unless the law grants it. This Convention may, by courtesy, extend to any gentleman the right to be heard; but if, as is now proposed, you grant him a seat, he will claim the right to vote. He would ask the Secretary to read the law under which the Society is organized. [The Secretary read the act passed February 28, 1846.]

Mr. Krum, of Ashtabula, continued the discussion, after which, a vote being taken, the motion was declared to be lost.

Mr. Ladd said he wished now to make a different motion. It has certainly been customary, when gentlemen, representing agricultural bodies, attended, to allow them the privilege of participating in the discussions of this Convention. He had voted in the negative, on the former motion, simply because that gentleman represents an independent organization, and his admission might, in some way, affect legally other organizations. But he could not see any objection to admitting individuals, as such, when they have sufficient interest, and from a pure love of agriculture, to spend their time and money in attending the Convention. It was done last year. In conclusion, he would offer the following resolution:

Resolved, That any gentleman present, favorable to agricultural interests, be invited to participate in the discussions of this Board.

Mr. Smith, of Logan, was not in favor of recognizing independent Societies. County Societies are created, and are under the control of the law. The Legislature recognizes every man in the State, belonging to a County Society, as having an interest in this Society. The law covers the whole field. Independent Societies can come in here, by giving up their independent organizations; but not if they do not do so, and if they do not, it shows that they are not satisfied with, and have no interest in the County Societies, and that they have no interest in the State organization. Now, if we permit them to come on to this floor, every man, whatever may be the organization, now or hereafter, can hold his position, and if so disposed, break down the organization—if they were given every privilege. In our decision, we must look forward to see what will be the result.

Mr. Ladd said he wished to be distinctly understood. He had merely made the motion as a matter of courtesy towards gentlemen attending the Convention. It has been customary to do it; and if it does not work well, it will be found very easy, next year, to change it. The very fact that the Convention voted down the first motion, shows what is the feeling towards the representatives of independent organizations. It is true that this is a legal organization; and so far as any action is concerned, it must be done legally; yet he urged this motion simply as a matter of courtesy

Mr. E. T. Sturtevant spoke further in favor of the resolution, showing that the Convention had nothing to do with the effect of these organizations at present.

Mr. F. U. Stokes, of Champaign, moved to amend the resolution by striking out all after the word "resolved," and inserting the following:

"That any person, belonging to any County Society, be permitted to participate in the deliberations of this Convention, except voting. It is also understood that this privilege does not extend to independent organizations, contrary to the provisions of the law."

This was discussed further by Messrs. Steele, Smith, Ladd, and Humrickhouse, when, on motion of Mr. Krum, the resolution and amendment were laid on the table.

Mr. Smith moved that Dr. N. S. Townshend be admitted to a seat in this Convention, which was agreed to. On similar motions by members, several gentlemen were admitted to seats in the Convention.

The President, addressing the delegates: Gentlemen, the law requires us to convene on this day, for the purpose of electing five members of the Board, to fill the place of Lucian Buttles, of Franklin; G. W. Barker, of Washington; John K. Greene, of Hamilton; B. Stedman, of Cuyahoga; and R. W. Musgrave, of Crawford, whose terms of office have expired.

The Report of L. Buttles, Treasurer, was read, and submitted to the Convention:

Abstract of Moneys received and disbursed on account of the Ohio State Board of Agriculture, for the year 1857.

RECEIPTS.

Balance on hand at date of last settlement	$6,838 25
Received of Dr. Sprague, balance due from him on account	74 59
" Treasurer of State, amount of legislative appropriation for the Board's portion of receipts from show license and escheats, for the year 1856	3,643 20
" John M. Kinney, for one week's rent of tents	125 00
" Citizens of Cincinnati, subscriptions towards defraying expenses of Fair of 1857	3,000 00
" Burnet & Guille, rent of Fair Grounds during the Fair, for refreshments	500 00
" Sales of admission tickets	16,894 75
" For entries—deducting $49 counterfeit money received	636 00
" B. Stedman, balance on sales of lumber used at Fair in Cleveland, in 1856	1,587 10
Total	$33,298 89

DISBURSEMENTS.

To Dr. G. Spragne, on account of salary as Secretary		$50 00
" J. H. Klippart, " " "		1,231 88
" Expenses of Columbus Office—rent, printing, binding, &c		1,653 93
" Executive Committee, to defray expenses at Cincinnati Fair		18,074 49
" Expense of Board at meeting, December, 1856	$130 35	
" " " January, 1857	138 50	
" " " Hamilton	117 65—	386 50
" Paid for diplomas, papers, medals, &c., for premiums for Fairs of 1855, 1856, and 1857		1,335 50
" Cash premiums of Fair of 1856		245 00
" " 1857		3,392 00
Total		$26,369 30
Leaving a balance in the Treasurer's hands, this day, of		6,929 59

Respectfully submitted, LUCIAN BUTTLES, *Treasurer.*

Mr. Geo. Everitt, of Lake, moved that the election of members to fill vacancies take place on to-morrow, at nine o'clock; which, on motion of Mr. Van Vorhes, was modified, so as to require that all nominations be made to-day.

On motion of F. U. Stokes, it was agreed to receive nominations at once.

The following nominations were then made:

Lucian Buttles, Franklin; Norton S. Townshend, Lorain; R. D. Poague Greene; James Loudon, Brown; G. W. Barker, Washington; John K. Greene, Hamilton; B. Stedman, Cuyahoga; R. W. Musgrave, Crawford; E. T. Sturtevant, Cuyahoga; John Sears, Medina; L. Q. Rawson, Sandusky; Israel Dilley, Licking; Eben Newton, Mahoning; John Reber, Fairfield; James M. Trimble, Highland; Robt. G. Dun, Madison; E. G. Denman, Williams; John Scott, jr., Ashland; J. H. Starr, Seneca; A. A. Jewett, Cuyahoga.

Messrs. B. Stedman and R. W. Musgrave peremptorily declined.

Mr. Ladd offered the following:

Resolved, That the thanks of this Convention be tendered to the retiring members of the State Board, for the prompt and faithful manner in which they have discharged the duties incumbent upon them.

Unanimously adopted.

Mr. J. P. Wilson, of Hamilton, asked in what way the Reports for 1856 had been distributed. In his county, they had not received a single copy.

Mr. Musgrave, in reply, said the Reports were under the control of the Legislature. In his county they had been received and distributed by their Representative; and if the gentlemen would inquire of the members of the Legislature in Cincinnati, he would find them stowed away in some garret.

Mr. Miller, of Seneca, said that they had not heard anything of the Reports in his county, and that they knew nothing about them.

Mr. Dugan, of Brown, remarked that the Reports for his county were distributed by the members of the Legislature, and their connection with an independent Society secured to its members a majority of the Reports. Present indications led him to believe that they would not fare so well this year.

Further remarks led to the offering of the following resolution by Mr. Wilson:

Resolved, That a committee of three be appointed to draft and report a petition to this Convention, to be presented to the Legislature, asking that the printed copies of the State Agricultural Reports be forwarded to the county seats, directed to the care of the President and Managers of the County Agricultural Societies, for distribution at as early a day as possible in each year; and that each and every member of this Convention be requested to sign the same.

The Reports should be distributed by some system, and he did not know in what way it could be done effectually, unless they were put into the hands of those who felt sufficient interest in agriculture to distribute them, and who would place them in the hands of those farmers bound to make the proper use of them. It is certainly useless to prepare Reports and have them locked up in garrets.

Mr. Strickle thought this, to some extent, might be obviated by the County Society. Their Representative had been invited by himself as President of the Board, to send the Reports in the right way, and it was done; and because the people of his county expect these things to be carried out in a manner which should benefit them. Now it appeared to him that there might be an understanding between the Presidents of County Societies, in such a way that it might be properly felt—that it might have an influence at home, and so as to make it tell in future. So far as presenting resolutions from this Board to the Legislature is concerned, it amounted to mere nothing. "Distance lends enchantment to the view;" but we can make ourselves felt at home; and let it be done.

Mr. S. D. Harris—The man begins to talk now. We who have been here in the capital, year after year, know something how things are managed.

Mr. Van Vorhes—I recollect very well that once a motion was made by some one of this body, to have the Convention meet about the time the Legislature meets, which would have lessened the distance between the two bodies. However, so far as distributing these Reports, I adopted this plan. I handed over a part of them to the County Society; after which I put an advertisement in the paper, announcing that I had a few more of the same "sort" left, which went off "like hot cakes." I think that the Representatives from the different counties are fully as capable of placing these documents in the hands of the right persons, as the Presidents or other officers of the Societies. I have passed over about half of the Reports to the Society, and the balance I have had no difficulty whatever of getting into the hands of the proper persons. I am very confident that if you pass such a resolution as is now before us, it will be ineffectual to accomplish any good. The members of the Legislature will pay but little attention to it.

Mr. Kelly, of Lawrence, stated that in his county, the Reports were circulated by their Legislator, solely for political purposes, and that the County Society knew nothing of them.

Mr. ——, would inquire of gentlemen, whether their Presidents are politicians or not?

Mr. A. E. Strickle arose to make a remark in reply to the gentleman from Athens; that is, to the statement he made that Legislators would put into the hands of the proper persons the Reports of this Society. He did not believe they possessed a tithe of the competency, or of the agricultural feeling, so far as the distribution is concerned, or so far as the increase of agricultural interest in Ohio is concerned, necessary to secure a proper distribution of the Reports. Elect a Democrat, and he gets one hundred Reports. Now he, (Strickle,) was a politician—had been a politician of the most rabid character, so that he could judge of the errors of the position—he knew full well where the Reports go to. When he distributed them, he put them where they would tell for Whiggery, [laughter,]—he felt it a duty he owed his country—this Democratic Legislator, as he was saying, with his hundred Reports, would put them where they would count for Democratic principles—it was to his interest, and in such case selfishness was a political virtue. Now, he had no objection to this—had no objection to having politics held up, but he had an objection to having the Agricultural Board made to bear up, and to build up a party. Let each department—in this case, as in a religious point of view—be independent of the others; let church and state be severed. He did not want any individual to indulge the hope or supposition, that they would make favor for political power. No, let the agricultural interests of Ohio rely upon those interested in them—upon the intrinsic power that supports them. He insisted on the resolution.

Mr. Sturtevant, of Cuyahoga, said. that in the remark he was about to make, he meant no disrespect to any individual. Their representatives know, perhaps, that there is a difference between a pumpkin and a squash, and they may possibly know of the existence of an Agricultural Society, though he thought not. As for laboring for the interests of agriculture, such ideas of duty have never entered the brains of the members of the Legislature. If these documents can be sent to the President of the County Societies, they would be put into the right hands: he would guarantee for Cuyahoga, that, if they were thus sent, they would be put into the hands of every farmer who can read, and that without the aid of the legislators.

Mr. Millikin said that it had been intimated that the expressions of this Society have been disregarded by the Legislature. He wanted the opportunity for so so doing furnished that body so often, that the people of this country would take the matter into their own hands; and if they but do it, something will be done. We should see to it, for we pay more than half of the taxes, and number the larger portion of the voters of the State, and it is high time we begun to understand what our rights are, and what our power is. So far as the distribution of Reports in Butler county is concerned, they are handed over to A, B, and C, without any regard to fitness. The member of the Legislature who is canvassing the county, and who stands in particular need of political assistance, hands them out, not with the view of enlisting interest in agriculture, or to subserve its interests, but for the purpose of making a favorable impression on the voter; and they go a begging who are opposed to him in politics. It may be as in the case cited by the gentleman from Brown county. Members of the Legislature may belong to independent organizations, and hence they are led to favor those who belong to those Societies. In conclusion, he would say, as he said before, that he had no objection to having them disregard all expressions of this body for the next three years.

Mr. Van Vorhes would say to the gentleman who has just taken his seat, that this kind of talk will cause the members of the Legislature to disregard all requests coming from this body. This is but a repetition in argument of what took place last year. Now it is well known, to any one at all acquainted with the Legislature, that the majority of its members are agriculturists, and is it to be supposed that they are going to disregard agricultural interests? It is just this kind of discussion, if anything, that will cause them to do so. He would renew the declaration that members belonging to the Legislature are fully as capable of placing the Reports in the hands of the right persons, as the officers of the Societies. But I think I can say of the Legislature that, as a matter of courtesy to the members belonging to the Agricultural Board, there will be no disposition to refuse a request, when approached in the right manner. When, however, they are approached in the kind of style shown by the gentleman last on the floor, they are disposed to kick; and as a member of the Legislature, if the thing should come before that body, in this kind of way, he would vote against it.

In distributing the Reports in question, he had made no distinction between Democrats and Republicans, but had had in view the interests of agriculture only; as a personal matter, he cared nothing about it. He did not expect to hold office for a living, for he had something higher in view. When, however, this thing was put upon him, he served as a matter of duty. He asked delegates to consider this matter seriously, and to show in their proceedings the right kind of spirit.

[Mr. Krum made inquiry in reference to the action of the Legislative Committee on Agriculture, on a certain report, but to what report he alluded, the reporter was unable to tell, as he could not hear distinctly what he said.]

Mr. Smith said he was highly gratified with this discussion,—thought it important and interesting. We were told that the Legislators have not been treated respectfully by the farmers of Ohio; consequently they feel justified in taking a position antagonistic to the true interests of the State, and contrary to their better judgment! Had we come up before that august body in a different manner, we are told, and prostrated ourselves, asking of them, in the mildest and most humble accents, the privilege of distributing the said documents among our farmers, they would have listened with a more willing ear, and perchance have granted the petition! [Laughter and applause.] He was pleased with Mr. Millikin's remarks. The memorials have been respectful. And is it possible that members of the Ohio Legislature come into this room to pick up every word, to see if it is molded to suit their ear? It is well known that the farming community are noted for their modesty, and indeed their modesty has been one reason why their requests have not been received more attentively. In the Legislature, the farmers are so modest that they do not feel like speaking after one whose business has always been that of speaking. We desire a different state of things, altogether. The Legislature *should* be treated with respect. But if we petition them year after year, and are spurned from the floor, then would we wish to meet such treatment with a proper feeling. On this subject he wished to see the farming part of the community united and earnest—not heated, but he would see them determined. To be so, effectually, he would desire to see them better acquainted with each other, that they may act well their part, and send men to the Legislature who are directly interested in agriculture. Presidents of County Societies cannot separate their interests from this great interest: but with the politician, although he may be a farmer, yet the fact that he is a candidate for election, or re-election, is sufficient inducement for him to distribute the books in such a way as to make political capital.

The vote being taken, resulted in the adoption of the resolution. The Chair appointed Messrs. Harris, Wilson, and Everitt, as committee.

On motion, the Convention took a recess till 2 o'clock, P. M.

AFTERNOON SESSION.

Convention met as per adjournment, and was called to order by the President.

Mr. McMillin, of Greene, offered the following resolution:

Resolved, That in the opinion of this Convention, an annual change of the place for holding our State Fair does not advance the welfare of our State Agricultural Society as well as would a permanent location; and that our State Board of Agriculture be requested to take measures, as soon as practicable, for the permanent location, in future, of our State Fair, at some point which will be best adapted to the wants of the citizens of the State.

[With the consent of the House, and on motion by Mr. Ladd, the hour for meeting in the morning was changed from ten, to nine o'clock, the order of business being then, by resolution, the election of five members of the Board.]

Mr. Millikin said that he thought there must be some contrariety of opinion about the propriety of adopting the resolution proposed by Mr. McMillen. He would offer the following as an amendment.

Resolved, That *it is not* expedient to make a permanent location of the State Fair at any point.

Resolved, That it is expedient that the State Board proceed to make such arrangements with County Societies, or with associations of individuals, as will enable them to hold State Fairs at Cleveland, at Columbus, and at some suitable place in the Southwestern portion of the State: and that they make such contracts with County Societies, as may ensure them the use of permanent grounds, and as will enable them to protect and preserve any improvements that may be made by such joint arrangements, from injury and decay.

Resolved, That in due time, when population and traveling facilities have sufficiently increased, a similar arrangement shall be made with some other County Society east of Columbus, so as to afford to the eastern and south-eastern portion of the State, the advantage of a State Fair.

Mr. John K. Greene would suggest to the mover of these resolutions, the propriety of making provision for the "*Hoop pole*" region, as that is a *growing* portion of the State. [Laughter.]

Mr. Harris called for a division of the question.

Mr. Millikin said that he was going to propose that the whole subject be referred to a committee of three.

Mr. Ladd remarked that it was expected that at this time there would be a general expression of the opinion of the delegates on this subject. He had no objection to having it referred to a committee, but before referring it, it had better be discussed; the committee ought to have a general expression of the Convention, before taking action on the subject; he would therefore move that the reference be laid on the table.

Mr. Millikin withdrew his motion.

Thereupon Mr. McMillen commenced to discuss the general question on location, when the Chair decided such discussion out of order.

President—The question is on striking out the original resolution offered by the gentleman from Greene, and substituting that offered by the gentleman from Butler.

Mr. Millikin renewed the motion to refer the whole subject to a committee of three.

The Chair, being unable to decide in reference to the first vote, a second was taken, which resulted as follows: Yeas, 26; Nays, 18. The Chair appointed Messrs. Ladd, Strickle, and Hunt, as committee. On motion, the committee were instructed to report at the opening of the evening session.

Mr. Stokes offered the following, which, on motion of the Secretary, was referred to the same committee:

WHEREAS, in view of the interest manifested on the question of the permanent location of our State Exhibitions, it is therefore

Resolved, That this Convention is now ready to receive propositions for the donation of land, &c., for the furtherance of this object.

Mr. Strickle arose to offer the following resolution, prefacing it with some remarks:

Resolved, By the present Convention, that the next Legislature be memorialized to furnish the Board of Agriculture with sufficient means to have their Annual Reports published and circulated.

Mr. Musgrave said, while he concurred with the objects of the resolution, he did not deem it politic to pass it. He wished such an appropriation could be secured from the Legislature, yet at the same time he would feel a delicacy in asking them for too much—to ask them to do, perhaps, that which they have no right to do. Have they the right to do indirectly, that which they cannot do directly?

Mr. Strickle thought there was as much authority for the Legislature to authorize the Board to publish Reports, as to authorize any individual or individuals to publish other very fine works, as for example, the "Reports" of the Supreme Court. As far as getting around certain supposed difficulties by the Legislature, it will not take a very great stretch of power, or of conscience. But seriously, he supposed after looking over that part of the Constitution referred to, he did not think it objectionable. A word in regard to asking of the Legislature too much. Did any man ever get ten dollars by asking another to give him a dime? Who does not know that Legislatures are formed of human beings, and that these, by becoming legislators, do not change their desires, feelings, and failings? If you want the Legislature to give you something, do not ask as though you deserved nothing. For this reason, he was in favor of asking more, rather than less. Persons may secure that which they have a right to demand, by being willing to take that which they know, and everybody knows they deserve. Let a man ask him for that he does not deserve, and he is disposed to give him nothing. This is the principle that runs through all the ramifications of life. In directing a course of action, the questions to be asked by every individual are, Is it right? Is it for the benefit of the community? And, ought it to be granted? In view of all the facts presented, showing how unsatisfactorily the Reports are managed, and that the State Board of Agriculture can do the work in much better style than is now done, can any one object to this resolution? He had only one way of judging any question, or any thing, and that is, if it agrees with the principle of right. If there are no constitutional objections in the way, then it is best to ask this of the Legislature; of course we ought not to ask them to do anything contrary to law.

In deciding this question, let it be asked, would the greatest amount of good to the greatest number of persons, be better secured by the proposed plan than by any other?

The resolution was adopted.

Mr. Ladd—for the purpose of eliciting information, and hearing an expression of those who have been engaged in the cultivation of the Chinese sugar-cane—offered the following resolution:

Resolved, That the cultivation of the *Sorghum sucre* and *Imphee* is worthy of the attention of agriculturists in Ohio.

He supposed it would be proper to give his own experience, though he did not give it much weight. His brother and he had planted but one-eighth of an acre, not being willing to expend much before knowing whether it would bear expense. They had a small mill made, consisting of two plain rollers, set in blocks, with a shaft attached to one of them. With this mill, they crushed the plant, after taking off the seed and leaves, and cutting off about eighteen inches of the top of the stalk, as that, not being so well matured, is more acrid than the rest. From this, they made a little over two barrels of molasses, although they did not get much, if any more than two-thirds of the juice extracted, as their mill was very imperfect. The molasses was very thick—did not clarify it so well as some he has seen, for he has seen it as clear as honey—yet it was decidedly preferable to the ordinary Orleans molasses; his family use it for sweetening, and like it very well in that way. With regard to its granulating, he was not so well satisfied, for he had not experimented in this way sufficiently to enable him to express any opinion, except to say that in the barrel from which they have been constantly drawing the syrup (it having been very thick when put into the barrel), it has granulated in the bottom of the barrel. It has a rough taste, similar to that of maple molasses sometimes. A man in his neighborhood had made very fine sugar of it. After reducing the syrup, he put it into a shallow glass vessel, and it granulated as well as you will generally see it, and was very light-colored. Next year, they shall cultivate it more extensively, and procure a better mill. He is satisfied that it is worthy the attention of the people of Ohio. In this respect, we can soon be independent of the South. Thought, if the cane was thoroughly matured, sugar could be made from it. The question in regard to molasses he deemed as settled.

Mr. Gardiner, of Lawrence, said they had no trouble there in having the seed matured, and perfectly ripe. He planted too early, and at first it did not come up; he also covered too deep—should be covered shallow. Another gentleman, in his neighborhood, put in three acres. When the time came to express the juice, he made a mill—a wooden mill—and run the stalks through three times. He made over ten barrels of molasses, and three barrels of what he called sugar. Mr. Kelly, his neighbor, made some very fair sugar. His neighbor, Mr. Hall, made up some sixty-one gallons, and kept a record of expenses. It cost, when half done, just twenty-five cents per gallon. It should be planted late, and afterwards tended like corn.

Mr. Ladd—"How much juice did it take to make a gallon of molasses?'

Mr. Gardiner—"It took between seven and eight gallons. The syrup was very thick."

Mr. Greene said, that, in a great measure, depended on the maturity of the plant. He had made an experiment: by cutting the stalks before matured, it required ten gallons; afterwards, eight gallons; then six gallons. With his imperfect machine, the cost was about twenty-five cents. They had made some, by boiling in porcelain kettles, that resembled honey.

Mr. Sturtevant would speak first in regard to its ripening. In the vicinity of Cleveland, the soil is dry and sandy. There was no Sorghum planted, in Cuyahoga, until the first of May. He thought there was no question, in an ordinary season, but that the plant will mature. Was convinced of one thing, that it is a bad plan allowing the suckers to remain; you cannot make a good quality of syrup by doing so. He was satisfied with experiments in making syrup; that he had made and used in his own family, was equally as good as any syrup he ever saw, and resembled in color the finest honey. When perfectly matured, there is no more difficulty of its granulating than that of the common cane. It requires, to make a gallon of syrup, when the stalk is ripe, only about one-half as much juice as when the stalk is green; he should say five and a half gallons when matured.

Mr. Kelley tried an experiment, in Southern Ohio. He planted something like two acres; planting and cultivating as described in the circulars issued by the Patent Office. The suckers came out, and grew to be of about the same size as the original stalk, but could not see that it made any difference. He made something like two hundred gallons per acre. He also tried sugar-making, by purifying the second time, and then setting away; it did granulate into fair sugar, though not so well as it should.

Mr. Ladd said there was one thing he had forgotten to mention when first up, and which was of some importance. When he went East last fall, he left word to have the seed of the Sorghum fed with the blades to the stock. Shortly after, his wife saw a notice in the "Rural New Yorker," to the effect that the seed had, in some instances, caused the death of stock, and she therefore gave orders to the hands to quit feeding it. When he came home, he was informed of it. He thought about it for some time, when he remembered having seen a statement, made by Dr. Wray, that the natives of Africa live on the seed of the Imphee. Now, the Sorghum sucre and Imphee resemble each other so much, that he thought if the seed of the one did not kill negroes, the seed of the other would not kill stock. He therefore gave orders to go to feeding the animals again. He himself fed it to a fine stallion, and he ate it greedily, and has been eating it regularly ever since. When the stalks are cut off, the cattle and horses will take it in preference to either corn, fodder, or hay.

Mr. Strickle said he had planted one-eighth of an acre last spring, about the 10th of May. It did not come up very well, there being in some places four or five hills missing; he therefore concluded to transplant some of it. He severed the plants, and set them out as he would cabbage plants, and they seemed to grow just as those which had not been transplanted. He cut, at first, about one-half of the crop, making of stalks about a common wagon load full. This produced about thirteen and a half gallons of syrup, which did not seem to be very good. He let the balance remain until the frost, or rather the *freeze* came. He then took his "man Friday," and went over and cut it. The frost had cut considerable of the stalk. The result was, that it produced the finest molasses he had seen anywhere in the country.

Mr. Greene had tried some, after it had been frozen, and found no difference, except that it did not take so much of the juice to make a gallon of syrup. Mr. Gardiner concurred in the statement.

The resolution was adopted.

Mr. Greene said the Miami farmers had made great complaint because the Board did not offer a premium for the production of Tobacco; and that they might have justice done them, he would offer the following resolution:

Resolved, That the State Board be requested to offer suitable premiums for the encouragement of the cultivation of tobacco.

This was discussed in a humorous manner by Messrs. McMillan, Greene, and Smith, when, on motion by Mr. Millikin, the resolution was laid on the table.

Mr. Millikin offered the following resolution:

Resolved, That in the opinion of this Convention, the Legislature of Ohio should pass a law restraining the running at large of domestic animals.

He claimed the attention of the Convention while he offered a few considerations why he thought the resolution should pass. In his opinion, sooner or later, the State must come to the matter of protecting the farmers from this nuisance. We have got to discuss the question of fencing; that is, the propriety of reducing the amount of fences on our farms, and thereby reduce the ordinary expense. He had made an estimate of the cost of keeping up an ordinary-sized farm—say a quarter section—in his part of the country. He had divided the 160 acres thus: Timbered land, 50 acres; the balance, 110 acres, cultivated land, fenced off into fields of the usual size of ten acres. And he was aware that in some parts of the State the estimate is greater than this. Here, in this county, fence rails are worth six dollars per thousand; throughout the State would average, probably, three or four dollars. In Butler county, the whole cost, for fences, is three millions of dollars; and the expense of keeping in repair will amount to half a million dollars more. He had made a further calculation, which will show that in Hamilton, Butler, Warren, and Clermont, the total amount of expense exceeds thirteen millions of dollars; and if he was correct in that statement, the amount of expense for repairs was near two millions of dollars.

The gentleman continued these highly useful and interesting remarks for some minutes, showing that, to enable farmers to reduce the enormous expense of "fence-building," they would have to have some legal provision, preventing the running at large of domestic animals. He was aware of the difficulties in the way of making any special law on the subject, but necessity would ultimately overcome these difficulties. He was followed by Mr. Ladd, and others, in some valuable and pertinent remarks on the same side; after which the resolution was unanimously adopted.

Mr. Ladd moved that Major Millikin be appointed a committee of one to carry out the provisions of the resolution just adopted.

Mr. Sturtevant offered, as an amendment "that he be appointed a committee to prepare a memorial to the Legislature," which was accepted by Mr. Ladd, and the motion agreed to by the Convention.

Mr. Stokes offered the following resolution, which, after some discussion, was laid on the table:

Resolved, That the Legislature be memorialized to pass a law, compelling railroad companies to fence their roads.

Mr. Strickle proposed the following resolution, which was also tabled:

Resolved, That the Legislature be memorialized to pass a law, taxing dogs.

Convention adjourned.

EVENING SESSION.

Mr. S. D. Harris, from the committee appointed to draft a memorial to the Legislature, reported the following:

To the Honorable Legislature of Ohio:

The undersigned, members of the Ohio State Agricultural Convention, assembled in the city of Columbus, December 8, 1857, petition your body to allow and direct the Secretary of State, of the State of Ohio, in distributing the annual Agricultural Reports of the State Board of Agriculture, to send the same directly to the county seat of each county, in which there is a regularly organized County Agricultural Society, to the care of the President of such Society, to be by him, in connection with the managers of the said Society, distributed to the contributing members of the said County Agricultural Society.

[Signed by all the delegates.]

Mr. Reber, chairman of the committee on the Clermont contested seat case, reported in favor of giving the seat to John Ferguson.

Mr. Greene moved to lay the report on the table temporarily, in order that they might hear from the other contestant, John H. Branch. Agreed to. Soon after, the report was taken up, and, by consent, Mr. Branch allowed to present such facts in the case as were pertinent. It was further discussed by Messrs. Ferguson, Musgrave, Strickle, Reber, Greene, and Millikin, when, on motion of Mr. Van Vorhes, the committee had leave to withdraw their report, and it was declared by resolution "that John H. Branch is the proper representative of the Clermont County Agricultural Society."

By consent, Mr. Ferguson was permitted to participate in the discussions of the Convention.

Mr. Ladd, from committee on location of State Fair, submitted a report:

To the Annual Agricultural Convention:

Your committee, appointed to take into consideration the propriety of defining a locality, or localities, at which the annual Fair shall be held, agree to report: 1st, that we think it inexpedient, at present, to make any permanent location of the State Fair at any one point. 2d. That as the action of this Convention can only be advisory to the State Board, in any event, we think any action of the Convention, defining certain points at which the Fair shall be held, alternately, will only trammel the action of the Board, without being of any benefit.

WM. H. LADD,
A. E. STRICKLE,
WM. HUNT.

The question being on agreeing with the report of the committee,

Mr. Harris said he presumed that question would not be allowed to be passed without discussion. Before making the remarks he proposed to make, he would ask the Secretary to read certain figures in his possession, showing the expenses of the migratory system.

Mr. Millikin then read the following exhibit of receipts and expenses for a series of years:

EXPENSES.

	STATE FAIR AT CINCINNATI, IN 1850.	STATE FAIR AT COLUMBUS, IN 1851.	STATE FAIR AT CLEVELAND, IN 1852.	STATE FAIR AT DAYTON, IN 1853.	STATE FAIR AT NEWARK, IN 1854	STATE FAIR AT COLUMBUS, IN 1855.	STATE FAIR AT CLEVELAND, IN 1856
Printing ...	$659 42	$1,216 87	$756 28	$1,261 56	$1,660 27	$992 07	$1,098 21
Clerks	413 65	758 48	472 50	541 00	*374 78	*486 36	807 25
Prep. gr'nd.	*5,585 48	....	....	....	†4,984 37	....	....
Lumber ...	*	3,128 14	3,854 67	7,551 00	2,500 00	4,993 30	3,805 48
Labor	*	....	....	1,925 87	647 00	2,111 44	3,617 90
Incidentals.	*	3,959 13	3,687 63	1,497 61	425 97	1,212 71	570 96
Police	406 50	635 67	830 03	523 00	‡157 70	556 25	1,009 00
Super'nts ..	†345 00	744 48	326 53	534 40	366 63	252 35	600 00
Band	....	150 00	125 00	150 00	72 00	120 00	120 00
Postage ...	22 09	90 02	222 87	90 79	145 90	187 18	100 85
Ribbons, &c	147 35	219 20	147 90	286 35	173 01	34 40	4 00
Forage	104 67	450 67	503 47	396 00	451 53	237 64	488 00
Stationery .	132 11	96 16	42 32	72 06	183 24	141 10	102 43
Omnibus ..	225 75	90 50	132 00	....	**23 50	186 95	175 00
Express ...	....	26 75	....	....	....	103 73	155 40
Refreshm'ts	163 80	....	....	750 28	....	....	397 00
State Board.	821 06	481 73	902 62	749 07	509 20	659 31	623 73
		$12,077 80	$12,087 07	$16,299 12	$12,653 60	$12,266 79	13,528 34

RECEIPTS.

	STATE FAIR AT CINCINNATI, IN 1850.	STATE FAIR AT COLUMBUS, IN 1851.	STATE FAIR AT CLEVELAND, IN 1852.	STATE FAIR AT DAYTON, IN 1853.	STATE FAIR AT NEWARK, IN 1854.	STATE FAIR AT COLUMBUS, IN 1855.	STATE FAIR AT CLEVELAND, IN 1856.
Tickets....	$7,284 96	$8,209 04	$13,260 00	$13,996 37	$8,824 58	$9,745 54	16,649 20
Rent of Gr'd	600 00	2,200 00	....	....	....	....	500 00
Subscript'n.	1,178 25	2,290 00	3,000 00	3,000 00	3,000 00	3,050 80	3,500 00
Lumber s'ld	1,006 07	2,261 00	1,543 28	5,015 67	2,500 00	†1,946 04	....

*All included under the head of Preparing Grounds.
†Paid to Alleyn & Peters, who took charge of the grounds after Lapham's death.

* In Secretary's office only.
† Paid Licking Co. Society.
‡"Tradition" says this bill was about $700; but the above is all that is on record.
** All that is on record.

*Not full; this includes only 2 in the Treasurer's office.
† Considerable lumber was shipped to Cleveland in 1856.

Mr. Harris, resuming—It is an old saying that figures won't lie. I wish it first distinctly understood that I have no personal interest in the matter—that I have no axes to grind for myself or my friends. I would rather go to Newark, Delaware, Springfield, or Chillicothe, or anywhere within fifty miles of Columbus, than to have the Fair located here; for then I would be freed from a feeling of personal responsibility, and would go to the Fair only to learn and enjoy myself. Those who have read my paper, know that I was always opposed to the location of the Fair; that I have said, if a respectable minority was opposed to the location, I was opposed to it. Now those of us who have been with the Fairs from the beginning, are all aware of the difficulties which attend the migratory system. But setting aside these difficulties—the piling up of six thousand dollars a year; the amount coming from the pockets of the people, who should not be thus taxed for no purpose; the bills of the hotel keepers, and of shaving institutions in general—setting these aside, I say, we are to look to the prosperity of the Society, and its usefulness to the cause of agriculture. We have gone about as far as we can go in getting up a Show. If this is all that there is to the Fairs, then the Society has accomplished its mission, and I would not care how soon it was dissolved. But we should have in view something more: we want to make the Fair tell on the agricultural interests of the State. You can get up a show of horse races, niggers, *or of fat women;* but the question comes up, what good have you done? In Cincinnati, with an expenditure, on the part of the public, of over twenty-four thousand dollars, and on the part of the Board, of about nineteen thousand dollars, you have left from your receipts about six thousand dollars. Against that, let us offset the disadvantages of the migratory system. We are expending six thousand dollars every year for temporary fixtures that must be all torn down at the close of the Fair, and are but poorly suited to the purposes for which they are designed. Those who attended the last Fair at Cincinnati were very loud in their complaint of want of comfort in the arrangement. A large number of visitors and exhibitors, heretofore in favor of the migratory system, changed their minds completely, in consequence of their experience at that Fair. Their property was not protected; and how could it be? The grounds were fitted up temporarily, as they must ever be so long as this plan is adhered to. Now, by coming upon a system of location, the shaving of the people will be measurably avoided; the sinking of six thousand dollars a year also avoided. The committee can go on and put up buildings which will insure the protection of property, and security and comfort for visitors, and if we could add to this the advantages of the cultivation of a few acres of ground (which might be carried forward under the intelligent supervision of the members of the Board, or a committee of their number, appointed for that purpose), we could be saving something, and taking a step forward in the intelligent progress of experimental agriculture.

As I said, in the first place, we could urge no better argument than the figures offered by the Secretary, in favor of location. It is true that with the migratory system, those men who have machines to sell, and men who have fat women to show, will cluster around. I do not object to having mechanics derive all the legitimate benefit they can from an exhibition of their manufactures at such a time: on the contrary, I am glad to meet them, and have them add thus much to the interest of the occasion; but when it comes to this, that the whole interest of the Fair must be sustained by these men—when it must be made only a sale shop (and I think that all will bear me witness that it is rapidly tending in that direction); and when those who wish to use it to advertise their wares, will be the only active contributors to the Fair, then it will not be worth our while to preserve it.

Mr. Ladd said that he was one of the committee that offered the report; and he had some reasons for writing said report. He was aware that the agricultural press in Ohio was favorable to the permanent location of the Fair; and that there has been an influence of that kind thrown around the people. He was well aware that, in making this report, it might be in opposition to the better digested judgment of the majority of this Convention; nevertheless, a free interchange of views and sentiments is the only way to arrive at a satisfactory conclusion.

The first item mentioned by the gentleman who has just taken his seat, is the expense. Now, his argument against the migratory system, that there is a good deal of money disbursed at each exhibition, would be a strong argument for such a system. If you wished to act upon the mind of the community, would you accomplish most by disbursing ten, or fifty dollars? What objection is there to the expense, if the people who go pay that expense? The migratory system seems to pay. Last year there seems to have been left six thousand dollars. The Fair has always been successful; and its success is increasing. It has been universally conceded by persons present from other States, that our Fairs were ahead of any ever held in their own States. The receipts of the migratory system show that the people are willing to pay, and to throw their money into a channel that will be effectual. The very fact that it is expensive is an argument in its favor. I know that it may be argued that a portion of the money is received of those of the city who do not receive any benefit in return. But mechanics are benefited, and if the rich wish to expend the money that way, very well. He would rather have the expense twenty-five thousand dollars more than what it is.

The gentleman spoke particularly of the mission of the Society. Now in that may be found the strongest argument on their side. The question is not whether the Board is a money-making institution. The only question, is, how they shall best effect the objects of the Association.

If they can best effect the ends of the organization by going to different points, that is the best way for them to act. Now let us look into the matter a little. Suppose the Board undertakes to locate the Fair at the city of Columbus. I ask what are the powers of the Board to locate the Fair? The Convention elects five members of the Board each year; five remaining. Of the gentlemen who will now be elected, and of those who remain, a majority may conclude to locate the Fair here at Columbus. Very well, the next change in the Board may bring a majority of members of an opposite opinion, and they may decide to change the Fair again. I know that Mr. Harris has said that the people of Columbus will cheerfully give the grounds, but it seems to me that when they know that the members of the Board are changed, they will not be so willing. You may say a Legislature may pass a law locating it. Legislatures are very unstable in Ohio; they may rescind that law at any time. These are only incidental objections. I will now come to what I conceive to be the really strong feature of the case.

It was my privilege to be a member of the Board four years, and I am aware that a majority of the people who attended the State Fair, came to it from the country around, to the extent of from thirty to fifty miles. Now if it was located at any one point, the people would come to it once or twice, and then discontinue their attendance. Who is it that is interested in these Fairs? Is it the members of this Board? Is it the President of this Society? He is interested in agricultural matters to the extent that makes him President. Is it Col. Harris? He is interested to the extent that makes him Editor and publisher of an agricultural paper. No! It is the men who till the soil with their own hands; and you will have to present some novelty, to induce them to leave their fields to attend a located Fair. But this is not the case with the migratory system. Men are induced to not only go themselves, but to take their families. If he pays one, two, or three dollars for them, it does him good—the very thought does him good. He is ennobled because he has contributed to their happiness.

But the strong argument, and the one upon which he has turned in this matter, is, that you cannot bring the masses of the State of Ohio together, at any one point, for a succession of years. But I tell you what you can do, you can take the Fairs to them.

Mr. Strickle said he would notice, first, the proposition that was submitted by his friend, the Editor—to him it looks a little paradoxical—the idea that the citizens of the capital would charge less exorbitantly, simply because the opportunity is afforded to them more frequently. He should say they would become expert in the business of shaving. The migratory system would give the people a better chance to dodge them, than where the road is regularly traveled.

The question is as has been remarked, how can we and the Board reach the masses of the people; how do the greatest amount of good to the greatest number? If you look back to the law, which is the true guide for the action of the Board, you will find that it is based upon this principle, and that one of the leading requirements is, that the premiums shall be so arranged that small farmers should have the same advantages as the larger land-holders.

Taking that as a correct principle, how are we to make a location upon one single point? You can readily see that the few wealthy ones can get to the State Fair wherever it may be located, while those who ought really to be the beneficiaries—the old corn-stock boys—who have neither the time to spare, nor the money to spend, can never see the institution gotten up for that purpose. Now we might as well undertake to establish a religious society, and say that it should be located at Columbus, and that every body should go up there every Sunday to be enlightened. The proposition is too ridiculous to be entertained for a moment. Now I would like to have had it located, and to have had a place to have built a shantee on, so as not to have been bored with hackmen and public shavers generally; my own opinion for individual comfort and convenience should be set aside, in order that we may reach those men who are yet carrying stones in one end of the bag and grain in the other. By bringing it right home to them, and saying, "Boys! go look at this." You cannot spend ten dollars, if you have but five, can you? "It can't be did." Who are the men who need the agricultural benefit? Is it the Editor of the *Ohio Farmer*, or the Editor of the *Ohio Cultivator?* No. It is the men who have fifty acres of land, with the first payment paid, the second arranged, and the third to be dug out of the earth; *these are the ones who must be benefitted if we accomplish the mission for which the organization was gotten up. We must go to the men who cannot come to us.* My notion is to level *up*, and get all to that point where the greatest benefit will result to all.

Now, whenever the State Board, and this organization, makes the making of money the chief end of the Fair—makes avarice the basis of their action, it strikes me that their mission should be at an end. If we go to Cincinnati, and use the lumber of the hard working men—[A voice—"The lumber speculators get it."] That depends entirely upon the kind of men you have in the Board. Now, I do not want to hear another argument, based upon the principle of avarice. We must go back, as I mentioned before, and seek the interests of those whom this Society was instituted to benefit. To have the exhibitions, as by the migratory system, all sections of the State will be benefitted. It will build up the County Societies for ten counties around any city where you may hold the Fair.

I do not make these remarks expecting there is no difference of opinion between members. I have no reference at all to the intention of gentlemen. We have come to different conclusions from the difference of circumstances surrounding us. I hope no remarks that I may have made, (for I *feel* on this subject,) will be construed personally. We all aim at the same thing.

Mr. Krum remarked that although he was a member of the Board, yet it was expected by the citizens of Ashtabula, that, as their representative, he would use his influence for a permanent location of the State Fair. One of his first acts, when a member of the Board years ago, was to favor a permanent location of the Fair; and, notwithstanding the experience since in their management, he has not changed his opinion.

He would give a few reasons which induce him to favor a permanent location. The first objection urged is, that the location of the Fair will make it a local thing. Now there was a time when that argument had force in Ohio. It has always been held out to us that the time might come when a permanent organization would do good. That time, with them, never has, and the prospect is that it never will come. But we say the time has come when a permanent location will prove best. At present the means of communication are so ample—all parts of the State are so checkered up with railroads, that it is useless to urge the want of communication as a reason for not locating the Fairs. You do not now find a man harnessing up his horses to go to the State Fair; he goes by steam. Now it is a mere assertion, when it is said that the majority of the visitors to the Fair come from the country, only thirty miles in extent—he did not believe it to be a fact. There is another objection which is frequently urged, and that is, that if we permanently locate the Fair, the citizens in the vicinity of that location, will take advantage and "fleece" the people. He did not see any force in that argument; the fact would be found to be that competition would regulate the thing. There would be competition for the accommodation of visitors. But there is another objection still, and one that seems to be very important in the opinion of some, and that is, by permanently locating, we do not reach the persons whom it is desirable to reach by these exhibitions. But do you succeed now? Having adopted a migratory system, you have only aimed at some of the larger cities, and all of the other places are left in the dark. What can you do in the North-west? Will you go up to the woods? There is another objection that we are never ready. When will we be ready? But this charge of not being ready is a serious argument against the present plan. More fault is found with the Board on this than on any other ground. It is said that we desecrate the Sabbath, even, in getting ready; and on this account we are deserted by moral people, and lose, therefore, a good deal of influence. This fact has been urged to me against the influence of the organization.

One of the first reasons in favor of location is economy. It is found now that there is an expenditure every year of several thousand dollars, which, if we had a permanent location, could be invested in a useful library, and a cabinet of minerals; we could collect everything of that kind, and make a really useful institution of it. We could have, also, a better and more perfect arrangement and system in our Fair; and then there would be the certainty of being always prepared.

Mr. Sturtevant begged to take exception to the remarks made by the gentleman from Ashtabula. He hails from the same picayune part of the State as that gentleman. With the view presented of the unstability of the Legislature, and of this Convention, all talk of permanency is ridiculous. There is no permanency in anything but sickness and death. Now as regards expense, it is a question that this body has nothing to do with. It is the masses of the people of the State, who furnish the means, every year, and he was in favor of it. The fact is, gentlemen, that if you wish to diffuse agricultural knowledge for the benefit of the people, it is the duty of this Board and Convention to take such steps as will best secure this end. It is education that is to elevate the masses of the agricultural community, and you must carry it to the doors of every family; you must carry it to every part of the State. It is in accordance with all experience, that novelty is the secret of success; and when the novelty of a permanent location is worn off, it then loses its interest—it dies out. If you locate it in one place, in five years time it will be dead. If you locate it here, the South will object—the North will object. And we of the North, pecuniary as we are, give more money for public enterprises than any other portion of the State, and have advantages equal. The South might urge similar considerations. So you see gentlemen, that a permanent location of the State Fair would lead this Society into continual difficulty.

Mr. Holmes said that many arguments adduced in favor of the migratory system had not removed his convictions in favor of the permanent location of the State Fair. He has been connected with the mechanical part of the Fair. He knows that the most laborious part of preparation was made on Sunday. Exhibitors of machinery and agricultural implements suffer every year from the rust, caused by the leakages of bad roofs. As long as the mechanical forms a part of the exhibition, you will hear complaints on the part of visitors and exhibitors. Men in Cincinnati suffered very much from the inclemency of the weather. However it is very common for persons disappointed to utter complaints. That does not alter the damage that may arise to machinery.

One of the arguments in favor of permanent Fairs is found in the example set by Pennsylvania. Their Fairs have been permanent for several years, he believes ten years, until they have collected together valuable libraries. In attending these Fairs, he meets the same faces year after year; and from this he judges that anybody in the habit of going to Fairs will continue to go.

Mr. Ladd begged leave to ask a question. Had the gentleman, when acting as Superintendent in the New York Fair, ever talked with the officers of that Society in reference to the location of the Fair?

Mr. Holmes answered in the affirmative. Some of the officers are in favor of it, and they are discussing the matter now. He had no doubt but that all the Fairs of the country would, some day, be permanently located.

Mr. Ladd—"What proportion of the farmers of New York attended the American Institute?"

Mr. Holmes—A number of the farmers attended; more than two-thirds of the attendance was from abroad. Men wanting good machines go there for them; he had himself been there twice, almost wholly, for the purpose of attending the American Institute; had met men there from every section of the Union.

Mr. Harris said that a considerable portion of the remarks made at the opening of the debate were aimed at him. He wished to say that he did not differ from the gentlemen so much as they supposed. Our object is to arrive at what will best conduce to the prosperity of our annual Fairs. It is not a matter upon which he looked to-day, and forgot to-morrow, but is with him a life business; so that he had an honest conviction that it was an important point to determine this question. It has been said that the Fairs have prospered by the migratory system, until we have arrived at our present state. Based upon this, friend Ladd assumes that if we change this policy we will lose by it. This don't follow. A man may go on speculating until he establish for himself a perfect palace; but men have found from last year's experience that riches take to themselves wings and leave the man with an empty pocket, who fancied that he could count his wealth by many thousands.

If you were to come to Columbus next year without the idea of permanency, you could not raise a hundred dollars; don't know how it would be in Cleveland, but if you should go to Cincinnati, he was of the opinion that they would receive the proposition unfavorably. Continue this five years longer, and what would become of the Fairs? Gentlemen on the other side have indulged in predictions of a perfect failure of interest and money if the Fair is located. He might indulge in predictions if he chose, and prophesy in reference to the migratory policy, that it would soon become, as Benton said of the Nebraska Bill, "a dead dog on the common."

The gentleman extended his remarks to some length, earnestly urging the necessity and propriety of locating the Fair. If they could save the six thousand dollars, to add to the premium list, they would equally secure the prosperity of the Society, and the interests of the people. He did not believe the contributions to, or the attendance on the exhibitions would be local. At Cleveland and Cincinnati, the market gardeners of Columbus carried off a respectable share of the premiums on vegetables; and of the dairy premiums given at Cincinnati this year, Ashtabula swept the boards. It would not seem from this that the recipients of premiums were confined to twenty or thirty miles, any more than were the visitors, who freighted the trains by thousands on all the railroads in Ohio, as well as the lines coming in from the heart of Kentucky and Indiana.

Mr. Millikin, after comparing the two systems under consideration, answered the argument that had been urged in favor of locating the Fair—that is, inasmuch as County Societies prosper, therefore a permanent State Fair would—by asking why County Societies prosper? Because they are institutions depending for patrons upon the communities immediately surrounding them. It is a local pride. If you look in the city of Cincinnati, you will see evidences of local pride, but does that local pride operate on the people of Cleveland, or on those of Southern Ohio? Not at all. He would grant, that if all the great interests of agriculture could be subserved by locating at one point, it would be best to do so, but this could not be. The reason he desires these exhibitions to be held in the southern part of Ohio, and in the central part of Ohio, or in any part, is because he would have the people see them, become interested in agriculture, and thus subserve the interests of society. Wherever there is population—wherever there are traveling facilities, there go with the Fairs.

He would briefly state the reason why he suggested the propriety of making permanent arrangements with County Societies. He considered that there were insuperable objections to a strictly local arrangement; his plan would obviate the difficulties in either case. For instance, make your arrangement with the Cuyahoga Society, contribute your two or three thousand dollars, and improve the grounds, so that they will be permanent. Do the same in the Miami Valley. And thus, by the expenditure of five thousand dollars, we shall have places where the State Fair may be held without going into this extra expense. He was not in favor of permanency at one point, but in favor of three points now, and when the time comes to justify it, of four, and so on.

He would admit the tendency of our exhibitions—they are not attended as they ought to be. People do not go to them for the purpose of learning, as much as they ought; they should go to improve themselves. He was very happy, with Mr. Harris, to declaim against fat women, but he could not help but think that he had forgotten about the light brigade. [Mr. Greene suggested "fairy light guard." Laughter.] He was opposed to all such things. The charge of never being ready, and being obliged in consequence to work on the Sabbath, is brought up as an objection to the present system. So far as the charge is concerned, it is not necessary, and never was necessary. These are objections, but not arguments.

Mr. Stedman—I have listened to the objections that have been made to-night, and feeling that some of them are true, and others are not true, I feel called upon to appear as testimony to that effect. Observing that we have a reporter in the house, I thought it not proper that these statements should go out uncorrected; and knowing the character of those men who are connected with the executive committee, I felt bound to myself, and to them, to state to this Convention that as far as Cleveland is concerned, there was no desecration of the Sabbath. All that was done, was simply the employment of policemen to look after the property. I had the paying for all the labor of every character, and I never paid a cent for Sunday labor, except in the case of the watchmen before mentioned, and have no knowledge of any being done. And so far as being in readiness is concerned, the Board will bear me witness that all was prepared by Tuesday morning. I do not believe it necessary at all to labor on Sunday in order to accomplish that work. There was no desecration of the Sabbath at Dayton.

Further remarks were made on the subject by Messrs. Ladd and Krum. The report of the committee was agreed to.

Convention adjourned to meet in the morning at nine o'clock.

SESSION THURSDAY MORNING.

The regular order of business was announced to be the election of five members of the Board. The Convention proceeded to prepare for balloting. The Chair appointed tellers, &c.

Messrs. L. Buttles, Dr. N. S. Townshend, John Reber, James M. Trimble, and L. Q. Rawson, having received a majority of the votes cast, were declared duly elected members of the Board for two years.

Mr. S. M. McCormick offered the following resolution, accompanying it with some remarks, which were entirely unintelligible to the reporter:

Resolved, That the officers of the State Agricultural Society award a liberal premium for the best domestic wine, manufactured from the grape.

The resolution was variously amended and finally laid on the table.

The following resolution was offered by Mr. Stokes:

Resolved, That the County Agricultural Societies be required to vote *Yea*, or *Nay*, on the permanent location of the State Fair, and embody the result in their annual report to the State Board.

The resolution was laid on the table.

Convention adjourned.

Sixty-three counties were represented by delegates, as follows:

Adams, G. S. Kirker,	Greene, D. W. McMillan,	Montgomery, R. W. Steele,
Ashland, B. Kellogg,	Guernsey, M. Sarchet,	Morgan, John Sigler,
Ashtabula, A. Krum,	Hamilton, J. P. Wilson,	Morrow, W. B. Lipsey,
Athens, N. H. Van Vorhes,	Hancock, Wm. Martin,	Muskingum, V. Best,
Belmont, H. Pennington,	Harrison, S. McCormick,	Pickaway, N. J. Turney,
Brown, Benjamin Dugin,	Highland, J. W. Pope,	Portage, L. T. Hine,
Champaign, F. U. Stokes,	Hocking, M. Stiers,	Preble, H. W. Dooley,
Clark, Wm. Hunt,	Huron, D. Clapp,	Putnam, J. Maidlow,
Clermont, J. H. Branch,	Jackson, S. D. Harris, sub.,	Sandusky, D. Capper,
Clinton, A. E. Strickle,	Jefferson, W. H. Ladd,	Seneca, J. W. Miller,
Coshocton, T. S. Humrickhouse,	Knox, I. Underwood,	Stark, H. Reynolds,
Crawford, R. W. Musgrave,	Lake, George Everett,	Summit, T. Beardsley,
Cuyahoga, E. T. Sturtevant,	Lawrence, W. D. Kelly,	Trumbull, J. F. King,
Darke, M Hart,	Licking, W. Alsdorff,	Tuscarawas, B. D. Downey,
Delaware, N. Dustin,	Logan, J. M. Glover,	Union, E. Burnham,
Erie, I. T. Reynolds,	Lorain, Ed. Byington,	Vinton, E. Walts,
Fairfield, John Reber,	Madison, J. J. Jones,	Warren, E. Carpenter,
Fayette, G Terrill,	Mahoning, M. Allen,	Washington, A. B. Battelle,
Franklin, D. Taylor,	Marion, E. Peters,	Wayne, W. Taggert,
Gallia, A. P. Rogers,	Medina, John Sears,	Williams, R. B. Rush,
Geauga, D. Robinson,	Miami, W. H. Gahagan,	Wyandotte, Gen. Sam'l Myers.

STATEMENTS, AND EXAMINATIONS OF FARMS.

Messrs. L. Smith and N. S. Townshend were appointed to examine farms. The following statements from applicants were submitted to them for consideration:

Your committee on Farms respectfully submit the following report:

Your farms were entered, and definite statements returned to the Secretary of the Board, in answer to the interrogatories published in the premium list. The farms were D. B. Kinney's, near Oberlin, Lorain county; Henry Ridenour's, near Gahannah, Franklin county, and two in Lawrence county—Wm. D. Kelly's, Ironton, and Thomas Gardner's, in or near Quaker Bottom, twenty-five miles above Ironton, on the Ohio river.

We met on the 23d of December, in Elyria, and proceeded directly to the farm of friend Kinney, and after eating a hearty dinner with him, and comparing his make of honey with the work of his bees, conferring together and agreeing that the bees made the best honey, and were entitled to the first premium, and he to the second, for a very good article of artificial manufacture; we examined his farm and buildings. Of his farm, containing eighty-one acres, all enclosed by a substantial fence, sixty acres are in a good state of cultivation, bearing unmistakable evidence of industry and intelligence. The soil clay—the land low, flat and wet, required the skill of scientific husbandry to cause it to yield the abundant harvests which have for many years rewarded his labor. Surface drains made with the plow have been adopted as a temporary expedient for removing the superabundant surface water, but we are of the opinion that a judicious system of underdraining as a better and more permanent improvement would pay well for the expense, and greatly enhance the value of his farm.

The plan adopted in the cultivation of fruit trees and hedges may be recommended to all who have similar soil and land, where underdrainage is not practicable. Several furrows are thrown together, the trees and plants set upon the surface, and a sufficient amount of earth drawn around them to support them in their proper position. Planted in this way he has a thrifty orchard of excellent fruit.

The farm next visited was friend Ridenour's, where we, in the good company of your treasurer, Lucian Buttles, Esq., and John H. Klippart, Esq., corresponding secretary, were received in true farmer style, and had a good time. This farm is on Big Walnut Creek, containing one hundred and twenty-five acres, of which thirty-seven are reserved for timber, and of the tillable land, the greater portion lying in front of his dwelling and extending to the creek is first and second bottom, rich, and in a high state of cultivation. It is laid off in convenient lots on both sides of a lane extending to the creek, so that by bars or gates he can pasture or feed in either lot, and his stock have access to the water.

Your committee went next to Lawrence county, and viewed the farms of Mr. Kelly and Mr. Gardner. We were highly gratified with the skill, industry and efficiency displayed in the farming operations of friend Kelley. In addition to the information contained in his report, we have but little to say. His farm is just above Ironton, and extends from the river bank, embracing two hundred and nine acres of bottom land, and extending over the summit of the beautiful and romantic chain of hills which border the Ohio. A large projecting rock, some four hundred feet above the low land, crowns this mountain elevation. Though much labor has been bestowed upon the bottom land, and every part of it made productive, and most, if not all of it, now enclosed by a hedge of Osage-Orange; our attention was most interestingly attracted by the improvements completed, and others designed and rapidly advancing towards completion, to render the precipitous uplands not only beautiful, but fruitful and productive. These hills which could not be easily ascended in a direct line, are environed by spiral roads from their base to the summit, forty-four acres, when we were there, in thrifty fruit trees and grape vines; and fifty hands at work, grubbing, hewing down the forest, and extending the orchard. This, when finished in the coming spring, will embrace eighty acres, which, we doubt not, will yield an income equal to, if not above the proceeds of the two hundred acres of bottom land. This too, is enclosed by the Orange hedge. About half way up the hill is a coal bed extending through it, which is being quarried out, and its place converted into a store house, in which to garner his fruit.

The Sabbath was spent in the hospitable family of friend Gardner. Walking over his farm on Monday, we were highly gratified in witnessing the fruit of his labor, unweariedly applied during many years in converting the wilderness and solitary places into fruitful fields. His farm is a good one, and very productive, and he and his good lady are in their old age, reaping the rich reward of united and persistent industry. We have nothing special to remark, but refer you to his statements, as sufficiently explicit.

We cannot close this report without expressing our disappointment in not finding that more attention had been devoted to building suitable, convenient and commodious houses, barns, stables, corn-cribs, graneries and out buildings generally, on the farms offered for premiums. In this respect, as well as in respect of the best kinds of stock of every species, we should have been glad, had we discovered the same taste and sound judgment, which marked their improvements in other respects.

In conclusion we respectfully recommend Kelly's farm as entitled to the first premium, Gardner's to the second, and Ridenour's to the third.

LUTHER SMITH,
N. S. TOWNSHEND. } Committee.

STATEMENT OF WM. D. KELLY.

IRONTON, *Lawrence Co., O.*

My farm contains about 300 acres, about 47 acres of which is wood and waste land; 44 acres of upland, set with fruit trees; 209 acres bottom land, under cultivation. The river bottom land is a mixture of sand and clay soil, where it is dry; the wet or marshy land is a clay soil; the hill land is sandy soil, with large sand stone, from 10 to 40 feet thick, underneath; from 3 to 4 feet coal; 12 feet clay; then comes iron ore, limestone, &c.

I improve my dry soil with clover: that is, by sowing seed on it, every third or fourth year; turn it under with the full crop. The second year follow with wheat or corn. By so doing I almost invariably get a good crop. I drain my wet land sufficiently dry to raise corn on it; then I sow grass seed every five or six years. I turn over the sward in the fall, four or five inches deep; in the spring I plow as deep as I can for No. 1 crops come for 2 years; then sow clean timothy seed again.

I prefer deep plowing in all kinds of soil, except when I plant sweet potatoes. I have demonstrated, to my own satisfaction, that deep plowing is best for the succeeding crop, and especially when a heavy coat of clover, stubble, or sward is turned under. I have drained all my land so that it can be farmed in any way I choose. I can raise a good crop of corn on it. I find it to produce better, and to be beneficial to health.

Timber on my dry land, poplar, beech, walnut, ash, buckeye, and some scattering oak. Undergrowth, pawpaw, spice-wood, &c. The timber on the wet or boggy land, shell-bark hickory, maple, sweet gum, &c. The timber on the hill land, oak, sugar, poplar, and ash.

I pile the offal of my barn to rot and make manure for garden or nursery purposes. I keep my farm land rich enough by clovering and observing carefully a proper rotation of crops. This leaves the ground in good order, and free from weeds; whereas, the manure from the barn yard makes my land foul and hard to cultivate. I consider the manure from cattle much the best.

My mode of manuring or enriching my land is to sow seed on the ground; when it matures, plow it under in a green state, about the time the crop is nearly ripe. Where there is a spot on my farm that seems to be wearing, on account of being a little rolling, I cover such places with manure from the barn yard. I find that to apply about 100 bush. slacked lime to the acre, keeps the ground loose, and improves it for some years. I prefer using the offal from the barn for other purposes than hauling promiscuously over my farm.

I keep my land by the above changes as rich as I wish to have it. Small grain lodges of a good season, so that I cannot save it. I have used lime on part of my farm; I find it improves any kind of soil, but it is best on clay soil. Ashes will improve the soil, but will not keep the ground loose as long as lime does.

This year I have cultivated about 209 acres of land; sowed 21 acres in wheat, 1 1-2 bushels per acre; it grew thick on the ground, and headed well. The army worm commenced on it about the 10th June; they appeared to come out of the earth, near the middle of my farm, where the clover had been plowed under (a heavy coat the fall before); the wheat was part lodged on the same ground. I cut a ditch around the spot to prevent their crossing, with a view of keeping them on as small a surface as might be. I found that they fed and traveled every day, from 12 o'clock until about 5 o'clock in the afternoon. They appeared to fill the ditch almost every hour. I then put a log in the ditch, hitched a horse to the end, and drove around the circle during the hours they traveled, to keep them from crossing the ditch by filling it full and passing over each other. They appeared to eat everything that was green within their reach, except the hard stems of wheat or grass. They died in about 12 days from their first appearance, after devouring everything they came to that was green. They ate the beards, meshes, and blades off of the stalks, leaving them naked. The grain was not formed in the head yet, and it grew out without any husk, almost entirely naked. The grain was well filled, and made a half crop. I have not threshed yet, so I do not know what the yield will be. This year I planted 35 acres of corn, on clover land. The ground plowed deep last fall; cross plowed in the spring; furrowed out 3 1-2 feet wide each way; left 2 to 3 stalks in a hill; yield, 83 bushels per acre. This is not a full crop, owing to the corn coming up so badly in the spring. I sowed 33 acres of oats, 2 bushels seed per acre. The crop made an average of 44 bushels per acre. Seventy-six acres of timothy, 1 1-2 tons per acre; cost of cutting, curing, and stacking, $3 50 per acre; pressing, $1 50 per ton, or $2 25 per acre; hauling to market, $1 00 per acre; the whole cost, $6 75 per acre. Sold at $16 00 per ton, or $24 00 per acre, leaving a net profit of $17 25 per acre; on the 76 acres, makes $1,310 00.

Irish potatoes are an uncertain crop with me, though by chance I do sometimes get a good yield. I planted 5 acres sweet potatoes; seed cost $100 00; plowing and making hills, $20 00; sprouting and setting out plants, $12 50; dressing them out with hoe 4 times, $56 00; digging and marketing, $19 00; the whole cost of raising and marketing, $247 50. Yield, 121 bushels per acre; whole yield, 605 bushels. Sold them at $1 50 per bushel. Net profit from 5 acres, $375 50, or $71 50 per acre. I prefer planting sweet potatoes on thin soil, without manure, well clovered and plowed under, in the fall or winter, 1 1-2 inches deep; put all the earth that is plowed up into the hills, 3 1-2 feet apart, 2 sprouts in a hill; set out about 10th May. I find that changing season of planting Irish potatoes is important in preserving them from the rot, and also to change the seed. I plant for early potatoes this year, of those I raised as late potatoes last year, and I plant for late those I raised as early last year.

I sow timothy seed on all my land, whether for meadow or pasture. I find it is best in market, fattens cattle as pasture faster than other grasses, and no danger of hurting them, and they can do without water when feeding on such pasture. I sow one gallon of timothy seed per acre, if the land is fresh. If it is worn land, I sow 1 1-2 gallons per acre. I prefer sowing seed on the ground after plowing and harrowing well, and rolling it in with a roller. When the ground is dry or in good order to work, I sow for a sure set about the 1st of September. If any part fails, I sow again the 1st of March. If I sow the first sowing in the spring, I do it as soon as the ground is in good order to work in the spring, as above mentioned. I prefer putting the clean seed on the ground, without any other crop with it. I sow clover seed to keep my land in good order, with oats, as they do well together. I sow 2 bushels of oats to 1 acre. I plow them in shallow on corn land, then harrow the ground level and sow three-fourths of a gallon of clover seed per acre; then roll it in or run over it with a brush. I do this for a change every third year on all my dryest land. I let it stand one year with clover, then plow it under deep for corn or wheat in the fall. This is the best manure and the cheapest that I have found. If I sow clover seed for pasture, I add 1 gallon of timothy seed per acre, with three-fourths of a gallon of clover seed; this can all be sown with oats, as soon in the spring as possible. The best time to cut timothy hay is when the seed is turning ripe, and before it begins to shatter out. In curing the hay, barn it on the second day, or cock it up and stack it on the third day after cutting. I plow all my meadow land, and raise 1 or 2 crops of corn; then seed it new with clean timothy seed. In this change I get my largest crops of corn.

The above treatment to my meadow land keeps it rich. Of wet seasons the grass lodges before harvest, which injures the crop. The best acre of my meadow will often yield 3 tons. I sow clover on my land partly to kill weeds. I use industry; work my crops early and late in the season. In August I dress out all my fence rows and waste land; by doing this I keep the briers and weeds under without much expense. I keep 4 horses; from 6 to 8 milch cows, mixed breeds. I have used a great many oxen. I prefer the old stock that we had in Ohio 30 years ago, for oxen or milch cows; for beef I prefer the Durham cattle. The cheapest way to feed is under shelter. I have made 12 lbs. butter per week from 5 cows, for 6 months. This is not what could be made from them. We use a great deal of milk otherwise than making butter. I raise but little stock; the market is better for corn, hay, and grain of every kind, than it is for stock. I showed a hog at our County Fair that weighed 832 lbs., at 2 years and 8 months old. This was kept in a pen and pushed. I keep no more than what will eat the offal of the farm. I butcher from 30 to 40 head per year. Cooked food is best and cheapest to feed or fatten hogs.

I have 136 bearing apple trees; 1580 young apple trees commencing to bear. On hill land, 60 varieties of grafted fruit, mostly winter fruit; 700 Rome Beauties, 200 Janetts, 100 Russetts, 100 Romanites, 100 Bellflower and Pearmains. The balance are in small lots. I keep the land in clover, mow it two or three times every year, dress around the trees with a hoe three times a year, trim them in the spring, and cut the water sprouts in summer. The clover keeps weeds from growing. The mown clover rots soon, and keeps the soil from washing; the trees grow fast and look healthy. I have 2300 peach trees planted among my apple trees; they are all budded; of the best selections in the four States. The worms are very bad on the peach trees. My best remedy to keep them off is to wrap grass around the tree from the ground up 18 inches, to keep the flying insects from depositing their eggs around the roots. This has had a good effect. I have tried lime, ashes, and sulphur. I have thought they hurt the trees. I have about 100 pears, plums, and cherries. I cultivate the same as the apple trees, except trimming. I gather all of my winter fruit as late as possible, so that the frost does not injure it. I raise no corn, wheat, oats, or other small grain among my fruit trees. I find it to be injurious to them. can and often do raise all kinds of garden stuff, and even sweet and Irish potatoes, melons, &c., among my young trees, and find it to be an advantage to the trees.

My house is an old-fashioned farm house, 44 ft. front, 60 ft. L, 2 stories high, built of brick, with porch 40 feet, for dining room in summer, when I have a large number of hands. I have 8 other houses for tenants to live in, of a cheap kind, such as hewn log and frame buildings. I have 2 barns in which to store away as much of my small grain as possible. I house all my small grain as soon as I can, when cured; it keeps the straw bright and the wheat good. I generally thresh after all my crop is secured. I save all my straw for market; it is equal to a half crop of hay, without much labor. I press the straw as I do hay, about 500 lbs. in a bale, and sell it by the bale as I do hay; it is worth from $6 to $8 per ton.

My rail or worm fence I consider the cheapest and best fence, when the timber comes off the land, and counting the timber worth nothing. I can sell my timber at from $2 to $4 per tree; 100 rails will make 4 rods of fence and 4 rails over, the fence 12 rails high to the panel, with stakes and riders. Cost of making and putting up 100 rails, or 4 rods of fence, $1 50; the timber worth $2 00, makes the fence cost 87 cts. per rod. I have some plank and some pale fence. Plank fence, 64 ft.; lumber, 64 cts.; 2 posts, 30 cts.; building and nails, 50 cts., $1 44 per rod. It is my opinion that the hedge is the thing that is destined to supercede all other kinds of fence. I have raised and set out 1008 rods of Osage Orange fence. Cost of 1 rod: plants, 15 cts.; planting, 20 cts.; dressing and trimming 4 years, 3 times a year, 36 cts.; whole cost per rod, 71 cts. I prefer this fence for several reasons. It keeps out malicious persons who wish to destroy fruits, gardens, or vine patches. I have made some wire fence, but it was very soon eaten up by rust. I consider it a poor fence, even while it does last.

I almost always sell all my farm products by weight.

In answer to 39th, 40th, and 41st questions, I would just say that I have not all my land cleared. I am raising grapes, raspberries, and small fruits of various kinds; green-house, gardening, nursery, and other branches of business, all connected with my farming operations—all done by the same laborers, so it is impossible for me to present an exact account of the farming expenses. I have in my employ all the time from 10 to 15 hands. When they are not at work in the garden, or on the farm, they are clearing up the uncultivated land, or at some other business connected with the farm, so that I cannot very well keep the expense account correctly. I pay my head gardener from $35 to $40 per month. I pay my other hands from $12 to $26 per month. My farm shows from $1,000 to $3,000 profit per year. The changes of the times changes the profits. I have never lost money by farming yet.

I have 57 families of bees. I find it to be profitable to raise bees for honey. I have been engaged in bees for 25 years. I find that all the patent bee hives that I have tried have failed (all humbug). I have tried many, and they have all failed to be what they were represented to be. The bee miller will go where the bee can go, and if the bees are not strong enough to protect all the comb, the miller will destroy them, or deposit their eggs in the comb, and hatch and destroy the whole hive. This is often done when bees swarm too often, regardless of the quantity of honey they may have. If the bees are strong they keep out the worms themselves. All the patent work that I have tried has only proved a harbor for the worms, and at the same time been very expensive. All beehives should be so arranged that the bees could have the advantage of driving the miller, or worm, out by an inclined plane. I have tried an experiment with 19 families in one building, separated of course from each other. Being somewhat acquainted with their nature, I manage the cells so that they make the fine honey in boxes or drawers, that hold 16 lbs.; the building is 12 ft. square, cost about $200. I can take 70 or perhaps 80 boxes or drawers per year—say 70, at 16 lbs. per box; 1.142 lbs., sold at 25 cts. per lb., $280, without destroying the bees. I have one family that I have robbed every year for 14 years, and had its increase. I find to take their honey every year is an advantage to the bees as well as to the owner, if properly managed.

I remain, yours, respectfully,

WM. D. KELLY.

STATEMENT OF THOMAS GARDNER, LAWRENCE COUNTY.

1. My farm consists of 291 acres; wood and waste, 54 acres; improved, 237 acres.

2. First and second bottom, clay; subsoil, stiff heavy clay, and holds water: needs under-draining. Third bottom, clay loam, with small pieces of sandy loam; subsoil, clay, mixed iron ore, swales black muck; subsoil, blue clay, mixed with bog-ore; one narrow piece across the farm, sandy; subsoil, gravel, sidehill black soil, subsoil red clay, stone on the side hill, sandstone, grindstone-grit, and hard chertystone; no limestone.

3. I use stable manure and barn yard manure, and sow timothy and clover on clay soil; the same for clay loam; for wet land or grass land I use stable manure fresh from the stable, and spread on the grass. I have used straw spread on meadows with good success.

4. I plow from 8 to 10 inches deep; sandy soil does not require as deep plowing as clay.

5. I have learned from deep plowing that the ground is dryer in a wet time, and wetter in dry weather; the roots penetrate deeper in the earth, and keep green longer.

6. I have used the subsoil plow with good success. I have seen the corn blades on the bottom of the stalks keep green till the husks were dry on the ear; the yield per acre was 159 bushels and 24 quarts. I have not used it on different soils. I used it on clay loam.

7. On the first and second bottoms, beech, sugar, red oak, ash, black gum, sycamore, black walnut, white walnut, mulberry. Forest trees on the wet land, elm, shell-bark hickory, maple, sweet gum, swamp white oak, red oak, black jack; on the third bottom, black oak, white oak, poplar, black walnut, sassafras, black gum, black locust, honey locust, hoop ash, buckeye, cucumber, sourwood, box-elder, ironwood, hornbeam, black hickory, bitternut hickory, pin oak, mulberry, June berry, beech, sugar, dogwood, water-beech, thorn-plum, spice-bush, redbud, pawpaw, slippery elm, burning bush, hazlebush, elder, wild berry, cedar bushes, wild plum. Plants, pea vine, Indian turnips, cumfrey, yellow root, ginseng, blood root, rattleweed, May apple, wild onions, bluebells, cranesbill, spikenard, celendine, adder tongue, putty ball or Adam and Eve, larkspur, columbine, life-everlasting, pond-lily flag.

8. From 30 to 40 per acre. I have a cellar under my barn, 70 by 45 feet, where I formerly kept my sheep, but I have sold the most of them. I stable my horses under my barn, where I make manure, and pile it up when I do not want to use it. A large portion of the time for the year past I hauled as fast as made, and spread on grass lands, some to fruit trees and some for potatoes. I have a barn yard below my barn, with a ridge of clay to hold the washings of barn and yard.

9. I cut up corn; haul the fodder and straw and feed it in the barn yard. I bed my horses and cattle with straw. I do not know how many loads of manure I haul in a year, but apply all I make.

10. In long and green state for corn, potatoes, beans, grass, and sometimes for wheat. I prefer using for corn or beans, and sow with wheat.

11. I could.

12. I have used lime for apple trees; used ashes for unhealthy apple trees, with good success, to 4 different apple trees, and at four different times; all are now healthy. I have rolled potatoes in lime to prevent rot; succeeded well; used one compost heap of manure for potatoes, and succeeded well; the land now in grass and produces a heavy crop every year; the heap was made of hog manure, cobs, dead fowls, offal of hogs, &c.

13. Acres of land tilled, 156 1-2; wheat 95 1-2 acres; corn 32 acres; buckwheat 1 acre; Chinese sugar cane 1 3-4 acres; beans 14 1-2 acres.

14. Wheat sown per acre, 1 1-2 bushels; ground plowed in August, from 8 to 10 inches deep, harrowed before sowing and twice after sowing, and rolled; sowed white wheat first and second weeks in September: 10 acres among the corn; plowed three furrows in a row and crossed with cultivator; corn cut up and hauled off after sowing; May wheat sowed in October; 8 acres sowed in November: not as good as earlier sowing: 19 bushels per acre; 22 1-4 acres yielded 620 bushels; badly damaged by the army worms; 1 acre and 2 rods, 40 bushels and 22 pounds; 7 acres and 23 rods, 38 bushels per acre. Wheat crop 2,755 bushels; army worm destroyed considerable wheat and grass: do not know of any remedy: the fly done a little damage 16 and 17 years ago: best remedy, make the land rich and sow early; the weevil and small miller have done considerable damage to the wheat after harvest: best remedy, thresh the wheat out of the shock; have never received any damage in this way. I cannot tell the amount of fertilizing matter taken from the soil. Corn, 32 acres, 75 bushels per acre. Plow the ground from 8 to 10 inches deep; harrow before planting: furrow 3 1-2 to 4 feet wide; plant and sometimes roll; use Buttong cultivator and shovel plow. Potatoes, 10 acres, 144 rods, clover ground in young orchard, with 30 wagon loads of manure from the stable; plowed and harrowed before furrowing; furrowed 3 feet: seed 7 bushels; dropped 18 inches in the row, in rows one way: twice through with shovel plow; hoed once; clipped the weeds out once: product, 200 bushels; 3 1-2 acres of Neshannock potatoes on the sidehill young orchard; product, 350 bushels: beans 14 1-2 acres: product 376 bushels; the ground manured 3 years past, or in 1854; ground plowed twice, harrowed once, furrowed 2 feet apart, beans drilled, 1 bushel of seed per acre, covered with cultivator, plant from the 20th of June to the 5th of July, cultivating 4 acres a good day's work, 1-2 acre a good day's work of pulling beans, 1-2 acre 1-2 day's work 2 hands and team to haul and thresh. Chinese sugar cane, 1 3-4 acres, ground plowed and harrowed once, ground furrowed 3 1-2 feet, part of the ground 4 feet wide, planted 5 packages of seed, 2 seed in a hill, 15 inches apart, covered with cultivator, covered too deep, ground too cold, did not come up well, a little over half a crop, product 280 gallons thick syrup: made some sugar; I have an iron mill from Cincinnati for grinding cane. Buckwheat, 1 acre ground, plowed twice, harrowed 3 times, 3-4 bushel of seed per acre, product 17 3-4 bushels. Apple crop, 825 barrels; sold 518 barrels

at $1 35 per barrel; 125 barrels at 67 and 75 cts. per barrel, without the barrel; balance unsold. Russetts did not bear this year.

15. I use barn yard manure and stable manure. I made no difference as to different kinds of manure. I prefer using manure for corn or potatoes, and then sow wheat. I use manure fresh from the stable on grass land in the fall, winter and spring.

16. I cover from 8 to 10 inches deep. I have used all soils alike.

17. Potatoes have been diseased some years, especially late potatoes, and I see some little rot this year; have rolled potatoes in lime before planting with good success. Best remedy I know, dig early and put up dry.

18. Timothy and red top. I sow 1 bushel of clover and timothy mixed to 8 acres. I have sowed in January and February on land prepared for meadow, sometimes among corn in August, sometimes with turnips, but most generally with wheat in February; for dairy purposes, clover and timothy.

19. Twenty acres of grass land for mowing; product per acre, 1 1-2 tons. I prefer mowing as soon as out of blossom. I cut with a mowing machine, and as soon as cured rake and cock and haul to barn.

20. My land is all suitable for the plow.

21. I have not irrigated any land.

22. I have reclaimed some peat or swamp land, by cutting a ditch into the river, and raised corn and wheat with good success.

23. I have succeeded in eradicating the most of the weeds in different ways, dock by grubbing, and when ripe by burning, briers by mowing them, and by feeding corn among them in winter, and killed them all out; iron weeds by grubbing; some foul weeds left yet.

24. Four cows, 2 heifers, 1 fat stag; breed, short-horn, 3-4 and full blood; 4 horses, 2 colts, 2 jennets, mammoth breed; horses common stock.

25. I have not made any experiments.

26. I feed my cattle with corn fodder, husks, and chaff, and let them run to the straw piles. I have stalls under my barn for tying them up, and when loose they go to the pond or ditch for water; generally keep them shut in the barn yard in winter to save the manure.

27. We are making from 10 to 12 pounds of butter per week; make but little cheese.

28. Sheep, 75 head Merino; yield per fleece, 2 1-4 lbs.; price from 29 to 50 cts. per lb.

29. I feed with bean pods and hay, 1-2 ear of corn per day. I have fed lambs with corn cob meal, or crushed corn, with good success; feed-

ing under shelter I consider much the best and cheapest. Last winter I lost 4 head.

30. Swine 12 head, shoats 9 head, 7 young pigs. I have a Suffolk boar and half breed sow. I feed with corn: have fed with steamed apples and bran with good success; have fed with crushed corn. I slaughter at 12 to 18 months; average weight 150 to 250; one hog 1 year and 2 days old, live weight 119 pounds; 5 hogs taken to Fairs at different seasons received premiums; first hog sold for $36, second for $32 50, and third for $30.

31. I have not made any experiments relative to the value of root crops, but they are good for making cows give milk. I consider them very healthy for stock.

32. Number of apple trees, 949, all grafted fruit; Rome Beauties, 574; Romanites, 70; Janets, 75. I have some 80 varieties of apples.

33. Number of pear trees, 50; peach trees, 928; cherry trees, 18; plum, 8. A choice selection of peaches, ripening in succession till October.

34. The borers are bad on the peach trees. I had an old peach orchard, 3 rows in grass; the borers never touched them; all the balance had worms in them. I have used ashes; did not keep them out; some keep them out by tying grass around the trunks of the trees. There is some kind of an insect that deposits eggs in the trunks of apple trees when they lean to the North. I have seen but few in my orchard; they are very injurious; I cannot describe them. Last spring the worms were injurious to young apple trees. On Saturday I went over a portion of an orchard, and shook them off and killed them, and on Monday, after rain and hail, they were all gone. The millers are troublesome in depositing in or on the apple. I think apple trees in a high state of cultivation will be injured but little by insects or disease.

35. I prune them well, give the apples sun light and air, and without it they cannot be good. I have used chip manure, corn cobs, and shavings. I plow often, and while some Rome Beauties in the neighborhood have been worthless, mine have produced good crops ever since they commenced bearing. I use soap suds for washing the trunks of trees. I scrape the rough bark off the trunks of the trees. In planting fruit trees I dig a hole 4 feet across and 2 spades deep through the subsoil; fill with good surface soil.

36. I have drained all my wet lands. I plow them and they produce good crops.

37. Barn 30 by 40, with three sheds 15 feet wide, length 70 by 45; cellar under the barn; wagon shed, 16 by 24; corn barn, 16 by 24; hog

pen, 16 by 12; wood shed, 50 by 12; milk house, 10 by 10; dwelling house, 30 by 20, two-story; kitchen 26 by 16, one and one-half story; buildings all frame; use of barn, cattle and horses in the cellar, hay, corn fodder, bean pod, wheat, and chaff; a second barn, 20 by 30; a hewed log dwelling house; 2 wells and 2 cisterns.

38. Worm fence, 2161 rods; Osage Orange hedge, 1034 rods; not yet sufficient to turn stock; cost of worm fence per rod, 65 cents; cost of hedge per rod at 4 years old, 31 cents; 200 panel of post and rail fence per rod, $1; 40 panel of board fence per rod, $1 30. I have not constructed any wire fence.

39. I weigh or measure, but do not keep accurate accounts.

40. Do not keep regular farm accounts. I cannot state the annual expense nor income.

41. I cannot give the annual receipts and expenditures on my farm. I have 1 1-4 acres of nursery of apple trees.

THOMAS GARDNER.

STATEMENT OF HENRY RIDENOUR.

1st. My farm consists of 125 acres, 37 acres of wood land, 13 acres partially cleared and in pasture, (it being under brushed or grubbed, the down timber all burned off and considerable of the large timber cut off,) 8 acres waste land, caused by the Big Walnut creek and two runs or ravines running through it—both runs afford plenty of stock water during the whole year, and 67 acres of cleared land.

2d. The nature of the soil various; my clear land is principally loam, with some clay, sand and gravel; or in other words second bottom subsoil loam, clay and gravel, and underlayed with gravel; wood-land mostly clay loam and some gravel subsoil, mostly clay with some gravel; there are about 12 acres; have some small lime stone in it, and there are some few small rocks (or which are better known with us as nigger-heads,) in some places on my farm.

3d. Manure, clover and a rotation of crops are the best means to improve and keep up land; fall plowing I consider injurious to land as it leaves it too much exposed.

4th. About 8 inches. I find it better for all my soils, as it gives more loose earth for all crops to root in and is not so liable to dry out in dry seasons.

5th. Not any.

6th. I have never used a subsoil plow. I have but one small ditch of about 30 rods, part clay and part black loam, with good results, making the land dryer and better for all kinds of grain.

7th. Trees—black and white walnut, blue, black and white ash, sugar, beech, hackberry, buckeye, hickory, bur and white oak, red and white elm, maple, and some sycamore along the creek; under-brush principally paw-paw plants, Kamp's first-up-in-the-spring, and have a stronger smell than onions. Nettles were plenty; crow's foot, May-apple, Indian tongue, pea vines, ginseng, bunch-grass, which made good early pasture for stock. September weed, a kind of weed that blossomed in September, and was great for bees, it grew about 3 feet high and was covered on the top with white blossoms. Glass or water weeds, an autumn weed, and grew mostly in bottoms, and blood-root or Indian paint, wild parsley, &c.

8th. From 15 to 20 loads to the acre. It is all kept in the barn-yard and not under cover.

9th. I always stack or rick my straw (retaining enough in the barn for bedding, horses, &c.,) in the barn yard for my cattle to lay around and eat what they want in winter; feed all my corn fodder around my straw stack; my horses I keep stabled and well bedded, and all the manure from the stable is mixed in with the straw and stalks, which adds very much to making the manure richer and better. I manufacture about 260 loads annually and apply it all.

10th. I apply in compost state and partially rotted; haul in August while it is dryest hauling, and most all for wheat, sometimes if it is not all wanted for wheat it is hauled on a stubble field for corn or potatoes next season.

11th. I think not.

12th. Not any.

13th. I till about 47 acres of wheat, corn, oats, rye, potatoes, sweet-potatoes, sweet corn, cucumbers, &c.; of wheat 15 acres, corn 18 acres, oats 5 acres, rye 2 acres, potatoes 5 acres, sweet-potatoes, sweet-corn, white beans, cucumbers, &c., 2 acres, and in clover for pasture 6 acres.

14th. Wheat, 1 1-3 bushels per acre; corn, 1 bushel to 6 acres, (plant enough, rather thin out than replant:) rye, 1 1-3 bushels per acre; oats, 2 bushels per acre; potatoes, 8 bushels. The time of sowing wheat, from 8th to 15th of September; rye, same time; corn, from 1st to 15th of May; oats, from 1st to 10th of April; potatoes, from 1st to 20th of April, and sometimes some few later—early planted most always best; wheat, haul on manure and scatter thin, plow my ground a week or ten days before sowing, plow from 6 to 8 inches deep with steel plow, use no other for breaking up ground; I have always sown broadcast (until this fall,) and harrowed in, harrowing twice; this fall after breaking up my ground, harrowed and put in with a drill; I put in ten acres this fall for meadow as follows: after plowing harrowed once, then rolled, then drilled, wheat and timothy seed put 14 1-2 bushels of wheat and 2 1-4 bushels of timothy seed on, then rolled the second time, it being intended for meadow, and being some cloddy; both wheat and timothy looks very fine. Cut before it gets quite ripe, bind and shock, and as soon as dry haul into the barn, and after it goes through a sweat, thresh with a machine. I believe in wheat going through a sweat in the mow or stack before threshing, as it adds to its value, making the grain look brighter and heavier and better for flour; my yield per acre has been from 18 to 25, this year 35 bushels. Corn, plow same depth as for wheat, harrow and furrow one way from 3 1-2 to 4 feet apart, then cross-furrow same width as first time, and then have a boy on hand, follow and drop the corn while the ground is fresh and damp, then follow with another horse and light frame, made by taking two scantling about 3 feet long, pinning them together at each end, leaving them about 8 inches apart; near the back end of the scantling I put in two small shovels, set at right angles, so as to draw the ground in from both sides of the furrow, and two pins at the front end to make it run steadier, then add handles and it's done and ready for work, with which I cover my corn; as soon as it is nicely up we cultivate and hoe a little where there is grass or weeds in the hills; in a week or ten days cross cultivate or plow, giving it the last hoeing, and after giving it one or two more plowings we lay it by—plowing corn is all done with shovel plow; as soon as it is ripe enough in the fall cut and set in shocks of one hundred hills each, and tie them to keep from falling down or spreading at the top; as soon as fit husk and crib—yield from 50 to 65 bushels of shelled corn, this year 70 bushels per acre; 6 acres going 90 bushels of shelled corn per acre. Oats, plow same as wheat or corn, sow broadcast, harrow in when ripe, cut with cradle and let it dry about two days, then bind and haul into the barn—yield, former years, 45 to 60 bushels per acre, this year about 35 bushels; the grass-hoppers cutting near one half the grain down before it was ripe. Potatoes, plow same as for other grain, harrow and roll if it is cloddy, (as potatoes want mellow land,) furrow one way about 3 feet apart, and if seed large cut in pieces and drop from 8 to 10 inches apart putting one piece in a place, covering with the same machine we cover corn with; as soon as they begin to break through the ground we harrow across the rows, which levels the ground, kills out all the grass and weeds; when up about 6 inches cultivate and hoe lightly, and before the tops get large enough to lop down finish by plowing with shovel plow, through October and the first of November; we raise them by plowing them out with shovel plow; sell some and put the remainder in my cellar—yield from 1 to 200 bushels per acre. The red weevil or midge troubles our wheat some; Mediterranean wheat and early sowing are the best preventatives. Corn, some with cut worms, fall plowing will prevent to some extent; grass-hoppers bad on grass and oats this year; no remedy. I can give no estimate of the fertilizing matter taken from the soil by wheat.

15th. Common barn yard manure; apply in August for wheat, and in the fall for corn; the following spring spread it over the top of the ground, and plow it in.

16th. All depths, as we plow it in it gets covered from the top to the bottom of the furrow, say from 1 to 8 inches.

17th. My potatoes have never been affected with anything except a very little with rot; plant in dry land, rather inclined to be sandy is the best preventative.

18th. Timothy for hay; red clover, white clover, timothy and June grass for pasture; timothy, 1 bushel to 6 acres for meadow; red clover, 1-8 of a bushel to the acre; other grass seeds I never sow, as they come into our meadows and clover fields as fast as timothy and clover go out; sow timothy in September, and clover from 1st to 15th of April; for dairy purposes timothy, red and white clover.

19th. I cut about 10 acres: average from 1 1-2 to 2 tons per acre, this year less; grass-hoppers injured it very much; cut when nearly ripe with scythe, scatter, and as soon as dry, rake with horse rake and haul into mow or stack.

20th. All suitable for the plow.

21st. I have never irrigated any of my land.

22d. None of that kind of land on my farm.

23d. I have succeeded in killing them to a great extent by rotation of crops, working crops well, mowing them down, &c. The most troublesome weeds were spanish-needels, large smart weed, with some cuckle burs, fox-tail grass and rag weeds.

24th. Seven cows, four head of young cattle, five head of horses; cattle mostly common stock; the young cattle are crossed to some extent, with short-horn; I have never kept but few cattle, and those only for milk and butter. Horses—I have one spring colt, and four for work, which are good sized farm horses, from 15 1-2 to 16 hands high; as to breeds, I cannot give it to any certainty as I have bought part of them.

I believe in breeding more draft horses, as the light horses are only good for carriage or saddle, but not for the farm.

25th. I have not made experiments enough to answer with any certainty.

26th. The best mode of wintering cattle is plenty of good corn fodder, salt and water; shelter would be a great addition.

27th. I have kept no acccount of the number of pounds of butter made, we make it in the old farmer's style; cheese, we make none.

28th. Sheep—I have little or nothing to say, as I have but one on the farm, and it runs with the cattle, lives on corn fodder in the winter and is always fat.

29th. Sheep—I formerly kept some sheep and I found them to winter better on good corn fodder than on the best of hay, with corn once a day and a good dry shed to lay under in wet or stormy weather; putting sheep in pens or stables will create heat and an impure air for them to breathe, thereby causing disease; we can never give too much pure air to sheep, and they should have free access to water.

30th. I keep about 15 head, now 33; as to breed I could not give it, as I have been crossing from different breeds for several years past; I now have a boar that is about one-half suffolk, which is about right, being lengthy in the body, heavy boned and short legged and easy kept. I generally put my hogs in a pen with floor and roof in September, feed on corn and give plenty of water; kill the latter part of December, weighing from 175 to 275, at from 10 to 15 months old.

31st. I have made no experiments to show the relative value of any root crops compared with corn or other grain to feed animals.

32d. 70 apple trees, 38 grafted and 32 natural fruit; the grafted I cannot give all the different kinds, but so far as I can give them they are rambos, seek-no-farther, Rhode Island greening, Spitzenburg russets, &c.

33d. Pears; two kinds of cherries, and a number of small peach trees; the old peach trees all killed by frost or hard winters.

34th. Can't say that the insects have done me much if any damage, but the two past winters have killed some 15 or 18 apple trees, and some of my best grafted trees, but I have been digging them out and planting in other good grafted fruit.

35. I have kept my apple trees well trimmed, which is about all the labor I have put upon them.

37th. I have some 10 or twelve farm buildings; first is the dwelling house (built in 1856) I live in, which is 18 by 32 feet, and the kitchen 18 by 20 ft., and has an 8 feet porch on the south side, and a 6 feet porch on the north side, making the kitchen and porches as wide as the house is long; all frame, and well painted on the outside (white); the house is 2 stories high, with 2 rooms on the first floor, finished with black walnut, oiled and varnished, and 3 rooms up stairs, with a clothes press, and painted with an oak finish; the kitchen is 1 1-2 stories high, and well finished. I have a celler under the main building for potatoes, &c., and two cellars under the kitchen, one 12 by 18 feet, partly out of the ground, with fire place in it; the other between that and the main cellar, 8 by 18 feet, and all plastered and paved with brick, with grate at each end for air for bread, butter, and milk, &c. 2d. A house standing at the end of mine, 18 by 24 feet, and 1 1-2 stories high, hewed log, sided up, and the lower story plastered. 3d. My barn is 48 by 60 feet, with horse stable, 6 stalls with manger troughs and feed room; barn floor 16 by 48 feet; 3 bins which hold over 500 bushels of grain, &c. 4th. Two lath corn cribs, 6 by 18 each, with ten feet space in between for wagon shed, with flour house, smoke house, buggy house, tool house, hog house, wood shed, &c.

38th. I have 650 rods of fence, staked and double-ridered, built at a cost of 50 cts. per rod; 110 rods of worm fence, built 7 rails high; we then drove a stake down each side of the corner, and after first bending and painting a No. 7 wire, we put it over top of the two stakes to hold them together; we put another rail on top, which makes a better fence than the old staked and double-ridered, and the cost being only the wire additional: cost of said fence, 56 cts. per rod; 120 rods of board fence, at a cost of about 80 cts. per rod; about 120 rods of 8 rail fence, with each corner well locked, at a cost of 45 cts per rod: and about 60 rods of fence, from 6 to 8 rails high, at a cost of 35 cts. per rod. All my rail fences are worm fences, having a worm of from 4 feet 4 to 6 inches, with a fence block under each corner. I believe in good fences keeping good neighbors. I have a gate or bars to every field; fences all in good repair.

39th. My wheat, rye, and oats, are all measured; corn, I always husk a certain number of shocks, say average shocks, and measure the same, allowing 3 heaped half bushels to make one bushel of shelled corn, and make the estimate therefrom. Potatoes I measure either by the load or bushel. Knowing the number of acres each field contains, it is easy making the estimate.

40th. I keep an account of my receipts and expenditures so as to get the total amount of the income and expenses at the end of the year, but not in such a way as to answer your question; but intend keeping a regular book, with separate pages for certain items of both income and expenses, hereafter.

41st. My income and expenses from the 1st of January, 1857, to the 30th of November, 1857, making eleven months, were as follows:

Income	$868 09
Expenses for same time	709 23
Leaving a profit of only	$158 86

But leaving me most all my crop and increase of stock on hand (after deducting enough for my own use), as follows:

Wheat,	380 bushels,	at 75 cts.	per bushel	$285 00
Corn,	300 "	25	"	75 00
Rye,	40 "	50	"	20 00
Potatoes,	325 "	40	"	130 00
Pork				60 00
				$570 00

Leaving on hand and for sale $570 00 worth of grain, &c., leaving out the increase of stock and smaller items.

Income for eleven months		$868 09
Grain on hand and for sale		570 00
Total income for 1857		$1,438 09
Expenses for eleven months	$709 23	
Add $50 00 for December	50 00	
Total expenses for 1857		759 23
Profits		$678 86

HENRY RIDENOUR.

GAHANNAH, Franklin Co., Nov. 30, 1857.

STATEMENT OF D. B. KINNEY.

1st. My farm consists of 81 acres, 60 under improvement, the rest in wood, all under fence.

2d. The soil clay, with some slight elevations of a gravely tendency; subsoil clay, underlaid with sand-rock from 3 to 5 feet from the surface; stone found upon it, sand-stone with an occasional boulder.

3d. Of clay soil to be kept mostly in grass; sward land for corn, with long manure plowed under, or short manure harrowed in on the top, followed by oats in spring, and wheat in fall with top dressing, of short manure harrowed in and stocked in clover or timothy.

4th. Plow from 5 to 8 inches for the first plowing, 5 inches is sufficient, deeper gradually.

5th. No experiments.

6th. Drained with surface drains, with the plow, and with good results.

7th. Timber—beach, maple, hickory, oak, some chestnut, basswood, elm, white-wood and white ash; one oak 7 feet 2 inches diameter, 50 feet to the first limb, a perfect tree; 7 white-wood trees, hewed on a line, 75 feet each, 8 inches at the top end, (square;) some hickory trees measured 135 feet high; one grape vine 6 inches diameter, and one hundred feet high. Plants too numerous to mention.

8th. Manures from 20 to 25 loads to the acre for corn; get out in early spring on sward land and plow under, remainder leave under cow-house or pile in the yard for fall use.

9th. In making manure I save everything around my barn and farm that can be used for that purpose; save all my straw for feed and bedding. I take land to raise grain on and bring all the stalks and straw home to add to my own stock of manure. Attached to my hog-pen I have a yard 14 feet square, which I fill twice a year with saw-dust, which keeps my hogs nice and clean and is a great saving of manure; in this pen I throw everything that is collected about the house and back-house, and in this way save a large amount of the very best manure; saving from my hen-house is also valuable; amount made is from 100 to 150 loads per year and all applied.

10th. My long manures are mostly applied to corn land and plowed under in spring; finer manures are applied to garden root crops and wheat; for wheat it is applied as a top dressing, and harrowed in with the best results; summer saving is by yarding my stock in a pasture of 4 acres until haying is over, and then in a meadow of the same size, till late in fall, when these lots are sufficiently rich cultivate them and yard in other lots. I consider the liquid worth as much as the solid in raising grass.

11th. No; the manure is all saved without regard to labor.

12th. I use lime in preparing seed wheat, and have sowed some on wheat land without any perceptable benefit; have used plaster on corn and potatoes and could see no benfit; ashes are used in out house around fruit trees and garden. I have tried ashes on wheat land by the side of compost manure in equal quantities, and with equal results; this was on my poorest land.

13th. From 12 to 15; about **4** of corn, 4 of wheat, 3 of oats, 1 of peas, 3-4 of potatoes; garden and small patches of other things, 1 or 2 acres.

14th. For wheat 1 1-2 to two bushels; time of sowing 1st of September; oats from 2 1-2 to 3 bushels per acre; ground plowed in the fall; grain sown as soon as I can harrow in the spring. I sowed 3 acres of wheat last fall, about the 10th of September, after oats; ground plowed and 70 loads of rotted manure spread on the top and harrowed in, then wheat sown and harrowed again; harvested and threshed, 102 bushels hand measured and grain weighed, of the Mediterranean variety. Oats—a heavy growth, but much injured by the grass-hoppers; harvested in the old way with cradles and rake; the corn crop this year was injured by the wet spring; a heavy growth of stalks, but corn did not ripen well.

15th. Short manures for wheat and corn, applied just before planting and harrowed in.

16th. If plowed in rather shallow.

17th. Have been some affected by the rot this fall; early planted did not suffer as much as later ones; a part of the seed planted this year was raised from the seed-balls; three years ago there were five different varieties from the same balls; have increased in size and numbers from year to year; this year was a good crop both in size and quantity with very large healthy vines, with many seed balls attached to them, which was not the case with the old varieties; they are good for the table, but being later were some affected by the rot. From the experience I have had with them they are going to be a decided improvement.

18th. I sow timothy and clover together, about 4 quarts of each to the acre, sometimes more; when stacking with wheat I sow in April, when after oats harrow in; in September cut no clover at that season.

19th. About 10 acres; product 1 1-2 to 2 tons, sometimes more; cut clover in the blow; timothy just out of blossom; cut with scythe and get in as soon as sufficiently cured.

20th. All suitable for the plow, and broken up once in 3 or 4 years, with a rotation of corn, oats and wheat with plenty of manure and stocked again.

21st. Some years ago I owned a farm where I took the water from a spring by a small ditch to a dry knoll and let it spread over it, and the grass grew abundantly, so much so as to lodge; at present I have the wash of my barn and yard carried by an open drain into my orchard, which is in grass, which is a great benefit.

22d. Have none.

23d. No, nor never expect to, but keep them down pretty well by having the ground occupied with something better; my fence corners are all mowed every year; all burs are destroyed before maturity, and large thistles in my pastures are mowed when in blossom; this is labor well spent, first the cattle eat them when wilted; second, they never grow again; third, the ground may as well produce grass as thistles; it adds much to the looks of a farm.

24th. I have one span of horses, one full-blooded Hereford bull, twelve cows that give milk, all half-blood Herefords, five of them 4 years old, and seven 3 years last spring; 2 yearlings; 13 calves, 3-4 blood, Herefords.

25th. I have made no experiments, but from the experience that I have had, I think the Herefords will give as much return for the food consumed as any other breed.

26th. I never before wintered my cattle as cheap as last winter; had 20 head; let them run to a straw stack, and fed corn stalks until 10th March; no hay, but used soft corn at the rate of one and a half bushels per day while the corn lasted, then corn and cob meal, 2 quarts per head, ground in Leavitt's Excelsior Corn and Cob Mill, of which I have one; cattle all wintered well; two pair of steers coming; three half-blood Herefords sold in March for $70 a pair. Shelter, keep 10 head in stable, the rest run under an open shed; watered at a well in the yard.

27th. We have not kept the account of butter made; for experiment, tried one cow the first week in June, which produced one pound a day, and we thought five more would do the same at that time; made 1,350 lbs. of cheese this summer, and raised 13 calves, worth $10 apiece; number cows or heifers, 12; manufacture in the common way.

28th. Sheep 30; merino breed; yield last spring, 4 1-2 lbs. per head; wool sold for 48 1-2 cts. per lb.

29th. My sheep run with my cattle, without any extra care; run under an open shed; lose one occasionally.

30th. Have on hand 7; one Suffolk boar, one breeding sow, and five pigs; have killed five this summer and fall, from 6 to 8 months old, weighing from 125 to 200 lbs. Manner of feeding, when I can, is with dry corn, ground in corn and cob mill; pour boiling water on and let it stand 24 hours; feed prepared in this way is worth nearly double that it is fed dry.

31st. I have made no experiments, but my opinion is that one acre of corn is worth more than an acre of any kind of roots, when we take the abor into consideration with the profit.

32d. I have 300 apple trees, all grafted, maturing at different seasons, from early harvest to the latest winter, and the best varieties.

33d. Fifteen bearing pear trees of different kinds, all grafted; 18 cherry trees, all bearing, the Honeyheart, May Duke, and common red. Peaches, we have some, but most of our trees have died within two or three years past. Plums have been destroyed by the curculio for a number of years and trees mostly dead.

34th. The borer has worked in some of my apple trees, the peach worm in the peach trees, curculio in the plums; some simple remedies have been tried, but to no purpose.

35th. My fruit trees have all been set by myself; first I dug a hole and put the trees in, and they all died; I then prepared the ground by turning a few furrows together, and set the trees on the top, throwing the dirt up around them; in after tillage turned the furrows towards the trees, so as to leave the centre the lowest; cultivated the land for four or five years, and then stocked the ground and let it remain in grass ever since; trees trimmed every spring; for manuring, a top dressing of leached ashes is applied occasionally, and coarse manure the same. Forest and ornamental trees have been set in the same way, with good success.

36th. I have prepared and used a compound oil, or sheep coating, which is death on ticks, flies, and other vermin; promotes the growth of wool, and health of the sheep.

37th. Answered elsewhere.

38th. One hundred rods of hedge, 3 years old, cost at this time 25 cts. per rod; 40 rods of board fence, cost about 75 cts. per rod; remainder rail fence, cost 25 cts. per rod. Some of the rail fences need re-laying; have the rails on hand for it.

39th. Nothing worth mentioning.

40th. Have not been as particular in this respect as would be desirable. The expense of improving my farm has been very little, except my own labor. I came on to this farm nineteen years ago, then a wilderness; have cleared and improved it myself, with occasional help as needed. The first few years that I occupied this farm my cattle died with murrain; lost 16 head in three or four years. I was told that if I would keep geese it would prevent it. I had no confidence in it, but got the geese, and did not lose a creature afterwards; keep 20 geese and 30 hens. My bees have been a source of income, of which I have 20 stand. I have thought of something on the management of bees, bee-hives, bee feed, &c., but must defer it at present. I have always taken a deep interest in the subject of agriculture; was one of the first to start a County Society; and when the State Society was formed, I went to Columbus in a buggy, and the first meeting of the State Board I rode one hundred and ten miles to attend; the next I went partly by stage and partly by railroad. I am glad that other men who are more capable are ready to carry on a work that was so well begun.

41st. My receipts this year, since March, have been—

For cattle	$201 00
For hogs and pork	91 00
For wool	58 20
For cheese	96 00
For wheat from 3 acres	128 00
	$574 20

Butter, fruit, and many other things not reckoned.

For expenditures I hardly know what to say. We have four children in a course of education; this, with the other farm expenses, about balance the receipts.

D. B. KINNEY.

OBERLIN, Lorain Co., Dec. 5, 1857.

ABSTRACT OF REPORTS OF COUNTY SOCIETIES.

ADAMS COUNTY.

The Society held the sixth annual Fair, commencing on the 20th October, and holding four days. It was one of more interest on the part of exhibiters, and the public generally, than any prior exhibition of the like character held in the county, there being a larger attendance during the whole of the Fair than on any previous occasion. We had the largest and best display of almost every description of stock, farm products, and mechanical skill, that we have ever had.

One hundred and thirteen bushels of corn, bottom land, and 100 bushels, upland, took the first premium.

Number of members the present year, 409.

RECEIPTS AND EXPENDITURES FOR 1857.

Total amount of receipts	$1,168 49
Total amount of expenditures	782 58
Balance in Treasury	$385 91

OFFICERS.—The election of officers for the ensuing year was held on the 14th November. President, George S. Kirker; Vice President, Nathan Hawk; Treasurer, John K. Billings; Secretary, John P. Hood; Managers, Washington Robe, Samuel E. Clarke, Watson Foster, Thomas B. Reighly, and James N. Hook. (Post office address, West Union.)

ASHLAND COUNTY.

Fair held September 22, 23, and 24. No report of finances.

OFFICERS.—B. Kellogg, President, Ashland; Jno. Scott, Jr., Vice President, Haysville; J. B. F. Lamprel, Treasurer; W. Osborn, Secretary, Ashland; Managers, R. P. Fulkerson, David Bryte, Peter Deshong, Peter Thomas, Joseph McComb, Geo. W. Rathburn.

ASHTABULA COUNTY.

Fair at Jefferson, Sept. 30 and Oct. 1. Independent Fair at Conneaut, Sept. 24 and 25.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$638 83
Total expenditures	1,446 82
Deficiency	$807 99

OFFICERS.—President, N. L. Chaffee, Jefferson; Vice President, Noah Hoskin, do; Secretary, C. G. Calkins, Ashtabula; Treasurer, N. E. French; Managers, Erastus Hulett, Joshua Fobes, Jr., Shelby Smith, J. P. Jennings, Harrison Loomis; Marshal, M. W. Wright; Assist. Marshal, R. E. Fillmore.

The operations of this Society for the past year have been confined to holding the annual Fair.

The Fair was held September 30 and October 1. The weather was generally unfavorable, a heavy rain occurring on the principal and closing day; so the attendance was much curtailed, thus diminishing the receipts, while the entries were sufficiently numerous, and of a character to claim nearly all the premiums offered.

The number of members this year is 260, which is an increase over last year of 9 per cent.; No. entries, 611, an increase from last year of 43 per cent., which was distributed in nearly equal ratio through all classes.

The Fair, as an exhibition, was interesting and encouraging; and the attendance, though limited, must have reached three thousand, as indicated by the receipts, thus securing the point of usefulness in not allowing it to be wasted on the "desert air."

Two independent Societies held exhibitions, previously to the Fair of the County Society, both of which were in a good degree successful. They each had the advantage of being located in contact with the most populous villages, where they were easily accessible from most of the more densely populated districts, and on good soil for withstanding the effects of wet.

The agriculture of the Lake region is, too, more varied in character, having much light, sandy soil to operate upon. Hence these exhibitions were well stocked with the lighter articles of fruits, vegetables, and domestic, ornamental and fancy products; indeed the amount and variety of these was prodigious, capable of garnishing almost any State Show, in a superior manner. It is believed these organizations will attain a high degree of intrinsic usefulness, while so far they do not in an essential measure, if at all, detract from the interest of the central society. To make a good and in all departments full and respectable fair, it is necessary to combine the products of nearly all parts of the county, and this the society hopes to accomplish more fully in future fairs than has been done.

The season past has not been favorable to the farmers, in this region. The unremitting rains of the first part of summer precluded raising but the fragment of a corn crop, never large, and the midge came in for the best half of the wheat, which has for a few years been a paying crop where attempted.

Grass was abundant, and pasturage tolerable, but the hay crop is considered inferior in quality. The production of cheese has been equal to the average of good seasons, but the "times are out of joint" so as to derange the market for this staple, and seriously lessen its value.

Most of the beef cattle have been taken off at fair prices, and they are now saleable at a moderate reduction from former seasons.

Wool has been produced the last year more than for a few years previously, and most of it sold in the season of shearing, at prices much below what was then being paid for similar grades, in regions more remote from markets. Horses are plenty in the county, but not saleable at good, fair prices owing to the falling off of business requiring their use. This county has for a few years exported largely of lumber, staves and oars, but now there is a stagnation in this trade that will deprive many who *should* be engaged in agriculture of their accustomed and favorite employments, of destroying the forests, teams, and the plank roads. But there will, for a time, be an excess of teams, if not of teamsters.

Fruits have not been abundant, though a fair supply throughout. The export demand has not been such as to cause the export of as much green and dried fruits and cider, as formerly, but there is no burdensome surplus remaining.

Potatoes and other vegetables have grown well where above water, but more or less potatoes were lost by disease. Early planting on selected and suitable soils, is not sufficiently attended to to secure, as it would, uniformly good and sound crops, in wet or dry seasons. But we shall not be under the necessity of importing at enormous prices this year.

This county now imports, of ordinary domestic agricultural products—

Flour, two-thirds the whole supply, nearly.		
Pork, one-fourth	do.	do.
Corn, one-half	do.	do.

Enough is known, experimentally, of the capabilities of our soil, to prove that we might export more or less of these, so soon as we would earnestly enter on the work of *reform in agriculture*, which is now the obvious duty of all who in any way control the operations on the soil. Land-wasting is a leading vice of a majority of the rural occupants, which the darkness of ignorance shields, but does not excuse, because it is itself inexcusable.

The chief glory of agriculture is to overcome defects in the arrangement of surface and soils, and the adversities and vicissitudes of climate and seasons. To the really successful agriculturists of the main portions of ours and of several other counties, will belong this honor, in an eminent degree. Drainage, thorough tillage, and the careful application of manures, should be the *ends* of persevering endeavor, and all "other things" sought to be gained by farming, "shall be added unto you."

ATHENS COUNTY.

The Athens County Agricultural Society is in a thriving and prosperous condition. The number of members is annually increasing, and a growing interest is manifested in all the operations of the society. During the past year the society has secured a lease (running ten years,) of a new site for holding their annual festival. The new location contains about eleven acres, which the society has enclosed with a substantial fence, and provided with permanent buildings, stalls, driving ring, wells, a large and commodious dining hall, and all the conveniences and comfort necessary for a full enjoyment of their annual exhibitions. The attendance at the fair was not as large as usual, owing to the unfavorable weather. There was a good display in all departments.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$723 54
Total expenditures	563 77
Balance in treasury	$159 77

OFFICERS—President, W. P. Johnson, Athens; Vice President, G. McDougal, Amesville; Treasurer, Lot L. Smith, Athens; Secretary, George H. Stewart, Athens. Directors, H. T. Hoyt, S. W. Pickering, Dr. William Campbell, H. B. Brawley, S. D. Workman, B. F. Johnson and John Elliot.

BELMONT COUNTY.

Fair September 30th and October 1st and 2d.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$1,591 62
Total expenditures	1,591 55
Balance in treasury	07

OFFICERS—H. Pennington, President; O. Taylor, Vice President; G. H. Heaton, Treasurer; G. Mitchell, Secretary. Managers, E. G. Morgan, S. Davis, T. Houghban, G. Bethel.

BROWN COUNTY.

(*Independent Industrial Association held a Fair at Ripley October* 6*th*, 7*th*, 8*th and* 9*th*.)

Our last fair passed off pleasantly, on the 29th and 30th of September and 1st of October, and paid to the society more than any of its predecessors. The attendance was large, and sufficiently evinced that our people are wide awake to the importance of agricultural improvement.

The crop this year is abundant; taking all agricultural productions into account, the amount this year exceeds any former crop.

The signs of improvement are visibly manifested in many sections of our county. Reaping and mowing machines are quite generally used. Farmers are using ground food, and some of them have begun to cook it before feeding. Great attention is paid to breeding good stock of all kinds.

Our society has erected a spacious hall for holding our fairs, which is the most elegant building of its kind in this section of the State.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$1,188 79
Total expenditures	1,188 79

OFFICERS—President, James Loudon, Georgetown; Vice President, B. Dugin, Georgetown; Treasurer, A. Sallee, Georgetown; Secretary, C. F. King, Georgetown. Managers, Thomas Jennings, Charles Richards, Charles Abbott, G. R. Shields, Jackson Dugin.

BUTLER COUNTY.

The seventh annual Fair was held October 7th, 8th, and 9th, 1857.

The operations of the Society during the past year have been more successful than heretofore. Its members amount to fourteen hundred.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$2,452 32
" disbursements	2,423 59
Balance on hand	$28 73

OFFICERS.—Charles L. Gano, President; John W. Erwin, Vice President; Geo. W. Tapscott, Treasurer; Lewis D. Campbell, Secretary. Directors, Michael Bowerman, Wm. H. Campbell, Richard H. Hendrickson, Christopher Hughes, William Sample.

CARROLL COUNTY.

The sixth annual Fair of the Carroll County Agricultural Society was held on the 14th, 15th, and 16th days of October, but owing to the extremely bad weather, the Fair was adjourned till the 27th and 28th days of October, but the weather still being unfavorable, our Fair was not half so good as it would have been had the weather been good: but with the bad weather, &c., &c., we had 148 members. The exhibition of horses was excellent; the cattle tolerable, but owing to the weather our best stock was not brought out. There is a marked improvement in the sheep of this county.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$337 42
" expenditures	465 50
Deficiency	$128 08

OFFICERS.—Harvey Cogsil, President, Kilgore; Thomas Weir, Vice President, Carrollton; John Thompson, Treasurer, Carrollton; Isaac Ulman, Cor. Secretary, Carrollton; Wm. Gantz, Rec. Secretary, Carrollton. Managers, Thomas Lee, Carrollton; Wm. Davis, Oneida; Lemuel Hole, Augusta; Robert Patterson, Carrollton; John Buchanan, Carrollton; John Casky, Carrollton; P. McGinty, Norristown; Jonah Queen, Salineville; James Beatty, Waynesburgh; John Rainesberger, Davis; Samuel Williams, Lamartine; Otho Baker, Hagerstown.

CHAMPAIGN COUNTY.

The people appear awakened up to their true interest by their patronage and support of our County Society. Our last Fair, which was held on the 13th, 14th, 15th and 16th of October, was a complete success. Never before has so much interest been manifested. The weather most of the time was wet and disagreeable, yet the attendance was large, and although we held our Fair four days, the interest was maintained to the last, and the receipts more than enough to meet all expenses.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,426 38
" expenditures	1,101 53
Balance in Treasury	$324 85

OFFICERS.—F. U. Stokes, President; A. F. Vance, Vice President; N. H. Harr, Treasurer; A. Bennett, Secretary. Managers, Price Morris, Jas. Wilson, O. Fairchild, Sam'l Cummings, J. Brubacher, Jas. D. Powell, Jno. Earsom, T. H. Thomson, Wm. Thomas, Daniel Snyder, A. R. Hedges, Thos. F. Woods.

CLARK COUNTY.

The fifth annual Fair was held on the 7th, 8th, and 9th of October. The weather was delightful, and the attendance very large. More interest than usual seemed to be taken in the Fair.

The show of horses was very fine; some splendid "Morgan colts" were in the ring, from the celebrated horse, "Paragon Morgan." The display of cattle was as usual very good. Our county can boast of having some of the finest stock in the West, and many extensive breeders of blooded animals.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$2,324 46
" expenditures	2,186 03
Balance in Treasury	$138 43

OFFICERS.—Wm. Hunt, President, Springfield; C. M. Clark, Vice President, Springfield; John Howell, Rec. Secretary, Springfield; W. S. Field, Treasurer, Springfield. Managers, T. J. McClintock, Springfield; Peter Sinty, Jr., Springfield; Jacob Peirce, South Charleston; Alex. Waddle, South Charleston; Perry Stewart, Clifton; J. R. Miller, Enon; Edward B. Cassilly, Springfield.

CLERMONT COUNTY.

(*Independent Fair at Bantam, September* 22*d*, 23*d*, 24*th and* 25*th*.)

Our ninth annual fair was held near Olive Branch, September 29th to October 2d, inclusive, under favorable auspices, and with highly gratifying results.

The throng of people gathered from all parts of the county; the quantity of stock of every kind, and the endless variety of implements, machinery, fruits, vegetables, grains, handiwork, &c., on exhibition, testified with unerring significance to earnest zeal in agricultural progress, while placing the seal of approving sanction upon the arrangement.

The favorable opportunity afforded the people of our county to witness the recent grand show of Ohio, no doubt had the effect to stimulate them to renewed exertion, and to give to their own fair an extended influence and usefulness.

The display of live stock of every kind was highly creditable to the county, but in one or two branches we are not able to note any rapid improvement.

In horses we think our show was scarcely equal to the year previous in numbers, while in character about the same. Though the improvement in this stock is not as decided as it should be, it is, we believe, gradual and sure.

In cattle, however, the exhibition was beyond comparison, the best ever held in the county, and was really gratifying to the lover of improved stock. The interest in this branch of agricultural wealth is certainly established, and our farmers are fairly awake to the profit of raising animals.

Mules are extensively bred in some portions of the county, and were on hand in very good character. There were also one or two very fine Jacks on the ground. This species of stock, though not one generally esteemed, is gradually being improved.

In Fruits, Grains and Vegetables, our show this year was very fine indeed. The arrangement and variety of display in our fruit hall attracted especial attention, many remarking a superiority in some respects to that of the State Fair.

Field Crops were, in many instances, remarkably fine, but farmers seem backward in entering them. The extra trouble and difficulty in keeping one acre or five acres of a crop separate from the main body, to harvest, thresh, clean and measure it apart, deters many from making any effort to compete. We propose to obviate this objection by permitting each one to enter his whole field or crop, limiting of course to a *minimum*, (say of 10 acres,) and compete per acre with each other upon equal footing. The practice of the society, heretofore of offering small premiums upon farms does not meet with that response from our best farmers, that we should desire, and in general, those premiums that have been awarded, have been bestowed upon second or third rate farmers, the *best* not offering. It has been a subject of discussion for some time, whether or not it would be wise policy to offer *large* premiums upon farms, to the exclusion of some minor interests, offering liberal inducements to competition, while at the same time by raising the standard of excellence, we should require a really improved degree of cultivation. The point is, that by offering two or three hundred dollars, say as premiums on farms, we would induce thousands of dollars worth of improved buildings, fences, drainage, orchards, deep plowing and general culture, whereas the few 10 and 20 dollar premiums really accomplish nothing.

Our annual address was delivered by Hon. Bellamy Storer, of Cincinnati. It was an eloquent, vigorous effort, eminently practical, and full of wholesome advice to both old and young. The warning to the young men and women of the country, against the temptations of the city, and the evils that curse the present day—*a great haste to be rich*, was exceedingly appropriate and well timed, and evidently calculated to produce an impression just at this particular juncture. The distinguished gentleman was much interested in the evidences of prosperity and progress we were enabled to show him.

We have distributed as premiums as far as possible to do so, various books and periodicals of an appropriate character, regarding every dollar distributed as a premium in this shape, as productive of twofold the benefit that it would be if paid in money. Farmers are not backward to read as a class, but they do dislike to pay their money away for reading material, beyond the county newspaper. In this mode the books and periodicals do not seem to cost anything, and we find a strong desire to obtain them. Those we have mainly awarded are the Ohio Farmer, Ohio Cultivator, Ohio Valley Farmer, Cincinnatus, Country Gentleman, Albany Cultivator, Stephens' Book of the Farm and Saxton's publications generally.

RECEIPTS AND EXPENDITURES.

Total receipts from all sources	$2,870 83
Expenditures	2,870 83

OFFICERS—John H. Branch, President, Branch Hill; L. D. Salt, Vice President, Williamsburg; W. Donaldson, Secretary, New Richmond;

H. Talley, Treasurer, Batavia. Directors, Mott Titus, Geo. S. Swing, John Applegate, E. G. Beck, Dr. S. S. L'Hommedieu, John Kugler, Jos. McConnell, S. R. S. West, Shadrack Dial.

CLINTON COUNTY.

We abandoned our former Fair grounds, and procured of Hon. Isaiah Morris, a delightful grove immediately east of Washington. We enclosed about fifteen acres, and erected part of the necessary structures, for the comfort and convenience of those in attendance.

Our Fair was held on the 23d, 24th and 25th days of September last.

We regard our last Fair as much the most successful, that was ever held in this county.

From the reports of our committees, as well as from our personal observation, we are inclined to *boast* a little, as to the entire success of the exhibition, particularly of horses, cattle, and sheep.

We were favored with pleasant weather, and we were permitted each day, to see some five thousand persons assembled, and no serious accident happened to any one; and only two young gentlemen, during the whole time, considered it necessary to use a "*drop of the critter*," and thus becoming too *hot*, were stowed away to *cool* off.

It is deemed unnecessary to say anything in commendation of our improvement in stock, machinery, or manner of farming, in our county; suffice it say that our farmers, generally, have become thoroughly convinced, that if they keep up with the present age they must *read* as well as *work*, and thus combine *science* and *labor*, the result of which is, large and profitable crops.

Reaping and mowing machines, wheat drills, and *improved* agricultural implements, are nearly as common and considered as indispensable, among the better class of our farmers now, as *cast-iron* mould board plows were a few years ago.

Our farmers have this year been favored with unusually large crops, and although most of our farm products have fallen in price, yet the extra yield will fully compensate them.

Our yield of hay, has been about one and a half tons to the acre; wheat about twenty bushels, (some fields yielding as high as thirty-eight bushels) to the acre; corn about fifty bushels, flax-seed about ten, and oats about thirty bushels to the acre.

The early *frosts*, or rather *freezes*, has caused our corn to be much lighter than it would otherwise have been.

We have never perhaps, had better root crops, especially in potatoes. We seem almost entirely to have escaped the potato rot this year.

The price of our leading farm products, in all parts of our county is about as follows: wheat 70 to 75 cents, flax-seed 70 to 80 cents, corn, oats and potatoes, 25 cents per bushel, pork $5, beef from $4 to $5 net.

We think the prospects of our society for success and usefulness was never more flattering.

Among the last things that *happened*, on the afternoon of the last day of our Fair, was a small sprinkle of *female equestrianism*, which proved a little too *fast* for even the *young America* portion of our population.

Our Board, while in session making out the list of premiums for publication, to be awarded at our last Fair, decided against offering any premiums to horses for *speed* alone, or *female equestrians*.

Our reason for stating these facts in this report is, to call the attention of the State Board, to these subjects.

It is believed by a majority of our Board that there is no necessary connection between *fast trotting*, *fast pacing*, or *female equestrianism* and *Agricultural Fairs*. But as long as State Societies foster and encourage such things, many will be found in every county, who will insist that county societies should not be behind in the *beautiful* and *graceful*, as well as the *substantial* and *useful*.

Our Society now numbers 671 members.

The soil of our county is peculiarly adapted to grass and corn, consequently cattle, sheep, horses, and hogs, are our leading staples in the way of stock.

We have no distillery in this county, but from occasional demonstrations, we are of opinion that some of the adjoining counties, do something at this business.

Our fruit crop this year has been very small, and what there was, was quite defective.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,694 50
" expenditures	1,693 06
Balance in Treasury	$1 44

OFFICERS—A. E. Strickle, President; J. G. Starbuck, Vice President; William Crumly, Treasurer; A. W. Doan, Secretary. Directors, E. L. Lacy, Samuel Pyle, Jeptha Perrill, E. W. McMillan and T. H. Vandevoort.

COLUMBIANA COUNTY.

The annual Fair of the Society for the year 1857, was held on the 28th, 29th, and 30th days of September, and was the largest, and, in every respect, the best ever held in the county. The laudable emulation manifested by competitors, and the interest exhibited, universally, by the members, and visitors in attendance, was truly gratifying to those who feel interested in the success of the Society, and the improvement of agriculture throughout our county, and is evidence conclusive that our agricultural society has become a *fixed* and *permanent institution.*

The exhibition surpassed the anticipations of even the most sanguine, and was one of which "Old Columbiana" may well be proud. The Society numbers 277 members, being an increase of 109 since last year. The exhibition of horses, cattle, sheep, hogs, and specimens of the productions of the farm and the garden, articles of domestic manufacture, agricultural implements, and samples of the handiwork of the ladies, and the variety and quality of each, as compared with former years, denoted the fact that an ambitious but praiseworthy spirit of improvement is prevailing, by the influence and efforts of our Society, in every department and branch of the stock-raising, producing, and manufacturing interests of our county.

The condition of the Society is prosperous. During the present year they have enlarged their horse-ring to double its former size; erected a large number of new cattle-stalls; planted a good many ornamental shade trees, and made many other necessary and permanent improvements on their Fair grounds, demanded by the increasing prosperity of the Society.

There were no entries for premiums on field crops (by the acre), except four, all of them being Sorghum Saccharatum, or Chinese sugar cane; but all of the competitors having failed to produce the required statements, no awards were made.

Our Society this year offered a first premium of $15, and second premium of $10, to the young or unmarried ladies who should produce at the Fair, the first, and second best, two loaves of bread. The result was, that there were thirty-two specimens of that article, alone, entered, and formed one of the most interesting features of the exhibition. We have no doubt that the offer of these premiums by our Society has been the cause of introducing the small white hands of many young ladies in our county, to the plastic dough, and, under the willing tuition of their mothers, making them good bread bakers. We hope that our Society will continue to offer liberal premiums on bread, both to the married and unmarried, and that they will offer, also, liberal premiums on other of the essential arts connected with good house-wifery, and that the same system may be adopted by other Societies throughout the State. The importance of a more general knowledge of the essential arts connected with good house-keeping, demands it; the fact that it will induce the young ladies of our counties to become good house-keepers, as every young lady should be, requires it; and the additional fact that the ladies of every family in our counties can compete on equal terms for these premiums, and consequently, that a feeling of interest in the welfare and success of the Society is extended into every family in our county, should be a sufficient reason for its adoption.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,284 78
" expenditures	1,193 69
Balance in Treasury	$91 09

OFFICERS.—James Sterling, President, New Lisbon; C. H. Cornwell, Vice President, Salem; Dennis Harbaugh, Treasurer, New Lisbon; Wm. J. Jordan, Secretary, New Lisbon. Managers, Samuel Bowman, New Lisbon; John Ramsey, New Lisbon; John Robinson, Little Beaver Bridge; Laben Ferrall, Fairfield; G. T. Satterthwait, Salem.

COSHOCTON COUNTY.

Fair October 14, 15, and 16.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,038 82
" expenditures	1,090 00
Deficiency	$51 18

OFFICERS.—M. P. Wheeler, President; J. M. Burt, Vice President; M. Johnson, Treasurer; C. H. Johnson, Secretary. Managers, T. Darling, Geo. Wolf, T. S. Humrickhouse, S. C. Burnell, W. Batchelor, E. L. Robinson, F. McGuire.

CRAWFORD COUNTY.

The Crawford County Agricultural Society has been in operation ten years, and its success has far exceeded the anticipations of its early friends. The tenth annual Fair was held on the 15th and 16th of October last, and was well attended. The exhibition was in every department greater than at any previous Fair in this county, and the result was most satisfactory to both officers and members, who were pleased to see such a large attendance, and to see every department so well filled, and that, too, in the face of predicted failure. The list of members now numbers two hundred and seventy-three.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$660 18
" expenditures	660 25
Deficiency	07

OFFICERS.—Samuel S. Caldwell, President, Bucyrus; Henry Minich, Vice President, Bucyrus; H. M. Locke, Secretary, Bucyrus; F. W. Butterfield, Treasurer, Bucyrus. Managers, D. C. Boyer, P. S. Marshall, Wm. Cox, Amos Horse, Jacob Mollenkoph.

CUYAHOGA COUNTY.

(*Independent Society's Fair at Dover, October* 15.)

This society held its eleventh annual Fair on the 29th and 30th of September and 1st of October. From the results of this exhibition we are free to say that an increased interest is felt in it by our citizens in behalf of agriculture. Although the exhibition was held under the most unfavorable circumstances, yet the show was above the average in every particular that has had a tendency to make it interesting and useful. During the entire exhibition we had scarcely three hours of uninterrupted rain; all this did not check the ardor of the officers and friends of the society. The great object of our society is materially advancing. The number of articles exhibited was fully equal to any previous fair held by the society.

An increasing interest is being taken by a large number of our agriculturists on the subject of the culture of the grape.

The society are under obligations to W. H. Beaumont & Co., for the display of green house plants, adorning our Floral Hall with the blossoms of a thousand varieties of flowers, and filling it with their perfume. To F. R. Elliott for a great variety of pears and other fruit; of the former he had over one hundred different varieties. To Mrs. Seth A. Abbey for her successful efforts in adorning Floral Hall with a large and exceedingly beautiful hydrangea. Mr. Jno. Stair presented clusters of "white sweet water grapes," raised in the county, the first ever exhibited to the society. We cannot close this portion of our report without a few words in commendation of "the Shakers," who lent a very attractive feature to our exhibition. It is well known in this county that these people (who are not so singular as many suppose,) are doing more for the advancement of agriculture and its accompanying branches, than any other set of people among us. They are careful to propagate nothing but the best of every variety, and by a system of study and application, they have become the standards of excellence in the great features that distinguish good farmers from poor ones. The Shakers exhibited a herd of cattle of various breeds that were pronounced superior to any on the ground, but their peculiar quaint notions of right and wrong would not permit an entry to be made on our book for competition, so therefore we only regard them in the light of exhibitors. We trust that they will continue to mingle in our annual exhibitions for our mutual good. We can but regret that so enterprising a set of people—endowed with all the elements that tend to make a great and a good people—feel, that their christian duty compels them, not to perpetuate a race that we all respect and admire for their many virtues. Unfortunately the race of Shakers will be likely to die out with the present generation, and be forever lost if no change of sentiment comes over them.

This society cannot report any variation in the kinds of agricultural products from our previous communications.

Our principal market town is the city of Cleveland, from which radiates much of the products of the county, and it would not be improper here to say that a large market is yearly opening around the upper lakes, particularly Lake Superior, for the sale of our early vegetables. For several years past our dealers have sent vast quantities of this commodity to those regions, and with a remunerative profit. The adaption of our soil to the raising of early vegetables, and the daily facilities for shipment, has induced many of our gardners to look to the region of the upper lakes for a market.

The number of contributing members to our society is four hundred and fifty-six.

The distribution of seeds by the Commissioner of Patents, has been, during the past year a matter of especial moment, a large variety was sent to the secretary and were carefully apportioned to producers in every part of the county and we are glad to say that this diffusion of seeds has been productive of incalculable good; new varieties of wheat, barley, corn, cabbage, lettuce, cauliflower, sugar-cane, and many others have been found to be of excellent quality. Mr. Cutshaw of Royalton, has tried the "Wingart Cabbage," and pronounces the best he ever raised, a thrifty grower, solid headed and remarkably sweet and tender. Mr. Richard Radway of Newburg, has tried the "White Turnip," and pronounces it excellent, better than any variety in common use. Thomas Dowse of Newburg, and Wm. Cowan of East Cleveland, have tried the "Cos Lettuce," and pronounce it a superior variety. The Chinese sugar cane seed, sent from the patent office, has been used by great numbers, and it is thought another year will thoroughly test the practicability of producing this commodity in our county; many esteem the slight experiment of the last year a decided success.

RECEIPTS AND DISBURSEMENTS.

Total receipts	$1,018 69
Total expenditures	913 08
Balance on hand	$105 61

OFFICERS.—E. T. Sturtevant, President, East Cleveland; A. A. Jewett, Vice President, Newburg; Wm. Dewitt, Secretary, Cleveland; B. H. Stair, Treasurer, Cleveland. Managers, O. W. Hotchkiss, Josiah Hurst, C. S. Gates, E. S. Willard, F. R. Elliott.

DARKE COUNTY.

The Darke County Agricultural Society held their Annual Fair upon the 23d, 24th and 25th of September. The weather was delightful and the attendance was larger than upon any former exhibition, and an unabated interest was maintained during the whole period.

We deem our Society no longer an experiment, but one of the fixed institutions of this county. Many of the farmers who were slow in giving us their confidence and patronage, and some who were even hostile to our organization, have become our ardent and fast friends.

We think there can be no one who has given attention to the agriculture of this county, but must have observed a marked improvement in all its branches. Tillage has been greatly improved—being much more thorough. Bodies of swamp lands that were deemed worthless for cultivation, have been reclaimed by draining, and are now our most productive lands. All kinds of stock have been improved, and some of the best qualities introduced. Farming implements are of improved construction, fencing is better, buildings are improved, and every thing else that contributes to the appearance of thrift and tidiness of the farm.

All this favorable change, perhaps, may not legitimately be attributed to our *institution*, but we think that there has been no one cause that has contributed so largely to it as the organization of our Society—and probably the next most efficient cause has been the dissemination of valuable agricultural periodicals, and this has been procured chiefly through the influence of our Society.

Our late exhibition we think has in all its departments at least equalled any former one of our Society, and in some departments decidedly excelled. The show of vegetables, especially, excelled any former exhibition. The show of domestic manufactured articles we thought creditable, and gave indications of an increased interest among the ladies of this county in the prosperity of our Society. The show of stock and of the other departments was not materially different from that of the exhibition of the previous year.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$981 00
" expenditures	682 00
Balance in Treasury	$299 00

OFFICERS.—Moses Hart, President, Greenville; Jacob Shively, Vice President, do; Joseph Bryson, Treasurer, do; Michael Spayd, Secretary, do. Managers, Abdel Sloniker, Geo. Elston, Isaac Funk, James Cole, and Reuben Lowry.

DEFIANCE COUNTY.

Our Society is now in a prosperous condition. We held a Fair at Farmer's Center, which was well attended, considering the disagreeable weather. We have upwards of ninety contributing members. There was paid out for premiums at that time, ninety-four dollars. The amount of money received of the county was thirty dollars.

This was the first Fair since 1845, and the fourth since the organization of the Society, but there seems to be a spirit of improvement manifested, which if encouraged, will be beneficial.

No finance report.

OFFICERS.—W. D. Haymaker, President, Brunersburg; Joseph Ralston, Secretary, Defiance; Brice Hilton, Treasurer, Brunersburg.

DELAWARE COUNTY.

The annual Fair of the Delaware Agricultural Society was held on the 7th, 8th, and 9th of October, and far exceeded that of any previous year, both in the character and quantity of articles exhibited, and the increased interest manifested by the whole community in the prosperity of the Society.

The attendance was very large, much more so than in any previous year, and the large increase of members is very gratifying. The number of members is now 1,005; last year, 591.

The display in the more important departments was very satisfactory. The improvement in cattle, horses, hogs, and sheep, was marked and manifest, affording the most gratifying evidence of an increased and increasing interest in the improvement of the stock of the county, by the introduction of superior breeds of animals.

In poultry the show was very meagre, indicating a decided abatement of the "chicken fever."

In vegetables the show was particularly fine, both in quantity and quality, affording evidences of good cultivation and careful selection of choice varieties.

Household fabrics and needle and fancy work were well represented, and afforded the most gratifying indications of the skill, taste, and industry of the *fair* exhibitors.

In fruits the display was not large. Some very fine apples were exhibited, and some beautiful specimens of grapes. In addition to some very fine foreign grapes, good samples of the Isabella and Catawba were on exhibition. The Delaware Grape also fully sustained its high character and reputation, proving itself perfectly hardy, very productive, of the most exquisite flavor, and improved in all respects by good culture. Peaches were nearly a total failure in this county this season, and plums are almost all destroyed by the curculio every year.

The influence of our County Agricultural Society upon the farming interests, is evidently highly beneficial; and at no period of its existence have its capabilities for usefulness been so great as at present. With capacious grounds, handsomely and permanently improved, with a largely increased membership, and with a board of officers and managers composed of gentlemen of acknowledged worth, talent, and energy, its future success and usefulness are placed beyond contingency.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,989 93
" expenditures	1,637 19
Balance in Treasury	$352 74

OFFICERS.—Nathan Dustin, President, Galena; Frederick Avery, Vice President, Delaware; R. E. Hills, Treasurer, Delaware; Edward Pratt, Secretary, Delaware. Managers, Jno. Wolfley, Wm. P. Frost, H. P. Havens, Dexter Durphy, John Dirst, Thos. F. Joy.

ERIE COUNTY.

The third annual Fair was held at the grounds in Huron, on Sept. 30th and October 1st and 2d, and prolonged to the 3d, for reasons hereafter stated. It opened with unwonted fair prospects. During the first day of the Fair, the weather was very favorable, and the number of entries in the various departments at the close of the day was much larger than at any previous year; the number being about 700. During the night following, an unusually violent storm commenced, which continued for the two days following. The almost constant fall of rain was accompanied with high winds, which often, and indeed for most part of the time, increased to a gale. The consequence was that many of the articles and animals entered were not brought forward, and the number in attendance was but comparatively small. The exhibition was, in consequence of the storm, con tinued another day. But though the storm had mostly subsided, still the streams were high, and the roads were exceedingly heavy. The number present, therefore, on the 4th day, was by no means large. These untoward circumstances will satisfactorily account for the diminished amount of our receipts.

Notwithstanding these occurrences, the show of stock, grains, vegetables, &c., was very good, exhibiting a decided improvement upon the previous year. The show of fruit was also quite large, and of decidedly good quality.

There was manifestly an increased interest in our Fair among the people generally. There is also manifest among the farmers a disposition and a purpose to improve not only their farms, but their stock of every description. In short, our prospects as a county are of the most encouraging character.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,219 60
" expenditures	903 60
Balance in Treasury	$316 00

OFFICERS.—I. T. Reynolds, President, Huron; Elijah Bemis, Vice President, Lyme, Huron Co.; F. D. Parish, Secretary, Sandusky; C. N. Ryan, Treasurer. Managers, Isaac Fowler, Wm. H. Crane, Wm. Squire, Wm. Parish, Charles H. Ransom.

FAIRFIELD COUNTY.

This Society was formed several years after many of our sister counties had adopted the plan of holding Annual Fairs; and since its organization it has met with uninterrupted success. It has become the owner of large, conveniently located and valuable grounds, upon which have been from time to time erected permanent buildings, suitable for the purposes of the Society. At the present time it may be safely said that no Society in the State is better provided with grounds, and all the means of holding the annual exhibitions of the products of the county. It has been the policy of the Society to make all the improvements upon its grounds with a view to taste, usefulness and permanent durability; and the result has been a completeness in this respect, of which we may well be proud. And although the outlay of money has been large, yet in the end it will be found that the plan will prove *cheaper* than the practice of annually erecting such temporary buildings, booths, sheds, &c., as the absolute necessities of the Society requires for the time being.

The Fair was held on the 18th, 19th and 20th days of October,—a period, in my judgment, too late under the most favorable circumstances, to fairly exhibit all the vegetable products, especially those of the garden, to the best advantage.

On the two first days of the Fair it rained incessantly, rendering it next to impossible for exhibiters or visitors to be in attendance on those days, and crowding so much into the last (which was fair) that this exhibition was not as satisfactory as some which preceded it.

Nevertheless, the attendance was respectable, the various classes of productions were well represented, showing that the interest of our people in these exhibitions has not in the least abated.

Within the past five years very many of the farmers of the county, have taken great pains to secure the best breeds of cattle and horses, and in these departments we can boast as good exhibitions as any county in the State.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,913 07
" expenditures	1,477 06
Balance in Treasury	$436 01

OFFICERS.—J. Reber, President: J. G. Cassel, Secretary; J. C. Weaver, Treasurer.

FAYETTE COUNTY.

The Annual Fair was held on the 8th, 9th and 10th days of September, 1857.

The number of members are 118. The whole number of entries, 333.

All classes of our county were represented, and their productions were alike creditable to the industry and skill of all. An unusual interest in the prosperity and success of the Society was manifest, not only by members of the Society, and exhibiters, but by the spectators, not only of our own but from adjoining counties.

We have ten acres of land well enclosed, with stalls and pens, halls and offices, suitable for the occasion. The land is owned by agriculturists, and kept for the use of the Society.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$400 00
" expenditures	441 39
Deficiency	$41 39

OFFICERS.—Gilbert Terrell, President, Jeffersonville; William Palmer, Vice President, Bloomington, Clinton county; M. Draper, Treasurer, Washington; S. F. Kerr, Secretary, Washington. Managers, Jesse Hageler, Samuel Myers, A. Wright, William Rodgers and I. N. Beatty.

FRANKLIN COUNTY.

The total number of members the present year is 866. Our Fair was held Sept. 9th, 10th, and 11th, and was very successful, both as an exhibition of stock and farm products, as well as pecuniarily.

Annexed will be found a comparative statement of the workings of the Society for four years, embracing the number of articles entered for exhibition, and the total receipts for each year, exclusive of moneys received from the county:

	1854.	1855.	1856.	1857.
Articles entered	563	604	722	834
Total amount received each year, exclusive of county appropriations	$1,274 35	$787 70	$1,468 99	$1,745 75

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$2,387 97
" expenditures	1,088 11
Balance in Treasury	$1,299 86

OFFICERS.—David Taylor, President; Alex. Mooberry, Vice President; Thomas Moodie, Treasurer; Gamaliel Scott, Secretary. Managers, J. H. Stage, W. T. Decker, John Stimmel, C. J. McDaniel, S. S. Davis.

GALLIA COUNTY.

The seventh annual Fair of Gallia County Agricultural Society was held on the Fair grounds, on the 30th day of September, and 1st and 2d days of October, was well attended, and each department well represented.

There is a manifest improvement in the stock of our county; a large number of horses were on exhibition; sheep and cattle were well represented.

Premiums, the Society this year paid in cash and the Ohio Cultivator (a plan we adopted where we wished to allow small premiums on stock or vegetables, was, instead of cash to award the Ohio Cultivator for one year, the benefit of which has not yet been realized).

Crops: we had good crops of all kinds; an unusual amount of wheat raised, although a considerable quantity inferior in quality; probable average yield per acre, 20 bushels. Corn is excellent; some danger from early frost was anticipated, as the crop was later than usual, but the season was favorable, and the crop may be said to be excellent. Potatoes: a good yield, and of excellent quality. Hay: the crop of hay was large, but the wet weather at the time of harvesting damaged a large amount. Pork: the number of hogs fatted is still diminishing; the high prices for wheat for the last three years has tended to lessen the corn and the pork crop.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$244 23
" expenditures	166 26
Balance in Treasury	$77 97

OFFICERS.—A. P. Rodgers, President; Samuel Jolly, Secretary; R. Black, Cor. Sec. Managers, B. F. Mills, J. W. McCormick, J. R. Smithers, J. R. Blessing, E. A. Stone.

GEAUGA COUNTY.

(*Independent Fair at Chardon, Sept.* 16, 17, *and* 18.)

Our annual Fair was fixed on October 1st, 2d, and 3d. On the morning of the second day, the rain, which had then been of several days' continuance, showed no sign of abating, and about noon, although there were some two hundred head of cattle on the ground, with a good show of horses, sheep, swine, &c., it was concluded by the almost unanimous voice of exhibiters, together with the officers of the Society, to adjourn until the 6th October, completing on that and the next day the Fair.

The morning of the 6th, at an early hour, were to be seen from every direction, approaching the Fair grounds, horses, cattle, and all varieties of stock, while the crowds of people picking their way among them, showed a determination not to be disappointed. About noon the clouds were dissipated, and the remainder of the time was very pleasant. By actual count, the number of cattle on exhibition was over 300, many of them very excellent specimens of their kinds, and all creditable. More than 300 horses and colts, pens full of sheep and swine, and the large halls, 140 ft. deep by 100 ft. front, part two-story, filled to overflowing. Entries of all kinds amounted to from 1200 to 1500.

The numbers in attendance on the last day were thought to be greater than at any previous Fair holden by the Society; the exhibition, on the whole, *more* successful, and one of which we, a county of sixteen townships in the deserted wastes of *Cheesedom*, may well feel proud.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,145 57
" expenditures	1,117 79
Balance in Treasury	$27 78

OFFICERS.—David Robinson, President, Russell; Anson Matthews, Vice President, Newberry; H. E. Ford, Secretary, Burton; M. D. Merriam, Treasurer, Burton. Managers, Lyman Millard, Harris Goold, Jno. Chase, N. E. Scott, E. Thompson.

GREENE COUNTY.

The annual Fair was held on the 30th of September and the 1st and 2d of October; the attendance during the whole period of the exhibition gave evidence of an increased interest in the success of the society, and a growing desire on the part of the members of our farming and mechanical community to avail themselves of the occasion to increase their stock of information bearing upon their different avocations. In every department the fair was a decided improvement upon any one which has heretofore been held in the county. The policy of the Board, heretofore pursued, of distributing freely as premiums, the several agricultural publications of the country, is having its influence—and the knowledge, thus disseminated of agricultural and mechanical improvements, is making itself apparent in the county.

There is no branch of agricultural industry which has not, in the opinion of the best and most intelligent farmers of the county, felt the influence exerted by our society—and that influence may be seen in the more general diffusion of the best breeds of horses and cattle, in the improved condition of farms, and in the desire manifested by farmers to avail themselves of the improvements and advancement made by their brother agriculturists here and elsewhere.

The ladies were very active in their department, and nothing equal to the exhibition which they made of butter, bread, quilts, carpets, &c., has been seen in the county heretofore.

The Yellow Springs Manufacturing Company has turned its attention to supplying the home market with improved implements for farm purposes, and the demand will unquestionably now keep pace with the increased opportunity to procure just such machinery as our farmers need.

RECEIPTS AND DISBURSEMENTS.

Total receipts from the Fair	$1,169 26
Total expenditures	1,169 26

OFFICERS.—Robt. D. Poague, President, Spring Valley; Daniel McMillan, jr., Vice President, Xenia; John Ewing, Treasurer, Xenia; Wm. B. Fairchild, Secretary, Xenia. Directors, Robt. Brown, John S. McClung, Wm. North, John Corry, Ellis Long.

GUERNSEY COUNTY.

The annual Fair was held at Cambridge on the 1st and 2d days of October, 1857, and as a whole, was better than any previous one. The exhibition of stock, excepting poultry, of fruits and vegetables and household manufactures, was very good, better than at any previous fair. The entries of sheep, manufactures and implements, were not so numerous as they should have been, and we hope our mechanics and artizans will take care to remedy this in the future.

There were no entries for crops, modes of culture, best cultivated farms, &c. The trouble attending these and such like claims for premiums, and complying with the requisitions of the Board have so far deterred many from competing. This should not be, and we hope for the future to see claimants for every premium offered.

Notwithstanding these apparent neglects, agriculture in Guernsey is steadily improving. The most careless observer at our fairs discovers it in the improvement of stock of all kinds, as well as in the other productions exhibited. It manifests itself in the management of the farm, in tillage, in the use of improved implements, steel and subsoil plows, reapers and mowers, to the eye of every person passing over the county as the first of the good seed sown by the society.

We have suffered much inconvenience for the want of suitable grounds and buildings, on and in which to hold our fairs and exhibit our productions. The fairs having been held alternately at Cambridge and Washington, and no accommodations being provided at either place, rendered it impossible to manage the exhibitions satisfactorily, either to the society or to the exhibiters, or to make that show of the things on exhibition which their merits so richly demanded, and justice to the exhibiters required.

So well were our members convinced of this that they rescinded the alternating resolution, with a view of buying ground and fitting it up at Cambridge.

RECEIPTS AND DISBURSEMENTS.

Total reeeipts from all sources	$163 00
Total expenditures	000 00
Balance in treasury	$163 00

OFFICERS—Noah Hyatt, President, Cambridge; Joseph U. White, Vice President, Cambridge; Stephen Potts, Treasurer, Cambridge; Cyrus P. B. Sarche, Secretary, Cambridge. Managers, John Bute, John Cook, Alex. McCracken, John Prianlse, James Davis.

HAMILTON COUNTY.

The Society held the annual exhibiton on the 8th, 9th, 10th and 11th days of September. Our entry lists were as large as usual, except in the agricultural department which cannot be attributable to any other cause than the lateness of the season. Farmers were at least four weeks behind in their work. Very many did not get through with their harvest until the last week of August, having no time to prepare any thing for exhibition. Our stock never was excelled either in numbers or quality. The show of cattle was good; sheep are very scarce in our county, there being none worthy of mention. The show of swine was good. The Society is in a healthy state, and general good feeling pervading throughout.

There are no positive means of ascertaining correctly, the number of members belonging to the Society as there is no enrollment of names. There is no means of arriving at an approximation except, the number of members' tickets sold. And this subject is another of serious consideration in the minds of the Board, whether it is not better to abolish the dollar ticket system, as there is much imposition practiced by that part of community not overstocked with honor and integrity of purpose.

Prof. TURNER of Illinois, interested the Society in a very eloquent and instructive address, relative to agriculture and agricultural societies, their benefit to the interest of the working as well as all other classes of community. Gen. S. F. CARY followed him in a short, but one of his happiest efforts of talent and humor, which added much to the interest of the exhibition.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$16,220 00
" expenditures	15,201 17
Balance in Treasury	$1,018 83

OFFICERS.—J. P. Wilson, President; John Kennady, Vice President; J. M. Cochran, Treasurer; John Schenck, Secretary.

HANCOCK COUNTY.

The Annual Fair was held on the 15th and 16th days of October. The first day was very favorable. The latter commenced very stormy. Notwithstanding the inclemency of the weather, our Fair was very well attended. The exhibition of stock and mechanical products were good. A large variety of farm products would have been exhibited had the second day been more favorable. As it was, our farmers made a very good showing, as well as the ladies in domestic manufactures, and quilt, needle-work, &c.

There were eighty dollars paid into the treasury under the law regulating public shows, for agricultural purposes.

No finance report.

Officers.—William Martin, President; John Eckels, Vice President; Henry Brown, Treasurer; N. E. Childs, Secretary. Managers, Jacob Carr, David Alspach, Charles Eckels, George Stough, Ebenezer Wilson, Jonas Hartman.

HARDIN COUNTY.

The Fair was held on the 24th and 25th of September, and was well attended throughout. The display of articles was excellent.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$174 38
" expenditures	174 38
Balance in Treasury	$000 00

Officers.—Samuel Watt, President, Kenton; Chester Hatch, Vice President, Kenton; Hugh Letson, Treasurer, Kenton; Samuel Smith, Secretary, Kenton. Managers, W. C. Hampton, A. P. Rose, P. C. Boslaw, Robert Miller, John R. Gunn.

Officers for 1858.—Samuel Watt, President, Kenton; W. C. Hampton, Vice President, Mt. Victory; George Fry, Treasurer, Kenton; Samuel Smith, Secretary, Kenton. Managers, John Goodin, G. R. Moore, J. A. Elder, E. C. M'Lane, F. J. Thomas.

HARRISON COUNTY.

The tenth annual Fair of the Harrison County Agricultural Society was held on the Fair grounds at Cadiz, on the 6th, 7th, 8th, and 9th days of October. The weather was clear and warm; the attendance large, numbering some ten thousand, giving evidence that the farming community of the county is taking a lively interest in the advancement of agriculture.

The floral hall was filled to overflowing with the handiwork of the ladies, together with all kinds of pickles, preserves, jams, jellies, Chinese sugar cane, molasses, potatoes, pumpkins, squashes, &c., &c.

The principal crops raised in this county are wheat, corn, oats, hay, and potatoes.

Wheat: Our wheat crop looked very promising until the grain began to form, when the weevil took possession in many places in the late sown, and nearly destroyed it. Average bushels per acre, 15.

Corn: The spring being about one month later than usual, and the fall being much wetter than usual, about one-half of the corn is soft. Average yield, 45 bushels per acre.

Oats: We had more than an average crop of oats this year. Yield about 50 bushels per acre.

Potatoes: The potato crop was unusually good until nearly digging time, when they took the rot; in some locations nearly one-half was destroyed by the rot, and in some places nearly all.

Hay: The hay crop was unusually heavy.

Stock: Our stock show was good; cattle a little better than usual; horses elegant, and in large numbers, both for saddle and harness, the truth of which was made evident on the show ground the last day of the Fair.

Hogs: The number of hogs in this county is great; quality good, and still improving; when fattened they are sold on foot for eastern markets generally.

Fruit: Our soil and climate is favorable for all kinds of fruit cultivated in the temperate zone, of which apples is the staple. The quality is generally good. The crop the last season is not an average one.

Grapes: The crop was abundant, but in consequence of the late spring and wet fall, the grape did not ripen, and was caught by the frost.

Sheep and Wool: We can boast of both the quantity and quality of our sheep. Number in this county, 125,297; amount of wool, 400,000 pounds; average price, 50 1-2 cts. It is considered here by the best judges that the Silesian sheep are the most profitable kind, the wool being closer longer, and finer than that of any other. It is thought that the Silesian and Spanish crossed would pay better than perhaps any other.

Agricultural improvements are slowly but surely progressing in this county; superior breeds of animals of all kinds are eagerly sought after; labor-saving machines are becoming more abundant; reaping machines and mowing machines were much in use last harvest. Subsoil plowing has in a few instances been tried with success.

There are several copies of the Ohio Farmer and of the Ohio Cultivator taken in this county.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,647 53
" expenditures	1,554 95
Balance in Treasury	$92 58

OFFICERS.—Ingram Clark, President; Obadiah Slaumous, Vice President; Wm. Knox, Treasurer; S. McCormick, Secretary. Managers, J. Hatcher, L. Copeland, S. McFadden (Irish), J. Haverfield, H. Boyles.

HENRY COUNTY.

Fair at Napoleon, October 7 and 8.

No finance report, nor list of officers received at this office.

HIGHLAND COUNTY.

The prospects of agricultural improvement in this county continue bright. The number of members of the agricultural society is now 320. Our Fair this year was better attended than ever before, and the number of entries greater than at any previous exhibition.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,342 44
" expenditures	751 69
Balance in Treasury	$590 75

OFFICERS.—J. W. Pope, President, Samantha; John Jolly, Vice President, Hillsboro'. Managers, T. B. Miller, Benj. Conard, Jno. Patterson, Wm. A. Trimble, T. Scott Patton.

HOCKING COUNTY.

The fifth annual Fair of the Hocking County Agricultural Society was held on the 2d and 3d days of October, 1857.

During the past year the stock ring has been graded; substantial and neat buildings have been erected; and ample shedding and stabling for stock has also been erected, so that so far as regards necessary conveniences, but little remains to be added. It is but justice to add that for these improvements the Society is mainly indebted to its energetic and worthy President, Silas H. Wright, Esq., who from the first organization of the Society has taken a practical interest in its success, and the objects it is designed to secure.

The weather during both days of the Fair was exceedingly disagreeable, rain falling constantly, which will account for the small receipts.

Of the stock entered for exhibition, the show of horses was not large, but included some very fine animals. There was a fair array of cattle and milch cows, among them some "whose haughty forms evinced their noble blood." There were few sheep on exhibition; our farmers are paying but little attention to wool growing, considering how well our county is adapted to it. The display of fruits and vegetables was very fine. Peaches, large and luscious, in great abundance; apples of fine quality, but not plenty. A fair display was made by Geo. Hensel, Esq., who is an experienced and successful orchardist.

The show of farm implements was not an index to the interest which our farmers have really taken in securing the best means of cultivating their fields.

Upon the whole, we think that the exhibition at our Fairs from year to year, indicate a rapid and permanent improvement in agriculture and its kindred pursuits, in this county. The breeds of horses and cattle have been undergoing a great change by the introduction of blooded animals; grains, fruits, &c., are produced in far greater variety, and of better quality; and the general appearance of our farms is improved. By the extensive introduction of labor-saving machines, farmers are able to cultivate more thoroughly and more extensively.

These improvements are to be attributed, in a great measure, to the stimulus afforded by the competition proposed by the agricultural society; but there is another agency, introduced to a great extent by the Society, which is powerful in its influence upon the farmer: that is, agricultural reading, furnished by the excellent agricultural journals of our State. To these sources we are much indebted for the superior intelligence with which our farms are managed of late years, and the fact should not be overlooked by those who would elevate agriculture to the station it deserves—that of a *science*, and the most honored pursuit in which men can engage.

In this connection we would refer to a branch of industry which is rapidly engaging the attention of farmers and capitalists here—the manufacture of iron. Several furnaces are in operation, and with the ample provision of materials for the manufacture of iron, the number must be greatly multiplied in a few years. Independent of the advantages to those immediately engaged in the business, its increase is of the highest importance to the producers of the valley, furnishing as it does an excellent market, at remunerative prices, for all the products of the farm.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$253 98
" expenditures	209 61
Balance in Treasury	$44 37

OFFICERS.—Silas H. Wright, President; Wilford Stiers, Vice President; James W. Crooks, Treasurer; L. H. Culver, Secretary. Managers, Geo. Hensel, E. F. McFadden, Wm. Plummer, N. B. Woodward. D. Rolston.

HOLMES COUNTY.

The annual Fair and cattle exhibition of this society was held October 28th and 29th; the attendance was very large, considering the lateness of the season and inclemency of the weather, yet every department was well sustained. The effect of annual exhibitions of the products of the industry and skill of the farmers and mechanics of our county, is seen in improvements made from year to year.

The present season has been to the farmer a prospering and encourageing one; his meritorious labor was richly rewarded in every department of his industry, a hundred fold returned to bless his toils. Wheat crops were generally very good; corn, oats, barley, potatoes and every description of vegetables and fruits raised in the county abundant. Our stock is improving, especially horses; there were a greater number exhibited than ever before, and much improved.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$213 00
" expenditures	206 00
Balance on hand	$7 00

OFFICERS—Russel Wheaton President,; Dr. S. Welch, Vice President; D. S. Uhl, Secretary. Managers, P. McCullough, J. B. Painter, S. W. Carpenter, A. Lockhart, John Gillis.

HURON COUNTY.

The third annual Fair of the Huron county Agricultural Society was held at Olena, on the 6th, 7th and 8th of October; the exhibition grounds were filled with the fine improved stock of the county in such herds as to astonish all. The exhibition of stock far exceeded any other fair ever held in said county. The attendance of the friends of agriculture from all parts of the county was very large, and gave evidence of a deep interest and the importance of sustaining the Huron county Fairs in preference to the side-shows. The ladies as usual contributed their share to make Floral Hall attractive and beautiful, and gave assurance that nothing shall be wanting on their part to make, sustain and extend the interest of said society. The hall for grain, samples and vegetables was filled to overflowing; there being no field crops offered for premiums. The interest manifested by the farmers in Huron county in the improvement of stock of all kinds is greatly on the increase.

The annual address was delivered on the third day of the fair, by G. T. Stewart, Esq., of Norwalk; it was a good address, and replete with information of a statistical kind.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$683 82
" expenditures	664 93
Balance in treasury	$18 89

OFFICERS—Dean Clapp, President; D. M. Pratt, Alex. McPherson, Vice Presidents; R. Baker, Treasurer; D. A. Baker, Secretary. Managers are one from each township, making 19 in all.

JACKSON COUNTY.

The whole number of members enrolled the present year was 150.

This Society held its third Annual Fair on the 8th and 9th days of October. The number of persons in attendance was at least double that of any former year.

The number of entries of cattle, sheep and hogs, was not large, but the animals, especially the young cattle and sheep, were of the very best quality.

The Society has the present year leased for a term of twelve years, for Fair grounds, a choice lot adjoining the town of Jackson, on which is situated a delightful grove of young forest trees.

The female equestrian exercises, which were introduced by this Society this year for the first, were performed in excellent style and contributed greatly to the life and interest of the occasion.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$306 42
" expenditures	400 00
Deficiency	$93 58

OFFICERS.—Walker Bennett, President; H. F. Austin, Vice President; H. C. Messenger, Treasurer; W. R. Hastings, Secretary. Managers, W. S. Schellenger, A. E. Carrick, Jno. Thompson, J. A. Sells, S. Vaughan.

JEFFERSON COUNTY.

The time set for the Fair turned out unfavorable and on that account was postponed until the 21st, 22d, and 23d days of October, consequently the receipts were not as large as they would have been if the weather had turned out favorable.

Our Fair grounds are located at Steubenville and are enclosed with a good fence, and have No. 1 buildings on the grounds; and in fact the Jefferson County Fair Grounds are among the finest in the State.

Number of members 331, for this year.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$966 00
" expenditures	930 00
Balance in Treasury	$36 00

Officers.—Col. James Collier, President, Steubenville; William Crocker, Vice President, do; William Abrahams, Treasurer, do; J. L. Holton, Secretary, do. Managers, William Means, John Culp, James Reed, Henry Hammond.

KNOX COUNTY.

(*Independent Fair at Fredericktown, October* ——.)

We have been struggling for the meagre existence of a society for several years past, under many discouraging circumstances, that have truly tried the real friends of agriculture, and until the present year, have not had what might be called an Agricultural Fair. The Executive Board of the past year, determined to make a bold movement, and with little encouragement and no means, purchased 10 3-4 acres of land for a fair ground, for the sum of $200 per acre, and enclosed it with a good board fence and erected permanent halls, stalls and pens, for horses, cattle, sheep and hogs, and two temporary halls and offices. The commissioners of the county agreeing, that when the society had expended and paid upon it $1,000, that they would appropriate a like amount.

The fair was a successful one, and a great deal of good has resulted from it; it has breathed a new life and energy into the society, and we think that the Knox County Agricultural Society and Fairs have become a fixed fact. There were over six hundred entries made of horses, cattle, hogs, sheep, mules, fowls, manufactures, farming implements, grain, vegetables, fine arts, needle and fancy work, domestic manufactures, painting, fruits, flowers, &c.

Officers.—Henry P. Warden, President, Mt. Vernon; Vice Presidents, Henry Phillips, Mt. Vernon, Isaac T. Beum, Danville, Robinson Frazier, Mt. Vernon, John D. Wolf, Mt. Vernon, Joseph Adams, Mt. Vernon; John Lamb, Secretary, Mt. Vernon; J. Underwood, Corresponding Secretary, Mt. Vernon; C. S. Pyle, Treasurer, Mt. Vernon. Executive Committee, John McCammett, James McCammett, Robert Green, Anthony White, Moses Dudgen, Daniel Paul, Harry Litzenburg, Lewis Carey, Louis Andrews, John McElroy, Elias Pealer, Ephraim Foot, B. S. Cassell, J. N. Burr, Erastus Rouse, Nathan Bostwick, Daniel Sharpneck, Josiah Cochran, Mahlen Walters, E. H. Irvin.

The society numbers about 300 members.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$2,736 68
" expenditures	3,967 96
Deficiency	$1,231 28

LAKE COUNTY.

Our annual Fair was held on the 28th, 29th and 30th days of September. The attendance was large, and a good feeling prevailed.

A steady and marked improvement, both in the raising of stock and in the cultivation of the soil, has been perceptible from year to year since the organization of our society.

The influence of the annual fairs is manifestly very beneficial, A spirit of emulation is awakened, which has led our farmers to improve their stock and keep their farms and buildings in a neater condition, while our farming implements are better adapted to the purposes for which they were designed.

Our society numbers about three hundred members.

The number of entries for exhibition did not exceed those of the previous year, except in cattle and horses, yet the quality of the animals and articles exhibited showed a decided improvement.

The show of fruits and vegetables was excellent and of a greater variety than ever before.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,381 97
" expenditures	1,317 59
Balance in Treasury	$64 38

OFFICERS.—George Everitt, President, Painesville; S. D. Williams, Vice President, LeRoy; C. C. Jennings, Treasurer, Painesville; Jonathan Coolidge, Secretary, do. Managers, George Anderson, Eli B. Haskill, Elisha Woods, Newton Wells, and Ariel Hanson.

LAWRENCE COUNTY.

The Lawrence County Agricultural Society held their fifth Annual Fair on the 29th and 30th days of September, and 1st day of October, 1857, which was well attended and most departments well represented, and a very evident increase of good feeling prevailed throughout the Society.

Machinery is fast making its way into our county with the farmers, and doing away with many old and unprofitable modes of farming. Some few of our farmers have tried sub-soil plowing, and report favorably.

Many of our farmers are planting out large apple and peach orchards. In apples our county can compete with any in the State. At our Fair Capt. H. N. Gillet exhibited one hundred and thirty different varieties of apples, most of which were very fine. There was but few peaches raised this year, owing to the heavy frost last spring. The high land of our county is considered (by most of our farmers) to be better adapted to fruit than the river bottoms, especially peaches. Vegetables, we raise as fine as any in the State.

Ironton, and the furnaces in the county (of which there are fourteen,) are the principal markets for the products of the county.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$584 00
" expenditures	

OFFICERS.—W. D. Kelly, President: A. J. Trumbo, Vice President; John P. Merrill, Secretary; J. M. Kelley, Treasurer; N. K. Moxley, Corresponding Secretary. Managers, H. N. Gillett, J. T. Irwin, R. Church, D. Locke and T. Gardner.

LICKING COUNTY.

The tenth annual Fair of the Licking County Agricultural Society was held on Wednesday and Thursday, 7th and 8th of October.

Our annual Fairs are still increasing in interest. Each year the attendance is largely increased, the last always the best. The number of persons in attendance by far exceeded that of any previous year.

In this, as at the exhibition last year, the horse exhibiters seemed to get up the greatest interest, at least to spectators. A large majority of horses exhibited at this Fair were very fine, and would compare favorably with any county in the State. The same may be said of cattle, sheep, and hogs. But as we made special reference to these several branches in our previous reports, and have nothing new to add, in the introduction of any of the finer breeds of stock in our county during the last year (except one stallion, Gray Eagle, now owned by Lyman Merchant, Esq., of Newark), will let this general statement suffice.

It is also just and proper that we should say that in each of the thirty-seven classes there was a very full representation of the several articles suggested by each class; in many of them much larger than usual, and in none inferior in quality to that of other years, but rather superior, showing a general interest in our farmers and citizens in our agricultural society.

We find a very decided improvement given by the awarding committees, less complaint of favoritism, &c. This is as it should be. Competitors for premiums should be satisfied by the award, when fairly made, although others may differ in opinion with them. Yet they must give credit for honesty of purpose, unless fraud is evident. This year we were gratified to learn of but very few complaints of this kind. To please all we do not undertake.

The Licking County Agricultural Society is now in a very flourishing condition, owning the ground upon which they hold their annual Fairs, composed of over forty-six acres, inclosed by a high fence, with permanent buildings, and almost covered stalls enough to accommodate all the stock exhibited. These grounds and fixtures, which cost the Society over ten thousand dollars, are all paid for, and the Society is entirely clear of debt, with a small surplus on hand.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,464 42
" expenditures	1,330 36
Balance in Treasury	$134 06

Officers.—Wm. Alsdorff, President, Utica; Joseph Pence, Vice President, Hebron; Wm. M. Cunningham, Treasurer, Newark; T. J. Davis, Secretary, Newark. Managers, Wm. Maholm, J. S. Griffith, Wm. S. Wright, John A. Miller, George Hagerty.

LORAIN COUNTY.

The fifth annual Fair of the society was held on the 6th, 7th and 8th days of October.

The weather during the whole time was very delightful. The fair was a perfect triumph, done up in the best style of Lorain county fairs, and the best we ever held.

The show of cattle was very fine; Short-horns, Devons, Herefords, Ayreshires, and a good show of natives and crosses, with a few trains of working oxen and some fine fat cattle.

Lorain county has a good show of Morgan horses, Black-hawks, Bacchus, and other fancy breeds. Jacks, mules and jennets, enough for variety.

Sheep, of the French and Spanish Merino, Leicester, Cotswold and Southdowns, we have a large show, some extras in the fine department.

Hogs of the Suffolk and Essex breed. The show of garden vegetables was a grand one; squashes weighing 205 lbs., pumpkins in proportion, potatoes and turnips extra, and all other vegetables on the large scale. Fruit, apples, peaches, pears, quinces and grapes, a good show.

Ladies' hall was well represented in all its branches in paintings, drawings, domestic manufacture, and in fact everything which would make a good show of the ladies' handiwork.

Farmers' and mechanics' department was well filled with everything from a horse-shoe up to threshing and mowing machines; carriages and buggies, some extra fine, and in fact everything both useful and ornamental, which tends to make up a fine show.

Prof. J. W. Hoyt, of Madison, Wisconsin, delivered the annual address on the third day of the fair; the address was such as should be practised by farmers and mechanics.

The number of members of the society is four hundred and seventy.

The yield of all grain crops in Lorain county in 1857 was very large. Wheat good, very little injured by weevil or rust. Corn from two to four weeks later than usual, but generally sound and large yield. Oats, barley and buckwheat crops good. Potatoes some injured by rot.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,625 16
" expenditures	1,474 83
Balance in treasury	$150 33

OFFICERS.—Edward Byington, President, Elyria; A. H. Redington, Vice President, Amherst; Wm. H. Root. Treasurer and Secretary, Elyria; H. E. Peck, Corresponding Secretary Oberlin. Managers, Joseph Swift, jr., Horatio Tyrrell, William Smith, Edwin Matcham, J. S. Warner.

Independent Fair at Avon, September 24th; Oberlin Fair September 30th; Union Fair at Wellington, October 14th and 15th.

LOGAN COUNTY.

Fair Sept. 29, 30, and Oct. 1 and 2.

Good display of everything, and the Fair an entire success.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$653 55
" expenditures	527 59
Balance in Treasury	$125 96

OFFICERS.—John M. Glover, President; A. Gardner, Treasurer.

MADISON COUNTY.

The annual Fair for 1857 was held on the 28th and 29th of September. Every class in the stock department was well represented, and much interest manifested.

All classes of stock in our county show a manifest improvement from late importations and judicious crossing, with the single exception of hogs. The importation of the Suffolk breed has greatly depreciated the quality of our heretofore best stocks of hogs. They are of much smaller growth, and more tender.

Stock of all kinds commands great attention, but cattle stand pre-eminent. We offer no premiums on any improved breed, except the Durham. Our county being in the main a grazing county, but little grain is raised for export. The production of corn is largely on the increase, but is mostly consumed on the farms that grow it. The yield this season was above the average; I think 45 bushels per acre a safe estimate. However, the wet weather has greatly damaged the crop, and there will not be more than half the crop gathered entirely sound.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$719 81
Total expenditures	614 88
Balance in Treasury	$105 93

OFFICERS.—Jas. J. Jones, President, London; Jesse Watson, Vice President, London; W. A. Neal, Jr., Secretary, London; I. F. Willis, Treasurer, London. Managers, Jacob Weaver, A. J. Ryan, J. T. Linson, Ed. Fitzgerald, W. A. Dunn.

MAHONING COUNTY.

The tenth annual exhibition of the Society was held on the 6th, 7th, and 8th days of October last. The exhibition lists were unusually large, and to the deserved credit of our people, I will say that the exhibition, from first to last, was but an uninterrupted display of economy, industry, mechanical skill, and wealth.

As an omen of progress, we are proud to say that this exhibition was larger, and in many respects superior to that of any previous year. Every department was well represented. Of vegetables there was a great variety, and each of excellent quality. The cattle department bore testimony of a manifest improvement in breeds; the same may be said of hogs, and of sheep in particular. The exhibition in the hall was attractive and beautiful, as evidenced by the crowds which filled its ample space during the exhibition. The exhibition of horses far exceeded the expectation of any; the number of entries was large, and most of the animals very meritorious. Indeed, it was the opinion of many from adjoining counties, that in point of number and quality, our exhibition of horses was second to none in the State.

In fine, our exhibition as a whole was of the first order, and passed off quietly, pleasantly and satisfactorily to all, especially to those interested in the progress of our Society. Heretofore we have always labored under disadvantages in consequence of monetary embarrassments. The Society incurred a considerable debt in the purchase of grounds, and making improvements thereon for the convenience of our shows; but the economy and good management of our board and officers have entirely relieved us of all such hindrances to our prosperity. Our Society is now free from debt, has a title to eight acres of valuable land, well fenced, and buildings suitable for the convenience of our annual exhibitions. And more than all other considerations, a growing public opinion in favor of the permanency of an institution, more generally considered to be of great utility to the industrial classes of our citizens. We consider our Society now placed upon a permanent basis; and while we cheerfully concede that it has already been a means of accomplishing great good, yet we feel (comparatively speaking) that its usefulness has just commenced.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$768 04
" expenditures	697 79
Balance in Treasury	$70 25

Officers.—Martin Allin, President, Ellsworth; George Pow, Vice President, New Albany; T. U. Rice, Secretary, Canfield; F. G. Lewis, Treasurer, Canfield. Managers, Freeman Gee, B. P. Baldwin, Andrew Shields, Robert Manchester, James Predmore, Thos. Mead, David Haynes.

MARION COUNTY.

Fair held September 23, 24, 25, 26, and 27.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$438 39
" expenditures	248 10
Balance in Treasury	$190 29

Officers.—Col. Everett Messenger, President, Marion; M. Jacoby, Vice President, Marion; A. D. Matthews, Secretary, Marion; B. H. Williams, Treasurer, Marion. Managers, Jacob Lee, Chas. Smith, Wm. Thew, David Pettit, D. S. Drake.

MEDINA COUNTY.

The twelfth annual Fair was held on Sept. 30th, and Oct. 1st, 2d, and 3d, 1857. We had 739 entries, being 114 more than any previous Fair.

The display of all kinds of stock was excellent, whilst that of domestic manufactures, garden products, and fruit, was far superior to any previous year. On the last day we listened to a very able and interesting address by Rev. D. C. Wright.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$744 94
" expenditures	603 85
Balance in Treasury	$141 09

Officers.—John Sears, President, Litchfield; Thos. W. Painter, Vice President, Weymouth; Francis B. Clark, Secretary, Medina; John Stebbins, Treasurer, Medina. Managers, X. S. Allen, Albert Hinsdale, Wm. A. Crane, Lucius Warner, M. U. Packard, C. E. Dunbar, A. Randall.

MEIGS COUNTY.

The County Fair was held on the 23d and 24th of Sept. The attendance was large, in comparison with former years, and an interest and zeal evinced worthy the great cause of agriculture.

There is an increasing desire among the farmers of our county to adopt improved modes of culture, and introduce improved breeds of stock, when the improvement in either case is known to be a fixed fact in agriculture.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$592 81
" expenditures	327 75
Balance in Treasury	$265 06

OFFICERS.—Abner Stout, President, Chester; Wm. Ledlie, Vice President, Ledlie's; O. Branch, Treasurer, Pomeroy; G. W. Cooper, Cor. Sec., Middleport; J. Q. A. Hudson, Rec. Sec., Middleport. Managers, N. Stansberry, R. Coombs, Waldo Strong, J. Brown, Isaac M. Gilmore.

MIAMI COUNTY.

The eleventh annual Fair of this society was held on their new grounds on the 23d, 24th and 25th days of September. On these grounds are permanent improvements; all the necessary halls, stalls, &c., are erected.

In spirit of noble emulation the farmers, stock growers and workers in mechanics and handicraft, united in making their first exhibition on these grounds superior to any since the organization of the society. It was very largely attended during the entire three days.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,662 42
" expenditures	1,533 54
Balance in treasury	$128 88

OFFICERS.—W. H. Gahagan, President, Troy; J. M. Dye, Vice President, Troy; B. S. Pyle, Treasurer, Troy; Geo. W. Morris, Secretary, Troy. Managers, W. B. McLung, Jas. Hart, Isaac Peck, D. French, J. J Robinson.

MONROE COUNTY.

The agricultural society of this county held their sixth annual Fair on the 24th and 25th days of September last, but owing to various causes over which the society could have no control, the exhibition fell far short of what it should have been. There seems, however, to be an increasing interest manifested on the subject by the agricultural portion of our citizens. The society numbers seventy-five members.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$204 26
" expenditures	83 83
Balance in treasury	$120 43

OFFICERS.—Jno. B. Noll, President; Wm. Steel, Vice President; John S. Way, Secretary; Jno. M. Kirkbride, Treasurer. Directors, John Kerr, Saml. P. Jones, Jas. Patterson, John T. Williamson, Wm. Myers.

MONTGOMERY COUNTY.

The Fair of the society was held in October, and was highly successful. All the departments were well represented. The halls were filled to overflowing with the contributions of our mechanics and manufacturers, and with the handi-work of the ladies. We never before had so fine an exhibition of farm products and vegetables. The mammoth productions of this prolific year were brought in large quantities, and bore testimony to the fertility of our soil and the introduction of improved varieties and better modes of culture. Much attention is paid in our exhibitions to the display of fruits and flowers; of these we had a fine show. The table of cut flowers with its ornamental designs and vases of beautiful bouquets attracted great attention. At many of the county Fairs I have visited, there was nothing to minister to the taste for the beautiful, but everything was forbidding and unattractive. Our fairs will never accomplish all the good in their power until they educate the *taste* of the mass of the people. A little effort on the part of the officers of county societies to enlist the ladies in decorating and filling Floral Hall would add ten fold to the interest of the exhibitions, and result in great good. We should hear fewer complaints of farmer's sons crowding to the cities to engage in the mad strife for wealth, which too often ends in bitter disappointment if farmer's *homes* were more worthy of the name. What a vast improvement the expenditure of a comparatively small amount of money would make in the appearance of all our rural districts. Who has not witnessed the wonders wrought by a little white-wash and a few trees and flowers? It is an important part of the mission of our county societies to teach these things to the people.

The attendance at the Fair was large. It is a most encouraging feature that our exhibitions are less dependant than formerly on the town for support. A large number of our best farmers are thoroughly enlisted, and attend the exhibitions with their families. The number of members is about eight hundred.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,582 93
" expenditures	1,455 83
Balance in Treasury	$127 10

OFFICERS.—Robt. W. Steele, President, Dayton; W. C. Davis, Vice President, Dayton: O. Kittredge, Secretary, Dayton; Danl. H, Dryden, Treasurer, Dayton.

MORGAN COUNTY.

Our county Fair, held the 30th of September and 1st and 2d days of October, was very successful, and passed off with general good feeling; the attendance was large and respectable. The number of entries exceeded that of any former year, and were generally highly meritorious and worthy of more extended notice than can be given here. Connected with our society is a Horticultural Society, which has been sustained for a few years, and promises to become a useful auxiliary to our society when its claims shall become more generally recognized by the community. Our fair grounds are now paid for; it consists of nine acres, lying upon the east bank of the Muskingum river, about one mile below McConnelsville, well fenced and supplied with a riding course, and stalls for stock. Our exhibition hall so far has been a temporary structure. Having now funds in the treasury, we propose soon to engage in the erection of a permanent building for that purpose. There is a continued and growing interest in our county agricultural society. The experience of the year just closed furnishes evidence of a higher appreciation on the part of our people of the advantages of associated efforts in the promotion of the various objects aimed at in our organization and manifest tokens, have been noticed of a desire on the part of our farming community, to improve upon former plans and methods of procedure, and a laudable ambition to excel in all the various pursuits engaging their attention.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,221 25
" expenditures	934 15
Balance in Treasury	$287 10

OFFICERS.—Wm. Sherwood, President; F. W. Wood, Vice President; Ford Sill, Treasurer; W. P. Sprague, Secretary. Managers, J. Sigler, Jno. Miller, J. Richardson, R. H. Dodge, D. H. Mortley.

MUSKINGUM COUNTY.

Our last Fair was held September 30th and October 1st and 2d; and though the weather was very unfavorable, yet the interest manifested by the citizens of the county was quite general, the number of entries was more numerous than on any previous occasion. The display of vegetables and fruits was very extensive, and the number of horses was larger than last year. The Fairs have contributed largely to the improvement of stock in the county, by inducing emulation and generous rivalry among our cattle and stock growers. The managers are determined to enforce the provisions of the law to protect Agricultural Fairs; and I am glad to say we had less disorder and disturbance during our Fair than ever before —thanks to our legislators for giving us such a law.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$862 25
Total expenditures	846 25
Balance in treasury	$16 00

OFFICERS.—V. Best, President; Wm. H. Thomas, Vice President; W. P. Bennett, Secretary; James Little, Treasurer. Managers, Jas. Buckingham, A. Howard, J. P. Northower, J. B. Robinson, William C. Tanner.

MORROW COUNTY.

(*Independent Fair at Chesterville, Sept. 24th and 25th.*)
Fair held at Mt. Gilead, Oct. 1st, 2d, and 3d.
No finance report.
Joseph Moshier, Corresponding Secretary, Mt. Gilead.

NOBLE COUNTY.

Fair at Sarahsville, Sept. 24th and 25th.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$263 50
" expenditures	000 00
Balance in Treasury	$263 50

Officers.—David McKee, President, Olive P. O.; Hiram Danford, Vice President, Mt. Ephraim; Lewis Baker, Secretary, Sarahsville; William Van Meter, Treasurer, Sarahsville. Managers, Peter Gephart, Martin St. John, Elijah Stevens, Joseph Parrish, J. B. Brown, Jr. Marshal, Gen. T. F. Wilson.

Whole number of members 93.

OTTAWA COUNTY.

Fair held at Port Clinton, October 6th, 7th, and 8th.

No finance report.

Officers.—Wm. Gill, President; Jonah Smith, Vice President; J. R. Johnson, Secretary; James Wonnell, Treasurer. Managers, W. P. Hanna, Garret Bredbeck, H. J. Miller, S. W. Smith, W. P. Russell, H. L. Warriner, and C. Moore.

PICKAWAY COUNTY.

Fair at Circleville, Sept. 30th, and Oct. 1st, 2d, and 3d.

The Fair was well attended; a good display in every department, and as a whole, altogether very successful.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,373 07
Total expenditures	1,368 25
Balance in Treasury	$4 82

OFFICERS.—N. J. Turney, President, Jackson township; S. M. Baker, Vice President, Circleville; P. C. Smith, Treasurer, do; O. E. Niles, Secretary, do. Managers, V. I. Williams, J. B. Parcells, Z. H. Perrill, Dr. M. Brown, Col. Elias Florence, Smith Chaffin, S. M. Owens, Evan Shelby, John Markle, James Morris, F. W. Renick, B. F. Renick, B. Corkwell, James Bennet, and T. T. Renick.

PIKE COUNTY.

Fair held at Piketon, October 1st and 2d.

No finance report.

E. R. Allen, Secretary, Piketon.

PORTAGE COUNTY.

The twelfth Annual Fair of the Portage County Agricultural Society, was held on the 28th, 29th and 30th days of September. This is the first year in which our Fair occupied three days. The change from two days to three, was made that more time might be devoted to the examination and exhibition of animals, and we found upon the trial that the additional day was of much advantage.

Our Society is in a prosperous condition and the meetings are creating an agricultural feeling that would not exist if we had no association for agricultural improvement. We have good grounds and our receipts are sufficient to enable us to offer quite liberal premiums. It has been the custom for this Society for some three or four years past to offer agricultural papers and books as premiums, and this year we awarded sixty-five Ohio Farmers, fifty-six Ohio Cultivators, and thirty-one volumes of books upon various subjects. Another feature which we propose to introduce, is to have what might be termed a "Farmers' Club," or a meeting once or twice a year for discussion of topics interesting to the agricultural community. Great good must result from friendly meetings and discussions of this kind, and from the diffusion of knowledge by means of books and periodicals as premiums.

At our late Fair the productions of the farm and the garden were abundant; never have we seen so large a collection of vegetables, and those too, of such enormous proportions. But this has been a year in which the earth has yeilded up her products with a liberality almost unprecedented, and it is not a matter of wonder that so great a display was witnessed in this department.

The only animals on exhibition the third day of the Fair were horses, and we can truly say that in our opinion, we never had a better show of this kind of stock. The famous Morgan horse "Searcher," which has been for some years past owned by Mr. Andrews, of Franklin Mills, took the first premium over many other noble animals. The horse has been recently purchased by a gentleman of Geauga county.

The number of paying members of our Society are two hundred and twenty-eight.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$892 19
" expenditures	737 82
Balance in Treasury	$154 37

OFFICERS.—L. T. Hine, President, Shalersville; W. W. Hinman, Vice President, Ravenna; J. T. Green, Treasurer, Ravenna; P. B. Conant, Secretary, Ravenna. Managers, Zenas Judd, A. V. Rudd, Thomas Brigden, Charles H. Bostwick, and Jesse Packer.

PREBLE COUNTY.

The eighth annual Fair of the Preble County Agricultural Society was held on the 14th, 15th, and 16th days of October, 1857. The number of entries was greater than that of any former Fair held in our county, showing a very gratifying increase of zeal and attention on the part of our farmers, mechanics, and artisans, in the varied departments of business in which they operate, and giving general satisfaction at the late Fair, and high promise for the time to come.

The Board of Managers return their thanks to the numerous exhibiters, and especially to the ladies, for the interest that was taken in the Fair.

Through some unaccountable neglect on the part of our farmers, there were no entries of field crops made—a neglect that I can account for on no other ground than carelessness, for I have personal knowledge where a yield of over 37 bushels of wheat was taken from an acre of land. In fact, field crops of all kinds in our county will give more than an average yield.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,641 69
" expenditures	1,628 16
Balance in Treasury	$13 53

OFFICERS.—H. W. Dooley, President, Eaton; Eli Conger, Vice President, West Florence; James Albert, Treasurer, Eaton; Joel W. Harris, Secretary, Eaton. Managers, Enoch Taylor, John M. Dougherty, Robert Marshall, Thomas F. Stephens, Silas Peters.

PUTNAM COUNTY.

Our Society is yet in its infancy. We have this year 53 members. Our annual Fairs have been held regularly, and were well attended, both by exhibiters and spectators. The interest exhibited by competitors, members, and the public generally, has aided us much. The improvement in agriculture in the county has advanced rapidly, and in stock it is observable all around us. We award nearly all our premiums in agricultural books and papers, leaving it, however, optional with the person drawing the premium, to take the one offered in the list, or its value in money, or exchange for another book or paper of equal value. And when we come to pay our premiums, it is very seldom that we find persons who want the money. In this way we have placed in the hands of our farmers a vast amount of agricultural reading matter, which they could not readily have got in any other way. And they and their families appear to duly appreciate it.

Our crops are wheat, rye, oats, corn, hay, potatoes, &c. Wheat and corn are our principal grains for sale. Wheat the last season has produced about 20 bushels to the acre; corn 45 bushels; oats 50 bushels. Wheat is worth 70 cents per bushel; corn 22 cents; oats 20 cents. Our grain is principally sold at Delphos and Homer, on the Miami Canal, and Findlay and Defiance.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$84 17
" expenditures	35 58
Balance in Treasury	$48 59

Officers for 1857.—Hiram Sarber, President; C. T. Pomeroy, Vice President; Stansberry Sutton, Treasurer; George Skinner, Secretary. Managers, James H. Smith, Seneca Dimmock, M. C. Ewing, John L. Ketchum, Isaac Vail.

Officers for 1858.—Jno. Maidlow, President; N. H. McCracken, Treasurer, Kalida; Geo. Skinner, Secretary, Kalida.

RICHLAND COUNTY.

The eighth annual Fair was held Sept. 22d and 23d, 1857. The Society has been holding its anniversaries upon ground belonging to a private citizen, without any other right than a permit, and for no specified time. The Society has adopted measures to procure and fit up grounds. The County Commissioners have agreed to appropriate one-half of the money, and the citizens of Mansfield agree to furnish one-half of the remainder; the balance to be raised by subscription in the county; and the Society is confident of success in the enterprise.

In view of the foregoing facts, the Society thought it best to hold a free Fair, charging only for entries of articles for exhibition, which accounts for the meagre financial statistics of the Fair, as reported.

Progress marks the history of the Society, and although the present exhibition has not been so large as on some other occasions, yet in the quality of the articles exhibited there is a marked superiority over any former year. Our citizens are waking up to the importance of adopting all the improvements of the age, and the result is, we see improved breeds of stock, from the noble thorough-bred stallion down to the Shanghai and the Dorking, in adopting improved implements of agriculture and of manufacture, economizing labor, and producing improved specimens of agriculture, manufacture, and art; and all this is attributable in a great degree to the labors of the agricultural society, thus establishing its utility beyond a doubt.

Our motto is "onward;" and located as we are in a climate, and upon a soil unsurpassed by any in the State for variety of agricultural products, with an intelligent and enterprising population, and with the facilities we now have for getting our products to the best market, we expect to rival the sister counties of our noble Buckeye State in those achievements that constitute us truly a great people.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$223 86
" expenditures	211 90
Balance in Treasury	$11 96

OFFICERS.—Ezra Osborn, President; J. W. Slone, Vice President; C. H. Askew, Treasurer; Alex. McIlvain, Secretary. Managers, Joseph Gladden, J. S. Marshall, James Reed, John Kline, L. Martin.

ROSS COUNTY.

The County Fair was held on the 7th, 8th, and 9th of October. In consequence of bad weather, it was not so well attended as heretofore, nor was the exhibition so full in any of the departments as was anticipated. There were in the mechanical department a few articles—such as wagons, carriages, buggies, cook stoves, with brass, copper, and tin trimmings, saddlery, &c., &c., of very superior workmanship—but the amount was too meagre.

The cattle and horses, though few in number, were select, and not behind former years in excellence.

Altogether, the exhibition was behind those of the last two or three preceding years.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$961 76
" expenditures	913 56
Balance in Treasury	$48 20

OFFICERS.—Geo. W. Renick. President; D. A. Schutte, Treasurer, Chillicothe.

SANDUSKY COUNTY.

Our sixth Annual Fair was held at Fremont on the 14th, 15th and 16th days of October, and the attendance exceeded any other Fair we have had.

Number of members 297.

The show of cattle and horses was far superior to any exhibited in this county heretofore. The Shorthorn and Devon cattle were particularly admired, the grade and native stock did credit to the cattle growers of our county.

The exhibition of horses was good and among which was some very choice animals.

The show of hogs was small but of the very best breeds.

The exhibition of sheep was also small but of desirable bloods.

In poultry there was a fair representation of Shanghais, Brahmas, &c.

The show of farm products was large and superior, fruit in particular was excellent.

Mechanic's Hall was not so abundantly filled as usual but of that quality and description that does credit to the manufacturers.

The show of farm implements was not large but of the most substantial and modern patterns, such as drills, reaping and mowing machines, cultivators, plows, &c.

There were many articles exhibited by the ladies in floral hall, that were of utility, and much credit was due them in connection with that department.

The wheat, corn, oat and hay crops were good, with the exception of corn, it matured rather late in the season to be all sound.

I regret to state that there was no competition by our farmers on field crops.

Our auditor reports that there has been paid for show licenses during the year $190.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$521 85
" expenditures	496 99
Balance in Treasury	$24 80

OFFICERS.—La Q. Rawson, President; Daniel Capper, Secretary; S. Buckland, Treasurer. Managers, Jas. Vallette, Jas. Parks, C. Powers, J. Winters, and A. Thorp.

SENECA COUNTY.

The Seneca County Agricultural Society held its seventh Annual Fair at Tiffin, on the 7th, 8th and 9th days of October and was the most successful Fair ever held in the county. During the Fair we had very pleasant weather and the attendance was unusually large, being estimated at from ten to fifteen thousand during the Fair.

The Board of Managers have not spared time or expense in fitting up and improving the ground of the Society; during the past year they have had erected a permanent building 108 by 44 feet for the exhibition and protection of articles on exhibition.

The editors of our county papers, public men, farmers, and citizens generally, have given their influence to the advancement of the Society.

There has been a decided improvement in all branches of agriculture and mechanics during the past year.

The progress of our Society is onward, and all interested manifest a determination that it shall be onward until very few societies in the State can make a better showing than ours.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,770 46
" expenditures	1,293 12
Balance in Treasury	$477 34

OFFICERS.—Lewis Baltzell, President, Tiffin; J. W. Miller, Vice President, Tiffin; William Gallup, Treasurer, Tiffin; J. H. Pittenger, Secretary, Tiffin. Managers, D. W. Eastman, Levi Keller, Horace Huber, Peter Brayton, and James Boyd.

STARK COUNTY.

The eighth Annual Fair was held at Canton, on the 7th, 8th, and 9th days of October, 1857, and the large number of people in attendance gave evidence that the people are becoming more and more interested in agricultural exhibitions.

The show of all kinds of stock was superior to that of any former exhibition, and the number of entries greater than ever before.

Each year we see a decided improvement in horses by importation, and in the growing stock, the number of blooded horses on exhibition was double what it ever was before.

The committee on cattle report as their opinion, that this was by far the best show of cattle, in number and quality, that has ever occurred in the county.

The exhibition of sheep was superior in number and quality, and we think that Stark county, can boast of as good flocks of sheep as can be found any where in Ohio.

In short each and every department, from the horses to the Shanghais, was fairly and well represented.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,811 01
" expenditures	1,742 51
Balance in Treasury	$68 50

OFFICERS.—T. S. Webb, President; H. H. Myers, Vice President; J. Keplinger, Treasurer; H. Raynolds, Secretary. Managers, J. S. Cock, P. P. Trump, Thos. Chapman, R. Porter, and J. Ellison.

OFFICERS FOR 1858.—James S. Kelley, President; Harris Raynolds, D. R. Atwater, Treasurer; S. B. Marshall, Secretary. Managers, Thomas W. Chapman, David Lind, H. H. Myers, Lewis Everhard, and W. P. Bryan.

SUMMIT COUNTY.

According to appointment, the Society held their eighth Annual Fair on the 7th, 8th and 9th of October. Of this we may say, that if the freely expressed opinions of numerous visitors from sister counties are to be credited, and if our own judgment in the case is not far from the truth, no county in the State has held a better.

Last year, our Fair was eminently successful. This year, contrary to the expectations of many who feared a retrogade movement, the interest was fully sustained, and the Fair more successful than any former one. In anticipation of such a result, the Board had enlarged their grounds, and to afford greater facilities to exhibiters, had erected an additional building, and increased the number of their stalls for stock. The days of the Fair showed the wisdom if not the necessity for this movement. The plan of distributing agricultural newspapers—for a time suspended, was again adopted, and quite a number of copies of the Ohio Farmer, Ohio Cultivator, and the Horticulturist, were placed among the premiums. It was at the same time provided "that any person drawing two copies of the Farmer and Horticulturist, might receive in their stead a copy of each, or drawing more than two copies of any paper, might receive for all over that number, what they would cost the Society in cash." By this it was hoped one ground of complaint against newspaper premiums would be removed. Some complaint against the distribution of papers in this way, yet remains; but for this, the advantage to be derived from their circulation in the county, will more than compensate.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,450 00
" expenditures	1,227 27
Balance in Treasury	$222 73

OFFICERS.—Talmon Beardsley, President, Coventry; Andrew Hale, Vice President, Bath; A. C. Voris, Treasurer, Akron; H. W. Howe, Secretary, Akron. Managers, Joseph Hawkins, L. L. Strong, William Johnston, Adam Yarrick, and John R. Buchtel.

TRUMBULL COUNTY.

Fair at Warren, September, 22d, 23d and 24th, and was eminently successful.

No Finance report.

OFFICERS.—J. F. King, President, Howland; J. D. Cox, Secretary, Warren.

TUSCARAWAS COUNTY.

The Tuscarawas County Agricultural Society held its annual Fair on the 30th of September and October 1st and 2d.

A larger entry of animals and articles, and also a greater number of membership tickets were sold than any previous year.

The weather was very unfavorable, and operated strongly against the society. The attendance being not near so good as was anticipated by so good a commencement, yet the display of stock, farm products, vegetables, fruits, agricultural machinery, manufactured articles, specimen of fine arts, and "last though not least," the exhibition of needle work, embroidery, fancy articles, together with the beautiful boquets and collections of flowers and the handsome and tasteful manner in which the "Round Hall" was decorated far surpassed any previous fair, and we think demonstrates beyond a doubt that our organization is permanent.

The society's grounds, now of about eleven acres, which is substantially enclosed and arranged for the reception of live stock and other articles, and also for the comfort and convenience of visitors.

The society have also, at considerable expense, graded a large horse-ring on their grounds, nearly one-half mile in circumference, which is very advantageous for the favorable display of horses and their speed.

The society is not meeting with that general encouragement and hearty co-operation from the farmers that it should in such an old and populous county as Tuscarawas. A few men have been untiring in their efforts to promote the agricultural interests of the county, and for years have been laboring assiduously to improve the stock, &c., but the great majority are never seen at our fairs, and many of those that are, only come as visitors with their families without *contributing* anything new, novel or useful to the exhibition.

The society largely increased the list of premiums the present year. A large number of agricultural papers were awarded by the society the present year, principally the Ohio Farmer, and Ohio Cultivator. We are not advised as to the number of agricultural papers taken in the county, but the subscription list is a large one, and quite a number of various kinds.

The principal market towns of the county are Canal Dover, New Philadelphia, Bolivar, Uricksville, Port Washington and Newcomerstown, and from these, produce is mostly shipped to Cleveland, which is our principal market.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources.....	$721 95
" Expenditures...	721 95

OFFICERS.—B. D. Downey, President; Jas. McDonough, Vice President; B. B. Brashear, Treasurer; John H. Baer, Secretary. Managers, B. D. Downey, B. B. Brashear, John Hildt, jr., Wm. Helmick, James McDonough, John H. Baer, U. C. Deardorff, David Johnson, Isaac Blickensderfer.

UNION COUNTY.

The annual Fair was held on the 1st and 2d days of October, which, though seriously impaired by the rains on boths days, was very satisfactory to those who attended.

The quantity and quality of the stock is on the increase, and everything showed conclusively that the agricultural interest of our county keeps pace with the age, and that our annual fairs are doing much to develop the various improvements of the county.

The friends of the society feel encouraged and are determined to increase their efforts at perfection; and wherein they found defects heretofore, to profit by the example of others and adopt every measure possible to increase the interest in this good cause, until the richness of our county is fully developed.

The crops this year are more than an average in quantity, but the grain crops are scarcely an average in quality. The average per acre of wheat is about 14 bushels, much of it light grain. The corn crop is very heavy but much of it will rot in the field; very little dried fit to crib before winter; average per acre about 50 bushels. Oats crop very good; and grass heavy, and hay generally put up in good order; hay average about 3 tons to the acre.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$429 65
" expenditures	403 33
Balance in Treasury	$26 32

OFFICERS.—E. Burnham, President, Milford Centre; J. A. Henderson, Vice President, Raymond P. O.; E. L. Reynolds, Treasurer, Milford Centre; M. C. Lawrence, Secretary, Marysville. Managers, Jas. Fullington, Thos. W. Miller, B. F. Kelsey, James B. Richey, S. Cook, Thos. Turner, Jas. R. Galloway.

VAN WERT COUNTY.

Fair at Van Wert, October 27th and 28th.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$113 50
" expenditures	88 34
Balance in Treasury	$25 16

OFFICERS.—J. G. Gillehand, President; M. F. Richey, Vice President; J. R. Scott, Treasurer; Jno. Blecher, Secretary. Managers, A. Patterson, N. Hattery, A. Johnston, Wm. Heath.

VINTON COUNTY.

The Vinton County Agricultural Society, organized on the 13th day of December, 1851, is still in successful operation and will, we trust, ere long become a source of much interest, as well as profit to the citizens of our county. The stock, as well as the agricultural department of our fair in September, was universally good; much more interest will be taken in the matter when our permanent fair grounds has been secured and fenced.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$126 75
" expenditures	126 75

OFFICERS.—Jno. Robbins, President, Reed's Mill; T. R. Stanley, Vice President; E. Waltz, Treasurer, McArthur; E. F. Bingham, Cor. Sec'y; J. R. Newton, Rec. Sec'y.

WARREN COUNTY.

I am happy to report to you that our Society is in a flourishing condition, and that it has, during the eight years it has been in existence, accomplished much good among the people of old Warren.

Our eighth annual Fair was held on the 7th, 8th, and 9th days of September last, and passed off satisfactorily to all concerned. The attendance and receipts were not quite as large as usual, owing to the backwardness of the season, and the early period at which it was held, being in the midst of seeding time with our farmers, together with other Fairs in progress in adjoining counties at the same time, all combined against us. Yet our exhibition was very good, and the Fair successful.

The show of cattle was far superior to anything we have ever had in our county, and in horses we always excel. The number of *superior* horses exhibited was large. Grain and many other products were not fully matured.

We have, during the past year, made permanent improvements on our Fair grounds, amounting to about $650. The premiums awarded this fall and paid, amount to about $675. We have always avoided debt, and have now a seven years' lease on 22 acres of ground adjoining the town, well fenced, and necessary buildings, sheds, &c., surpassed by very few if any county societies in our State, and have a small amount in our treasury.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$2,077 39
" expenditures	1,943 67
Balance in Treasury	$133 72

OFFICERS.—Ezra Carpenter, President, Wilmington; Benjamin Potter, Vice President, Franklin; W. F. Parshall, Secretary, Lebanon; Jacob Koogle, Treasurer, Lebanon. Managers, Robt. G. Corwin, John Morrow, Ephraim Kibby, Jonas T. McKay, J. P. Gilchrist.

WASHINGTON COUNTY.

The twelfth annual exhibition of the Washington County Agricultural Society was held at Marietta, October 7th, 8th, and 9th, 1857.

If the increased interest manifested annually at our Fairs may be taken as a true index of progress, our course is most assuredly onward. The late Fair was even more successful than its predecessor of 1856. Farmers, although greatly overpressed with work, in securing the enormous crops of the season, generally "shut up shop," and came up to enjoy their annual gala days.

The number of entries at the late Fair was seven hundred and fifty.

In addition to seven acres of ground enclosed and provided by this Society in 1855, a purchase of five additional acres was made the present year.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$1,373 78
" expenditures	744 83
Balance in Treasury	$628 95

OFFICERS.—L. J. P. Putnam, President, Marietta; John Breckenridge, Vice President, Brown's Mills; W. W. Rathbone, Secretary, Marietta; W. B. Thomas, Treasurer, Marietta. Managers, G. W. Barker, Joseph Holden, Jr., John Newton, Geo. M. Woodbridge, Geo. Dana, Jr., Wm. B. Shaw, E. Gould.

WAYNE COUNTY.

The annual Fair was held October 1, 2, and 3, and compared favorably with our previous exhibitions. Owing to heavy rains the first and second days, many were prevented from attending, but on the third, the weather being more favorable, a large number of people were in attendance, manifesting the usual amount of interest.

The exhibition of stock, particularly horses, in numbers and quality, evidenced a decided improvement. In agricultural implements and machines, mechanic arts, domestic manufactures, farm and dairy products, we had a good show, comparing favorably with previous years.

Much and permanent good has resulted from the organization of this Society, the effects of which are being realized in the improvement of stock, improved method of cultivation, introduction of improved implements, machines, &c.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$997 95
" expenditures	608 59
Balance in Treasury	$389 36

OFFICERS.—William Taggert, President, Wooster; Michael Totten, Vice President, Wooster; James Johnson, Secretary, Wooster; John McClelland, Treasurer, Wooster. Managers, Constant Lake, Thomas Bracken, Moses Lockhart, John Hindman, James Jacobs.

WILLIAMS COUNTY.

The second annual Fair was held in Bryan, on the 6th, 7th, and 8th days of October, and was one of unusual interest. The weather during the past season has been of the most favorable kind for the farming interests; hence the crops were all good. Wheat was somewhat injured by the weevil, but yielded a fair crop; average about 14 bushels per acre. Corn was extensively cultivated, and will average about 40 bushels per acre. Grass was heavy, largely grown, and well cured. Oats, more than an average for this county. Rye, but little grown. Potatoes were raised in large quantities, yielding from 200 to 400 bushels per acre. Some varieties were considerably affected by the rot, among which the Pink-eyes suffered most. But little attention has yet been paid to the improvement of farm implements; the country being new, but few drills, mowers, or reapers are required. Heretofore the culture of fruit and its improvement was much neglected; hence the demand is greater than the supply. The exhibition of fruit and vegetables, however, during the Fair, was beyond expectation. A growing, healthy interest is manifested in the improvement of cattle, horses, hogs, and sheep. The stocks from which improvements are being made are: in cattle, Durham, and Devon; horses, Morgan; hogs, Suffolk; sheep, several improved breeds.

Owing to the expense of fencing the Fair grounds and putting up the necessary improvements, the amount awarded in premiums this year was not large, though about double that of last year. The weather, during the week of the Fair, was pleasant, and during the second and third days the attendance was very large. Our Society numbers now 284 members, with a fair prospect of an increase in the future.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$843 00
" expenditures	756 00
Balance in Treasury	$87 00

OFFICERS.—David Morrow, President, Bryan; Wm. Stubbs, E. G. Denman, Vice Presidents, Domestic; Dr. R. B. Rush, Treasurer, Bryan; W. A. Smith, Secretary, Bryan. Managers, P. D. Benson, George Eli, Henry Gilbers, David Carpenter, Simon Smith.

WOOD COUNTY.

The seventh annual Fair of the Wood County Agricultural Society was held at Bowling Green, on the 6th and 7th of October. The weather was fine and the attendance large. It was truly a lovely sight; the rich products of the field, the orchard, the garden and dairy. The wives and children were not forgot, they too were there, all enjoying the occasion, and all appearing happy. Well may the farmers of Wood feel proud of their seventh annual fair.

There was a fine show of stock, much better than at any of our former exhibitions, which indicates that our farmers are rapidly improving that branch of husbandry.

There were choice samples of spring and winter wheat, corn, oats, rye and buckwheat, also timothy and millet seed. A great variety of vegetables were also exhibited, all of fine growth, and to appearance, of the best quality.

The display of fruit could not well be surpassed; it was really the best part of the exhibition. There were 40 entries of fruit, comprising 50 varieties of fall and winter apples, all named; 15 varieties of fall and winter pears, also named. Three varieties of grapes; good specimens of peaches and quinces.

Fair samples of butter, cheese and honey were exhibited, also a good representation of manufactured articles.

It was resolved that the next fair should be held at the same place. The Board of Managers were also instructed to procure ground for a permanent location.

No Finance report.

OFFICERS.—Lee More, President; Martin Warner, Vice President; Geo. Powers, Recording Secretary; Samuel Johnson, Corresponding Secretary: Shibnah Spink, Treasurer. Managers, T. S. Carman, James Pember, Alva Clark, Geo. Williams.

WYANDOT COUNTY.

The annual Fair of the Wyandot County Agricultural Society, was held near Upper Sandusky, on the 1st, 2d and 3d days of October.

The number of persons in attendance and the character and zeal of competitors, in the face of a violent storm, which continued nearly the entire three days, demonstrated clearly that Wyandot county has within her own limits the *material* for the permanent establishment of a successful Agricultural Society.

Measures are also being taken to secure the erection of a commodious and permanent Hall, in addition to the one (sixty feet in length,) already erected and in use on the grounds.

The fee on the Fair grounds (eight acres well enclosed and improved,) originally on thirty stock-holders, has with commendable liberality been conveyed to the society. Six hundred dollars ($600,) has also been added to the assets of the society, from the sale of escheated lands in this county.

The membership of the society is 150.

Principal agricultural productions of the county are corn, wheat, oats, rye and barley. Places of market Upper Sandusky and the enterprising business place, Carey.

Potatoes and other vegetables common to this latitude, are raised in abundance.

A liberal supply of garden and other seeds has been received from the general patent office, together with numerous samples of foreign and domestic grain, wheat, barley, rye, &c., which have been distributed by the society throughout the county, in reliable hands.

Much attention has been given to the subject of blood cattle. Much improvement has been made in the horse department, through the efforts of several intelligent and enterprising gentlemen.

Special attention has been bestowed to improved stock in the hog department.

RECEIPTS AND DISBURSEMENTS.

Total receipts from all sources	$243 25
" expenditures	498 50
Deficiency	$255 25

OFFICERS.—T. V. Reber, President; F. F. Fowler, Vice President; L. Spaulding, Secretary; J. D. Sears, Treasurer. Managers, Mc D. M. Carey, T. C. Dye, Wm. B. Sleigh, Jacob Harshberger, James Lindsay.

GENERAL CONDITION OF AGRICULTURE IN OHIO.

CATTLE.

The ox is a native of eastern climes—of Africa and Asia, and as civilization proceeded westward, the ox with other animals became the companion of the pioneer. The buffalo is undoubtedly indigenous to America, but the common ox was introduced by Christopher Columbus, in his second voyage in 1493, when he brought to the New World from Spain, seeds of various kinds, plants, even some small trees, several horses, a bull and several cows. The Portugese, French, and English emigrants to the New World imported cattle from their Fatherland, or else brought them with them. Cattle were imported into Virginia in the early portion of the seventeenth century; and in 1610 an edict was issued by the Governor prohibiting the killing of domestic animals of any kind, on penalty of death to the principal, burning the hand and loss of the ears to the accessory, and twenty-four hours whipping to the concealer. The first cattle imported into New England from England were those brought over in 1620 for the Massachusetts Bay Company. About the same time the Danes imported cattle from Denmark into New Hampshire, and the Swedes made importations from Sweden, in Delaware as early as 1630. From these importations were derived all the *native* cattle of this country.

Several hundred years ago considerable attention was paid to cattle breeding in England. It is fully two hundred years, if not more, since cattle were kept in distinctive herds in Scotland and England—this being the first step towards a permanent improvement; because it was the first attempt although undoubtedly innocent on the part of the proprietors, of developing the good or bad qualities by in-and-in breeding.

Very much has been accomplished in the development and change of form by breeders. In a "*state of nature*" the cow gives no more milk than is necessary to rear her offspring, but by care and attention on the part of the breeders this secretion has been greatly increased in quantity, so that a single cow now gives as much milk as six or seven did before this quality was cultivated and developed. In the wild state not only is the entire frame of the bull small, but the hinder parts are much smaller in proportion than the fore-parts, so much so, that we should not be surprised at the answer that Paley gave to Parkinson: Dr. Parkinson, in a conversation with Paley, in speaking of the success of Bakewell in the improvement of stock, remarked, that Bakewell had the power of fattening in whatever part of the body he chose, directing it to the shoulder, leg or neck, as he thought proper, and this, continued Parkinson, "is the great *problem* of his art." "It's a lie, sir," replied Paley, "and that's the *solution* of it." Parkinson was mistaken as to the mode by which Bakewell produced his fat stock, but almost any one after observing native cattle and comparing them with Bakewell's stock would almost have come to the same conclusion.

The Collings of England may be regarded as the first producers of the improved "short horned" cattle; they commenced operations about the year 1780, and such a marked change was produced by them in this variety of cattle, that in 1822 a "herd book" or registry of the stock descended directly from the Collins' improved stock was demanded for the protection of English breeders. We may form some idea of the extent and popularity of the improved short horn breed of cattle in England, from the fact that the first volume of the English herd book was published in 1822, and the eleventh volume in 1855; the series containing the pedigrees of 14,051 bulls and at least twice that number of females. All of these bulls are and were superior animals; some of them being sold for as much as $6,000.

Physiologists had long predicted the fact, thatimportant changes could be produced in the animal form, and these results made permanent; but as it never was suspected by agriculturists or stock growers, that science, and more especially so precise and physical a science as physiology, could have any possible connection or important relation to their avocation, the idea advanced in this particular by physiologists was regarded rather as a "*learned*" chimera, than as a thing to be introduced into every day life and actual practice. But when Bakewell, the man who "sat in the huge chimney corner of a log kitchen hung round with the finest joints of his dried oxen, preserved as specimens of proportions; a tall, stout, broad shouldered man, of brown-red complexion, clad in a brown loose coat and scarlet waist-coat, leather breeches and top boots;" utterly indifferent to vulgar traditional prejudices, demonstrated to the world in a practical manner the results which not only *might* but which absolutely could be produced by attention to physiological laws, whether known or unknown to him, egotism, conceit, dogmatism and prejudice, were compelled, although reluctantly, to acknowledge the superiority of science when properly applied. Fully cognizant of the great changes and improvement which had been wrought in the carcass of cattle by Knight, Collins and Bakewell, Mr. Alexander Walker, of England became satisfied that similar improvements upon the *physique* of the human species might be wrought, and that much misery, crime and suffering might be eliminated, if as much care and prudence were exercised in pairing the human family as there was by Collings and Bakewell in their herds and flocks. He conceived the idea, and in his work on "Intermarriage," clearly illustrates, that offspring afflicted with disease and deformity result from certain unions or marriages, while from certain other unions offspring glowing with health and endowed with personal beauty, are sure to be produced; also, that in the former cases insanity is not an unfrequent concomitant, whilst in the latter the offspring enjoy the clearest intellects.

Walker was of the opinion that a dwarfed, diseased, or deformed body seldom was endowed with a profound, vigorous, active mind — in a word that physical health and development generally controlled mental health and development.

Oxen formerly were kept until they were seven or eight years of age before they were fatted for the shambles, but science has predicted and practice confirmed that they fatten most readily when three or four years of age, or rather when just done growing. When an ox was produced (of the native breeds of course,) that girted six to seven feet, and weighed from 1,500 to 1,800 pounds, he was considered quite a prodigy, but now, when the directions indicated by science are followed, it is not uncommon to produce them girting nine feet and upwards, and weighing 3,000 pounds.

Accounts of the success of the brothers Collings, Bakewell, Bates, and Knight were not long in reaching America, and as early as 1783 we find importations being made from England into Virginia of the *short-horn* or "*milk-breed*" of cattle.

Some of this milk-breed was introduced into Kentucky about 1803. In 1817 Mr. Sanders made the first importation into Kentucky, direct from England. Mr. Etches of Liverpool selected the cattle for Mr. Sanders, and assured Mr. Garran of Ky., that "they were the best of their kind then to be had in England." Six of these animals were of the Teeswaters; the cows were generally very fine milkers. Several of these animals although purchased from a gentleman who enjoyed the reputation of rearing and dealing in pure blooded stock only, were brought into

Kentucky without any pedigree, and to this day their descendants are regarded as not being full blooded short-horns.

Ever since the organization of Ohio as a State, the Miami and Scioto valleys have been regarded as *the stock* region of the State. As early as 1808, cattle were taken from the Scioto valley to the eastern markets. There is no doubt that some of the descendents of the Virginia importation of 1783 found their way into the Scioto valley. It is highly probable that some of the best cattle in Southern Ohio owed paternity to Kentucky, and were the descendents of the bulls Phito and Shaker, which were imported into Kentucky in 1803.

The first importation made into Ohio from England direct was made in 1834, under the auspices of the Ohio breeding company.

HISTORY OF THE OHIO COMPANY FOR IMPORTING ENGLISH CATTLE.

On the 2d November, A. D. 1833, Governor Allen Trimble, George Renick, Esq., and General Duncan McArthur, citizens of the State of Ohio, for the purpose of promoting the interests of agriculture, and of introducing an improved breed of cattle into the State, formed a company, and they, together with the subscribers hereafter named to the written articles of their association, contributed the amount of money necessary to import from England some of the best improved cattle of that country.

The sum of $9,200 was very soon subscribed for that purpose, in ninety-two shares of $100 each; and after making the necessary preliminary inquiries and arrangements, the company appointed Felix Renick, Esq., of Ross county, Ohio, their agent for the purchase and importation of said cattle.

Mr. Felix Renick was accompanied by Messrs. Edwin J. Harness and Josiah Renick, of Ohio, as his assistants, and they left Chillicothe for England on the 30th January, 1834.

The following persons were subscribers to the stock of said company on the 25th day of January, 1834, viz:

Allen Trimble, 5 shares, $500; George Renick, 6 do., $600; Duncan McArthur, 6 do., $600; John J. Van Meter, 2 do., $200; R. R. Seymour, 2 do., $200; Edwin J. Harness, 2 do., $200; Arthur Watts, 3 do., $300; Robert Stewart, 1 do., $100; Strawder McNeil, 2 do., $200; Preslay Morris, 2 do., $200; James Vanse, 1 do., $100; Evan Stevenson, 1 do., $100; Thomas Huston, 3 do., $300; John McNeil, 3 do., $300; John M. Alkire, 1 do., $100; Elias Pratt, 1 do., $100; William Renick, Jr., 2 do., $200; Josiah Renick, 1 do., $100; Thomas Renick, 1 do., $100; George Radcliff, 1 do., $100; Elias Florence, 1 do., $100; Asahel Renick, 2 do.,

$200; Felix Renick, 2 do., $200; H. P. Galloway, 1 do., $100; John Boggs, Sen., 1 do., $100; John T. Webb, 2 do., $200; Batteal Harrison, 1 do., $100; A. Hegler and M. Patterson, 1 do., $100; Wesley Claypoole, 1 do., $100; Archibald Stewart, 1 do., $100; Joseph G. White, 1 do., $100; John Pancake, Sen., 1 do., $100; Bodkin J. Davis, 1 do., $100; Charles Davis, 1 do., $100; Asahel Renick and E. Pratt, 1 do., $100; E. W. Gynne, 1 do., $100; M. L. Sullivant, 1 do., $100; Lyne Starling, 2 do., $200; S. S. Denny and Wm. Renick, 2 do., $200; M. McCrea, assign. to Harness Renick, 1 do., $100; Jonathan Renick, 3 do., $300; Francis Campbell, 1 do., $100; William Renick, 1 do., $100; John L. Taylor, 1 do., $100; John Crouse, 1 do., $100; John Foster, 1 do., $100; R. R. Seymour, for W. H. Cunningham, of Virginia, 4 do., $400; James Vanse, for Isaac Cunningham, of Kentucky, 8 do., $800. Total number of shares, 92; total value, $9,200.

Mr. Felix Renick, and his assistants, Messrs. E. J. Harness and Josiah Renick, proceeded to England, and made a careful examination of much of the improved stock of that country, purchased from some of the most celebrated and successful breeders of cattle in England about nineteen at various prices, selected from the herds of Mr. Bates, the Duke of Leeds, the Earl of Carlisle, Mr. Whittaker, Mr. Paley, Mr. Mason, Mr. Ashcroft, and others, consisting of bulls and cows, of the *thorough-bred short horned Durham stock.* They brought these to Ohio, and returned in time to exhibit them at the Agricultural Society of Ross county, on the 31st day of October, 1834.

This stock of English cattle was kept together, under the care of an agent, by said company, and they *increased the number, by additional importations from England, until the 20th day of October, A. D.* 1836; when the cattle imported, as well as the natural increase thereof since the 31st October, 1834, were sold at public auction, under regulations adopted by the company.

The following extract, from "The Scioto Gazette of October 26, 1836," will show the names of the purchasers, and the prices the stock brought at public sale:

GREAT SALE OF DURHAM STOCK,

Imported by the *Ohio company for importing English cattle*, in the years 1834, 1835 and 1836, held at Indian Creek farm, the residence of Felix Renick, Esq., agent of the said company, in Ross county, on the 29th day of October, 1836. The stock of the company was in fine condition, and in great demand.

Notwithstanding the high prices at which the cattle were sold, some of them exchanged owners immediately, at very considerable advances; and, for others, more than 50 per cent. on their cost was offered and refused.

Reformer, a bull, not sound, sold to John T. Webb, of Ross county, Ohio, for	$48
Matchem, a bull, sold to Abraham Renick, of Kentucky, for	1,200
Earl of Darlington, sold to Batteal Harrison, of Fayette county, Ohio, for	710
Young Waterloo, a bull, sold to R. D. Lilley, of Highland county, Ohio, for	1,250
Duke of York, a bull, sold to R. R. Seymour, of Ross county, Ohio, for	1,120
Experiment, a bull, sold to James M. Trimble, of Highland county, Ohio, for	1,150
Comet Halley, a bull, sold to R. R. Seymour, of Ross county, Ohio, for	1,505
Whittaker, a bull, sold to Wm. M. Anderson, of Ross county, Ohio, for	855
Nimrod, a bull, sold to Elias Florence, of Pickaway county, Ohio, for	1,040
Duke of Norfolk, a bull, sold to Robert Stewart, of Ross county, Ohio, for $1,225; afterwards sold, at private sale, to Gov. Vance and J. H. James, of Champaign county, for	1,400
Goldfinder, a bull, sold to Isaac Cunningham, of Kentucky, for	1,095
Duke of Leeds, sold to John Crouse, Jr., of Ross county, Ohio, for	575
Windham, a bull, sold to Charles Davis, of Ross county, Ohio, for	500
Columbus, a bull, not sound, sold to Thomas Huston, of Pickaway county, Ohio, for	180
Davy Crockett, a bull, sold to Peter L. Ayres, of Ohio, for	490
Snowdrop, a bull, sold to Stewart and McNiel, of Ross county, Ohio, for	480
Independence, a bull, sold to Hegler and Peterson, of Ross county, Ohio, for	400
Perry, a bull, sold to Wm. H. Creighton, of Madison county, Ohio, for	400
Goliah, a bull, sold to Isaac V. Cunningham, of Scioto county, Ohio, for	300
Logan, a bull, sold to Elias Florence, of Pickaway county, Ohio, for	750
John Bull, a bull, sold to Wm. Renick, Jr., of Pickaway county, Ohio, for	615
Paragon, a bull, presented by the company to Felix Renick, Esq., their agent.	
Powhattan, a bull, sold to George Renick, Sen., of Ross county, O., with Flora.	
Rantipole, a bull, sold to Arthur Watts, of Ross county, O., for	810
Gaudy, a cow, sold to James A. Trimble, of Highland county, O., for	985
Blossom, a cow, sold to R. R. Seymour, of Ross county, O., for	1,000
Flora, and her calf, Powhattan, were sold to George Renick, Sen., of Ross county, O., for	1,205
Lily of the Valley of Tees, sold to Thomas Huston, of Pickaway county, O., for	950
Matilda, sold to Arthur Watts, of Ross county, for	1,000
Calypso, a cow, sold to Strawder M'Niel, of Ross county, for	325
Young Mary, and her calf Pocahontas, were sold to Edwin J. Harness, of Ross county, for	1,500
Lady Blanch, (no proof of this cow being a breeder,) sold to Charles Davis, of Ross county for	250
Teeswater, and her calf, Cometess, sold to John I. Van Meter, of Pike county, O , for	2,225
Duchess of Liverpool, sold to Wm. M. Anderson, of Ross county, O., for	570
Lady Colling, (it is doubted whether this cow will ever be a breeder,) sold to John T. Webb, of Ross county, for	205
Beauty of the West, sold to Asahel Renick, of Pickaway county, O , for	900
Lilac, sold to Elias Florence, of Pickaway county, for	425
Lady of the Lake, sold to R. R. Seymour, of Ross county, O., for	775
Lady Paley, sold to Alexander Renick, of Ross county, O., for	510
Poppy, sold to Harness Renick, of Pickaway county, O., for	610
Pink, sold to William Trimble, of Highland county, O., for	575
May Flower, sold to Batteal Harrison, of Fayette county, O., for	405

Lucy, (pedigree doubtful,) sold to George Ratcliff, of Pickaway county, O., for.........	$505
Moss Rose, sold to Jonathan Renick, of Pickaway county, O., for.....................	1,200
Celestina, sold to T. Huston, of Pickaway county, O., for............................	930
Malina, sold to Isaac Cunningham, for..	1,005
Illustrious, sold to Abraham Renick, of Kentucky, for................................	775
Lady Abernethy, sold to Thomas Huston, of Pickaway county, O., for...................	815

Attest: JOHN L. TAYLOR,

Secretary of the Ohio Importing Company.

On the 1st of April, 1837, at a meeting of said company, at Chillicothe, upon a settlement of the business of the company, a dividend of $280 per share was declared on the 92 shares of the stock of said company, amounting to $25,760.

This company held their last meeting on the 15th April, 1837, and settled finally the business thereof, so far as was practicable, by ordering a second sale, which was held as follows:

"THE HIGHEST PRICES YET."

A sale of seventeen head of improved short-horned cattle, belonging to the Ohio Company, being mostly of this year's importation, and the produce of others, took place at the Sugar Grove, in this town, on Tuesday last. The attendance was numerous, comprising a larger number of actual bidders than the previous sale. Among the individuals present who are pre-eminently noted for their agricultural enterprise, were Governor Vance, Ex-Governor Trimble, the Messrs. Renick, Mr. Sullivant—and, indeed, nearly all the large farmers of this valley and the adjacent country. The bidding was, consequently, very spirited, and the prices obtained for the cattle plainly show that the kind of stock sold is rapidly advancing in public estimation. By the following list from the auctioneer's book, our brethren of the press will discover that the cattle enumerated were even more highly valued than those of the *sham sale* they were of late parading in their columns, copied from the "Cincinnati Gazette:"

BULLS.

Acmon, three years eight months, M. L. Sullivant & Co., Columbus..................	$2,500
Comet Halley, five years, George Renick & Co , Chillicothe.........................	2,500
Hazlewood, one year six months, Allen Trimble and R R. Seymour.........	700
Bouncer, one year seven months, John Walke, Pickaway county, Ohio................	453
Powhattan, one year nineteen days, Harness Renick, Pickaway county, Ohio..........	500
Santa Anna, three months twenty-one days, Joseph C. Vance, Ohio county, Va........	425

COWS.

Flora, seven years six months, M. L Sullivant, Columbus..........................	$1,300
Matilda, six years six months, Allen Trimble, Highland county, Ohio.................	1,220

Fidella, seven months eighteen days, Allen Trimble, Highland county, Ohio..........	$610
Elizabeth, (and calf,) five years, J. & Wm. Vance, Champaign county, Ohio..........	1,450
Charlotte, four years seven months, Joseph G. White, Ross county, Ohio...............	630
Arabella, (and calf,) three years seven months, Arthur Watts, Chillicothe.............	1,200
Blush, two years nine months, John H. James, Champaign county, Ohio..............	1,015
Emily, two years eight months, Asahel Renick, Pickaway county, Ohio...............	875
Victoress, one year nine months, M. L. Sullivant, Columbus..........................	700

Very great benefits have resulted to the country by the introduction of this improved English Durham stock into the State of Ohio by this company.

An improved breed of cattle throughout the State has resulted from crossing the English stock with the common stock existing at that time; and a very fine, large and thrifty race of cattle in many parts of Ohio has been bred by this laudable enterprise. Some of their full blood bulls and cows have been sold to farmers of the adjoining States; and thus the benefits of their importations have contributed largely to improve the stock of cattle in the western country.

Mr. George Renick, of Ross county, has bred, from a portion of the stock imported by said company, and the common cows of Ohio, a very fine race of cattle; and for the last six years, as he states, he has annually sold about 50 or 60; the average weight of which, at from three to four years old, was about 1,000 pounds net. Some of them weighed as much as 3,000 pounds, and one (older) as high as 3,400 pounds, gross.

Ex-Governor Allen Trimble, of Highland county; Doctor Arthur Watts, of Ross county; M. L. Sullivant, Esq., of Franklin county—all well known as amongst the most successful farmers and stock growers in Ohio—besides many others of this company—have contributed largely, by their skill and enterprise, to increase and diffuse the improved breed of cattle, resulting from the importations of the company, into every part of this State.

Doctor Watts, at the agricultural exhibition in Ross county, in 1849, exhibited eight two-years old steers, averaging 1,526 pounds each; and at the State agricultural fair at Cincinnati, held in 1850, he exhibited, amongst other cattle, one four years old steer, (full-blood Durham,) weighing 2,550 pounds, gross; and one three years old steer, weighing 2,220 pounds, gross. These weights are given to show the enormous weight which this Durham stock of English cattle attain at an early age when bred by skilful and intelligent farmers; and they show, also, the great value of breeding from this stock to those who are engaged in furnishing the beef markets of our country.

There have been several importations since that time, one by the Clark County Importing Company, in 1854, and another by the Madison County Importing Company, during the same year. The great proportion of the Short-horn stock in Ohio are the descendants of the stock imported by these several companies.

The Devons and Herefords find encouragement in proportion to the estimation in which they are held.

There were apprehensions that our very dry climate, very warm summers, and excessively cold winters would prove great obstacles to the acclimatization of cattle imported from the moist and more uniform climate of England; but I am not aware that in the hands of a careful and judicious breeder any deterioration has taken place. That the Short-horn or Durham thrives as well, and attains as ample proportions in Ohio as in any other State in the Union, may be safely inferred from the following:

In 1846, Mr. L. F. Allen, of Black Rock, N. Y., published the first volume of the American Herd-Book; this volume contains the pedigrees of 502 animals—192 bulls and 410 females; of which Ohio contributed the pedigrees of 60 bulls and 103 females, or a fraction less than one-third of the whole list registered for the entire United States. In 1855 the second volume of the Herd-Book was published, containing the pedigrees of 978 bulls and 1718 females; of these pedigrees of bulls Ohio furnished 239, and of the females 466, or a fraction more than one-fourth of the entire amount recorded.

In 1857 the third volume was published, in which the previous proportion of pedigree sfurnished by Ohio is fully sustained. When it is remembered that New York contains some of the finest herds in the Union, and that many of the most successful breeders in America may be found within the boundaries of that State; that Kentucky enjoys the reputation of producing the finest specimens of cattle in the Union; that Virginia has all the facilities of being a first-class cattle growing State; that Indiana and Illinois have entered the lists to compete with Ohio; that Michigan, Wisconsin and Iowa have made great progress in this direction, we would be untrue to ourselves did we not congratulate the breeders of Ohio upon the success which has crowned their every effort to introduce better strains and improve the cattle of the State.

Much of this success is due to the well-sustained efforts of the State Board at the annual Fairs, as well as to the Fairs held by county organizations. In fact, many counties ascribe the introduction and improvement in the breeds of cattle to the successful organization and conduct of county agricultural societies. The following, gleaned from the reports of county agricultural societies, present a fair indication of the condition of the State in respect to the improvement in cattle. For statistics of cattle in this State the reader is referred to the tabular statement on page 50 of this report.

CONDITION OF STATE IN RESPECT TO FINE CATTLE.

Ashland—Great improvement by importation, Durhams, Devons, and their crosses.

Belmont—Durhams are the best for beef; great improvement in this respect.

Brown—Durhams are being introduced.

Carroll—Little improvement; Short-horns are sparingly introduced.

Champaign—Much improvement: Durhams are preferred on account of size and fattening qualities.

Clark—Much improvement by importation; short-horns preferred.

Clermont—The interest in this branch of agricultural wealth is certainly established, and our farmers are fairly awake to the profit of raising animals that will make as much beef at two or three years old as a native will at double the age. Since our last Fair quite a large number of Short-horns have been brought into the county from the herds of the Shakers, and other noted breeders in Ohio and Kentucky, making a valuable acquisition to the several good herds already among us. The Short-horns, on account of their size, early maturity, and capability for *profitably* converting food into either beef or milk, are the favorites in our county, to the exclusion of any other improved breeds.

Columbiana—Marked improvement—Short-horns are preferred for beef qualities. About 10,000 cattle are raised annually; a great portion of these are sold to the eastern markets.

Coshocton—The cattle interest is a great one in this county; our breeders prefer the Durham. Among the fine herds existing for many years in this county may be mentioned those of A. Medbury, Geo. Wolf, F. McGuire, T. Darling and A. G. Wood, and more recently established S. Burrill, W. P. Wheeler, D. Miller, and others.

Darke—Great improvement, the best qualities are being introduced.

Defiance—Short-horns and Devons are being introduced—great improvement.

Delaware—There has been in some sections of the county a very decided improvement in the breed of cattle, by the introduction of thorough-bred and high grade Short-horns; this breed of cattle seeming to be most generally approved. I know of no accurately noted experiments in feeding. But the general impression is that the Short-horn cattle take on flesh earlier, and yield a much greater return for feed than any others. There are few, if any, thorough-bred Devons, Herefords or Ayreshires in the county.

Erie—Decided improvement. Durhams preferred for beef, and cross of Durham and Devon for Dairy.

Fairfield—Improvement by importation of Short-horns.

Franklin—Great improvement. Durhams preferred on account of size, easy feeders and early maturity.

Geauga—Constant improvement by importations of Short-horns and Devons, and attention to breeding. Many beef cattle fatted and exported.

Greene—The annual exhibition of cattle showed a growing diffusion of the Short-horn breed, and that the pure blood now makes up a portion of the stock of a great number of our farmers, who are not raising for speculation, but for the improvement of their herds. Durhams are preferred and are pretty well introduced throughout the county. The preference is based on their early maturity, good milking and readily fattening qualities.

Guernsey—Improvement by importing Durhams from the Scioto valley. Devons are also introduced.

Hamilton—Great improvement.

Hancock—Durhams and Devons largely imported—give much satisfaction.

Hardin—Great improvements have been made by attention to breeding.

Harrison—Improved breeds eagerly sought after.

Highland—Great improvement by attention to breeding and feeding.

Hocking—Great improvement by importation of Short-horns.

Holmes—Some improvement.

Huron—Durhams and Devons preferred for their fattening qualities.

Jackson—Durhams imported from Kentucky are preferred for beef, on account of size and early maturity.

Jefferson—Some improvement—Short-horns and Devons introduced as much as thirty years ago.

Knox—Of late there has been quite an improvement in cattle. The Durhams have been introduced on account of their easy keeping, early maturity, large size and fattening qualities—the Devon because of their beauty and neatness in appearance, their superiority as working cattle and extra milking qualities. There are no Herefords or Ayreshires in the county.

Lake—Durhams are preferred, because they are more constitutionally inclined to become fat and lazy.

Lawrence—Very little improvement; cattle mostly natives; a few Durham grades.

Logan—Great improvement by importing and crossing with Short-horn stock.

Lorain—Considerable improvement—Durhams, Devons and Herefords, all have their admirers.

Madison—Great improvement by importation and attention to breeding. Short-horns preferred.

Mahoning—Durhams recently introduced; are admired on account of their superior size and aptitude to fatten.

Marion—Considerable improvement—Short-horns are preferred.

Medina—Great improvement; Durhams preferred to all others except for dairy purposes.

Miami—Durhams are preferred for their size and beauty. Natives are crossed with the Durhams to a great extent.

Monroe—Much attention has lately been paid to the improvement in cattle. Durhams preferred.

Morgan—Cattle are improving by the introduction of blooded strains, but cannot decide which is best.

Morrow—Some improvement; Short-horns preferred for beef.

Muskingum.—By crossing with Devon, Durham and Herefords great improvement has been wrought. The Devons and Herefords are preferred because they will live and do well on much shorter pasture and less food than Durhams; besides they make decidedly better beef and incomparably better oxen.

Noble—Cattle mostly native, a few Devon and Durham grades have been introduced.

Pike—Durhams and Devons are being introduced.

Portage—Our cattle are improving and farmers are learning that the expense of rearing an animal worth one hundred dollars is no more than to rear one worth twenty-five dollars only. Several very fine Short-horned bulls have been introduced into the county. A number of very fine Short-horn cows and heifers owned and reared within the county were on exhibition at our Fair.

There are very few Devons in our county, there are some fine animals of this breed owned in the vicinity of Randolph.

The Durhams are preferred for their fine beef qualities and early maturity. A cross between the Durhams and Devons are said by some to make the finest cattle in the world—the Devons imparting a good color and horns, and the Durhams giving size. There are no Herefords or Ayreshires in the county.

Putnam—A few Durhams introduced.

Richland—Great improvement. Durhams preferred because adapted to the soil and climate, and have proved to be better for beef, but are not as good milkers as Devons or Ayreshires.

Ross—Ross county at one time possessed as large herds of imported and blooded cattle as any other in the State, but she is gradually losing, we fear, her prominence in this respect. The pioneers in the introduction of improved cattle are fast passing away and their sons are not maintaining the deserved reputation of the fathers in this branch of agriculture. We still have fine cattle, but not so many as formerly, and fewer persons are engaged in rearing them.

The number of cattle, stall-fed, in the county, has diminished more than one-half in the last five years. This is owing to the high price of corn. The increased demand for distillation and for the furnaces east of us—and the greater facilities for getting it to market make it more profitable to sell than to feed. Cattle cannot be fed on forty cent corn, as we feed in the Scioto valley.

Sandusky—Material improvement. Durhams preferred for their beef making qualities.

Seneca—Great improvement in stock.

Stark—Some improvement. Blooded stock is being introduced.

Summit—Durhams, for their size and appearance, are preferred for beef; of these we have many fine full bloods and crosses. Our native cattle are much improved for beef by crosses with the Durhams, in the following respects, viz: they grow faster and larger, get fatter on grass, the flesh is more tender and juicy, and invariably command a better price.

Trumbull—Great improvement in cattle, and greater emulation in getting good blooded stock. Durhams greatly preferred for beef. Some of the best Kentucky stock has been imported within the past two or three years.

Tuscarawas—Great improvement. Durhams yield one-fifth more beef from the same pasture than any other breed.

Union—Great improvement. Short-horns the most popular.

Vanwert—Some improvement. Blooded stock is being introduced.

Vinton—Much improved. Durham and Devon preferred.

Warren—The character of the cattle of this county presents as marked a change since the formation of this society as any county in the State for the same length of time, and yet we have only made a beginning. Of the 17,787 returned by the assessor for 1857, probably there are 400 head of pure Short-horns and 2,500 good grade cattle; the balance the old *Penny-*

royal breed, (of which enough would break Stephen Girard.) I am happy to think the old stock have had their day, they are giving slowly but surely to the Short-horns, that will always pay for the feed consumed. The same difficulty stands in the way of experiments of cattle feeding as in sheep and hogs—the proportion of labor to the product of beef.

The last importations have been reported to the State Board in '55 and '56. I will not close this article without mentioning the superior herds of R. G. Corwin, Esq., of between forty or fifty head of very superior cattle. The Shaker Society, of Union, now possesses the largest herd in the State, of near two hundred head comprising many very superior animals. The Messrs. Collett, Steddom, O'Neils, Perrines, Probasco, with many others that I do not now remember, have more or less blooded Short-horns.

If the State Legislature would pass an act prohibiting the raising any of the *Pennyroyal Bulls* for breeders and authorize the county commissioners to purchase Durham bulls, to be placed in every neighborhood, to be used gratuitously, the counties would receive in five years the investment back with 100 per cent. in the taxes on the increased value of the stock.

Wayne—Much improvement. Durhams preferred for beef. Devons and natives and their crosses for milk and butter.

Williams—Not much improvement. Very few thoroughbreds in the county.

Wood—Improving.

Wyandot—Some improvement. Short-horns preferred.

Intimately connected with the subject of the state of improvement is the question of cattle feeding. It is much to be regretted that no experiments have been conducted in Ohio for the purpose of determining how much beef 100 bushels of corn will produce, fed to the cattle raw and unground, or how much the same quantity ground and boiled would produce. It is a question of no small import to the cattle grower, and where so large an interest is involved, it is somewhat remarkable that every detail, even to the last degree of minutiæ, has not been either learned, developed, or observed.

It has been frequently suggested that it properly is within the legitimate province of the State Board to determine, by actual experiment, not only the actual, but also the comparative merit of *all* the *blooded* breeds of cattle, for the various purposes of beef, dairy, &c., as well as for draft. Were the cattle interest the only interest whose development and furtherance the State Board was organized to consummate, then would the practical fulfillment of the suggestion be compatible with the duties of the Board. But there are other departments of agriculture whose claims are equally valid, and to develop and advance with justice and uniformity all these interests would require the employment of a large corps of persons, and consequently the command of a sum of money much larger than that at any time subject to the control of the Board.

In the absence, then, of the means to test the merits of the various breeds of cattle, the Board are doing the next best thing in their power to do, namely, to offer liberal premiums on the different breeds of cattle, and thus to encourage the introduction and improvement of *all* kinds; until the parties interested—should no other means be devised—place subject to the command of the Board a sum sufficient to defray the expenses of conducting the experiments with the greatest exactitude.

Meanwhile, the Board is collecting all the reliable information which under the circumstances it is possible to do, through its exchanges with European societies, with the societies of other States, as well as by correspondence with cattle breeders within our own State. The following are all the replies, other than the stereotyped ones of "*know of no experiments*," which were received to the question, on the printed circulars (900 of which were distributed throughout the State—100 only of which were returned to this office), How much beef will 100 bushels of corn in the ear make?

CATTLE FEEDING.

Coshocton—Cattle intended for the butcher are mostly fed in this county with the corn in the shock, in the same way as heretofore on the Scioto. Doubtless, if the corn was fed separately, and ground and cooked before feeding, its value would be very much increased. In the making of meal into mush by boiling, such new chemical combinations are produced as render the mush a new substance, and no longer corn meal and water. This new substance—mush—pound for pound with corn, or corn meal, ought to be experimented with. First, to ascertain how many pounds of mush a pound of meal will make; and second, to ascertain the relative value of the mush and meal, pound for pound. If it should turn out that a pound of meal will make, for instance, four pounds of mush, and that one pound of mush is equal to one pound of meal when fed, it will be demonstrated that one acre of corn is by that process made equal to four; and also, that the capital and labor of three acres is saved.

T. S. Humrickhouse.

Franklin—One hundred bushels of corn in the ear will produce 250 pounds of beef on Short-horn cattle. D. Taylor.

Fairfield—One bushel of corn in the ear will produce three pounds of beef. J. Reber.

Logan—I fed crushed corn and cob, seventeen pounds per day, to each of sixty, three-year old grade steers in the stalls. This amount produced an average increase of weight of seventy-five pounds per month, in the winter of 1855–6. This and other experiments which I have made convince me of the fact, now well understood by all who have tried similar experiments, that no economical farmer will waste grain by feeding it in a rough state. J. M. GLOVER.

Summit—It takes five pounds of corn to form one of beef; but if the corn is ground and cooked, three and a half pounds will do it.

L. V. BIERCE.

I find the following in the Transactions of the Agricultural Society of Denmark, at Copenhagen, 1856:

Machines for crushing feed for animals were discussed, and the conclusion arrived at that their use was attended with a saving of fodder; but that crushed and cooked food was not so healthy for the animal as the natural grain and other food, because it would be chewed less, less saliva would flow, and digestion would be less perfect. But that if fattening was the object, then the *prepared* food would be advantageous, as the animal would take on fat faster, while for strength and endurance the preference was in favor of the unprepared food.

The following essay, by Dr. Voelcker, on the Chemistry of Food, has not, to the best of my knowledge, been republished in this country. It was published in the autumn of 1856 in England, and inserted here not as a familiar thing narrated in an attractive style, but because it contains much very valuable information, as well as many excellent suggestions to stock feeders.

THE CHEMISTRY OF FOOD.

(*By Dr. Augustus Voelcker, Professor of Chemistry in the Royal Agricultural College, and Consulting Chemist to the Bath and West of England Agricultural Society.*)

We are indebted to Professor Mulder, Boussingault, Dumas, and, above all, to Liebig, for a number of elaborate and beautiful researches into the chemistry of food; and to several of our most distinguished feeders of stock, especially to Mr. Lawes, for a series of carefully conducted and highly valuable feeding experiments. But, though it cannot be denied that these scientific investigations and practical experimental trials have led to the establishment of several important scientific principles, and given us clearer views of the nutritive value of food, it must be confessed that our knowledge of the mysterious process of nutrition and the adaptation of the various kinds of feeding-stuffs to particular purposes, is still in its infancy. It would be ingratitude not to acknowledge the services rendered already by the above mentioned distinguished chemists, and by others who have labored successfully in the field of animal physiology, but still I am bound to confess at the outset that practice is in advance of science. It may appear, therefore, useless to occupy the time of the reader by the following pages. However, considering that no scientific investigation in which the chemist or animal physiologist engages is more intimately connected with the successful practice of farming than the inquiry into the processes of nutrition and the practical value of feeding substances, I trust this paper will be found not without interest to the practical man.

Within the last few years several of our best agricultural chemists have been busily engaged in attempts to ascertain more accurately than before the composition of those substances which the farmer usually employs for the rearing and fattening of stock. Their labors have been eminently successful owing to the more advanced state of chemistry and the more refined methods of analytical processes. Unfortunately the results of their investigations are inaccessible to the majority of practical men, being scattered in isolated fragments in agricultural publications, or deposited in journals specially devoted to physiological or other strictly scientific literature. Having had frequently occasion to observe the difficulty under which the practical man labors in finding that information which he is anxious to obtain with respect to the composition and practical value of food, it has appeared to me desirable to facilitate in some measure his search for information on this subject. To this end I have collected the most trustworthy analyses, and I hope, after rejecting all those which bear upon them the impress of imperfection or impracticability, to present to you in a systematic order a sufficiently correct account of our existing knowledge of the composition and practical feeding value of the more important feeding-stuffs employed by the farmer for maintaining the animals on a farm, or for rearing and fattening of stock. With a view of lessening much that is necessarily tedious in such an account, I shall endeavor to intersperse it with some general practical remarks, which the various headings will suggest, and shall conclude by pointing out a few considerations which ought to be well weighed in estimating the economical value of feeding materials. Before entering into details, however, it will be necessary for me briefly to allude to the principal divisions of the constituents of food, and to their respective adaption to the wants of the living animal.

If we expose to a strong heat in an open vessel wheat, oats, or barley, turnips and mangolds, clover, artificial or natural grasses, and indeed all kinds of food raised for the use of man or animals, they are dissipated for the greater part, and but a small quantity of a generally white ash is left behind. The incombustible portion, or ash, amounting rarely to more than 6 per cent. of the whole mass of the dry substance, consists principally of two classes of substances:—namely, first of earthy matters, insoluble in water; secondly, of saline and soluble substances. The earthy insoluble matters, in the majority of cases, consist chiefly of a combination of phosphoric acid with lime, which, constituting two-thirds of the bones of animals, is called bone-earth. The earthy portion of the ash supplies the animal with the materials for the formation of its bony skeleton. The saline constituents of the ash of food consist chiefly of common salt and of phosphate of soda, which two combinations enter largely into the composition of blood, and likewise of salts of potash which abound in the juice of flesh. The saline matters thus supply the blood, juice of flesh; and various animal juices, with the necessary mineral constituents. The organic or combustible part of all food is composed of a great variety of organic compounds, such as starch, gum, sugar, cellular fibre, albumen, casein, gluten, &c. But all these compounds may be grouped together into two classes. The first class includes constituents rich in nitrogen or nitrogenized matters; and the second, constituents free from nitrogen or non-nitrogenized compounds. To the former, the nitrogenized compounds, belongs:

Vegetable albumen, a substance identical in composition with white of egg.

Gluten or vegetable fibrin, a compound occurring in considerable quantity in wheat, and giving elasticity to the dough made with wheaten flower.

Vegetable casein, a substance indentical in composition with the curd of milk.

Legumin, a peculiar vegetable principle, which derives its name from its occurrences in large quantity in peas, beans, and other leguminous seeds.

A few other nitrogenized compounds of rare occurrence need no special mention.

To the second class, or to the non-nitrogenized substances belongs:—

1. All oily and fatty matters.

2. Starch or amylum, which constitutes the principal part of wheaten flour, oat and barley meal, rice, Indian corn, and the dry matter of potatoes.

3. Sugar, which abounds in mangolds, carrots, and turnips.

4. Gum and mucilage, constituents of every kind of food.

5. Pectin, the jelly-like substances, which is found in carrots, mangolds, turnips, and many other bulbous roots.

6. Cellular and woody fibre, substances which constitute chiefly the bulk of straw and hay, and occur abundantly in every other vegetable produce.

These, with a few other compounds of less general occurrence, constitute the class of non-nitrogenized matters. The nitrogenized compounds constitute a remarkable class of organic substances. They contain all about 16 per cent. of nitrogen and small quantities of sulphur or phosphorus, or both, and resemble each other so closely in their general properties and composition, that they can scarcely be distinguished from each other. As the type of this interesting class of compounds we may regard vegetable albumen, a substance analogous, if not identical, in properties and composition with the white of eggs. On account of the close resemblance of vegetable casein, gluten, and legumin with albumen, all the compounds of this group are often called albuminous matter, and as they all furnish by a simple chemical process a substance called protein, they are likewise frequently described as protein compounds. The discoverer of protein (Professor Mulder) was the first to suggest this name, as he regards albumen and the other albuminous substances as compounds of protein, with small and variable quantities of sulphur or phosphorus, or both. Not only are these substances nearly identical in composition and properties with each other, but they resemble so intimately animal albumen, casein, and fibrin, or those materials of which the flesh and blood of animals principally consists, that they have been called with much propriety, flesh or muscle forming principles. Oilcake, peas and beans, and other leguminous seeds, are very rich in flesh forming principles; oats, barley, and wheat, likewise contain a considerable proportion of these substances. In smaller quantities they occur in roots, grass, hay, and all other kinds of feeding-stuffs. On the whole, however, the plants which serve as food to animals are, comparatively speaking, poor in albuminous compounds, but rich in starch or gum, sugar, cellular and woody fibre, or any other non-nitrogenized substance. Plants thus present the animal with a mixture in which the substance of the muscle, so to speak, exists ready-formed; for without undergoing great changes in the stomach of the animals, the albuminous compounds are readily assimilated and converted into blood and muscular fibre.

No food entirely destitute of flesh-forming constituents is capable of supporting animal life for any length of time; hence the great importance which is attached to these compounds by the physiologist. Many careful experiments have proved nearly beyond dispute the fact that the animal organism does not possess the power inherent in plants, of compounding and preparing the substance of the muscles from its elements; unless, therefore, food is presented to animals which contains ready-made muscle, they soon become emaciated and rapidly perish.

Thus it has been shown that dogs fed upon arrow-root, sugar, gum, butter, and other food, entirely destitute of flesh-forming principles, rapidly lose all flesh and die at the end of the fifth or sixth week, or a little later than they would if no food of any description were given. Similar experiments have been tried with sheep and geese. Thus Macaire and Marcet fed a sheep weighing 53 lbs. with food perfectly free from nitrogen. On the 20th day after the beginning of the experiment death occurred, and the weight of the sheep was found reduced to 31 lbs.

Tiedemann and Gmelin obtained similar results with geese: a goose weighing 6 lbs. 1 oz., was fed with sugar, and died on the 22nd day after the experiment had begun, and then weighed only 4 lbs. 8 oz. Another goose weighing 8½ lbs. was fed with starch, and a third weighing 5 lbs. 12 oz. with gum: the latter died even after 16 days, and was then found to weigh 4 lbs. 12 oz; and the former after 27 days, when its weight amounted to only 6 1-4 lbs.

Practical experience, moreover, has made us acquainted with the high feeding value of oil cake, beans, and grain, articles of food very rich in albuminous compounds, and with the inferiority of food poor in nitrogenized compounds. It may therefore be laid down as a principle established both by practice and science, that the nutritive value of food depends in a great measure upon the amount of albuminous compounds which it contains.

Non-Nitrogenized Principles.—Neither the health nor indeed the life of all our domesticated animals, we have seen, can be maintained by food destitute of nitrogenized or flesh-producing matters. Though absolutely necessary to the very existence of animal life, long experience and direct experiments have proved alike that food consisting entirely of muscle-producing matters cannot support the life of herbivorous animals for any length of time. Thus a goose, it has been found by experiment, when fed with albumen or white of egg, died after 46 days, her original weight of 8 lbs. 1 oz. having sunk to 4 1-2 lbs. Similar experiments have shown that herbivorous animals, when fed upon nitrogenized food, containing no starch, sugar, or other non-nitrogenized compound, notwithstanding the liberal supply of the highly nutritive albuminous matters, become emaciated, and die almost as soon as others fed upon food containing no nitrogen at all. Experience thus teaches that starch, fat, sugar, gum and other organic compounds not containing nitrogen, are almost as essential to the well-being of herbivorous animals as the flesh-forming principles.

The various non-nitrogenized substances are all characterized by a large proportion of carbon, for which reason they are sometimes called carbonaceous constituents of food. Their use in the animal economy is of a two-fold character. They supply either the materials for the formation of animal fat, or they are employed to support respiration, and with it animal heat. According to the fitness and ease with which the non-nitrogenized compounds fulfil the one or other function, they may be divided into two classes, namely, into fat-producing matters and into principles of respiration. To the first belong the fatty and oily matters which occur in all our cultivated plants, in some in larger, in others in smaller quantities. The oily and fatty vegetable substances are eminently well adapted to the laying on of fat in animals, inasmuch as the composition of vegetable fat is analogous if not identical with the several kinds of fat which form part of the bodies of animals. The fatty matters of food, without undergoing much change, are therefore readily assimilated by the animal organism, and applied when given in excess to the storing up of animal fat. Vegetable oils and fats, given along with a scanty supply of starchy food, are used to support respiration; and on the other hand, starch, gum, and sugar, when given to fattening beasts in excess, are transformed into animal fat. There is thus no essential difference in the fatty or the starchy constituents of food, in so far as their use is concerned. According to circumstances, vegetable fatty matters are either stored up in the animal system or employed to support respiration; on the other hand, starch or sugar, which are usually employed to feed the respiration, are under favorable conditions changed into animal fat. The proportion of carbon in fatty matters amount to about 80 per cent., and is much larger than in starch or sugar. On account of this deficiency in carbon the latter compounds are not so well adapted for the laying on of fat. On the other hand, all food containing much ready-made fat or oil is justly esteemed for fattening beasts. The changes which starch, sugar, gum, and similarly constituted substances undergo in the animal system are readily explained. These compounds consist of carbon and water only, and on account of the simplicity of their composition are well adapted to feed the respiration. In breathing, the atmospheric air taken in by the lungs supplies the oxygen, which, combining with the carbon of starch or sugar, produces carbonic acid in abundance, which is thrown off with watery vapors in exhaling. The quantity of carbon consumed during respiration of animals varies at different times, in different species, according to the rapidity of breathing and mode of living. Under all circumstances, however, it is considerable. Thus a horse, according to Boussingault, throws off daily 45 lbs. of carbon in the form of carbonic acid gas; and in the case of the cow four-ninths of the carbon contained in the daily food is consumed during the process of respiration. Animals therefore require food not merely to support or to increase the weight of their bodies, but also to furnish the necessary amount of carbon required for supporting respiration. When starch or sugar is burnt in the air, the oxygen of the latter unites with the carbon of the former, and both together are dissipated in the form of carbonic acid, with the production of much heat. The process of respiration resembles intimately the act of combustion. It is in fact a slow combustion, and like all processes of that description, is attended with the evolution of heat. The amount of heat thus generated is proportionate to the quantity of carbon consumed during respiration, and by this provision the uniform temperature of warm-blooded animals is preserved throughout winter and summer. If it were not for this constant source of heat the bodies of warm-blooded animals would soon become cold and stiff as the bodies of dead animals do. Respiration thus is necessary to supply heat to the animals.

In recapitulation of the above remarks it may be briefly stated:

1. The earthy substances contained in food, consisting chiefly of phosphate of lime and magnesia, present the animal with the materials of which the bony skeleton of its body principally consists. They may be called, therefore, bone materials.

2. The saline substances—chlorides of soldium and potassium, sulphate and phosphate of potash and soda, and some other mineral matters occurring in food—supply the blood, juice of flesh, and various animal juices with the necessary mineral constituents.

3. Albumen, gluten, legumin, and other nitrogen-containing principles of food, furnish the animal with the materials required for the formation of blood and flesh, they are callod, therefore, flesh-forming substances.

4. Fats and oily matters of the food are employed to lay on fat, or to support respiration and animal heat.

5. Starch, sugar, gum, and a few other non-nitrogenized substances, consisting of carbon, hydrogen, and oxygen, are used to support respiration—hence they are called elements of respiration—or they produce fat when given in excess.

6. Starch, sugar, and other elements of respiration alone cannot sustain the animal body.

7. Albumen, gluten, or any other albuminous matter alone does not support the life of herbivorous animals.

8. Animals fed upon food, deficient in earthy phosphates or bone-producing principles, grow sickly and remain weak in the bone.

9. The healthy state of an animal can only be preserved by a mixed food which contains flesh-forming constituents as well as heat-giving principles, and earthy and saline mineral substances in proportion, determined by experience and adapted to the different kinds of animals, or the particular purpose for which they are kept.

Having explained the different purposes to which the proximate constituents of food are applied in the animal economy, I shall now proceed by directing attention to the composition of the principal varieties of feeding-stuffs, which are used by the British farmer, either for rearing or fattening of stock.

1. LINSEED.—According to Anderson, linseed contains in 100 parts:—

Moisture	7·50
Oil	34·00
Nitrogenized or flesh-forming constituents	24·44
Substances not containing nitrogen—	
Heat producing principles	30 73
Mineral matters (ash)	3·33

The ash of linseed is rich in phosphates or in bone materials. It will be observed that linseed is both very rich in ready-made fat and in muscle-producing substances. Linseed, for these reasons, is admirably well adapted both for young growing stock and fattening beasts. There is, indeed, hardly any other feeding substance which equals linseed in nutritive power. Whether it is superior to good linseed-cake or not is a point on which there seems to exist some diversity of opinion among practical feeders. Good oil-cake, we shall see presently, contains a larger amount of flesh-forming principles, and may therefore be better adapted to feeding when it is wished rather to produce muscle than to lay on fat. For fattening beasts. I am decidedly of opinion, linseed is preferable to cake, for it contains a much larger proportion of ready-made fat than cake, and the oils and other constituents of linseed have not undergone those changes to which they are so liable in the preparation of linseed oil and cake, especially if heat is employed in the manufacture of the latter. Whilst linseed is always free from any rancid oil, and consequently possesses a sweet, agreeable taste, the oil still remaining in the cake is often so rancid that the cake becomes unpalatable to beasts. In linseed, moreover, the albuminous substances and the mucilage exist in a more soluble condition than in cake; heat, which renders these substances less soluble, being generally employed in extraction of the oil from the seed. Linseed thus is more easily digested than cake—a circumstance of considerable importance in estimating the nutritive value of both.

Made into a jelly, linseed is often given to weaned calves, who are very fond of it, and get on upon it remarkably well. Linseed-jelly, mixed with chaff and sliced turnips, is also recommended by practical feeders as one of the best mixtures that can be given to fattening beasts; and for the preparation of this well-known mess many prefer linseed to the cake.

In using linseed for feeding or fattening purposes, however, care ought to be taken not to allow too large a proportion of seed to the animals, inasmuch as linseed-oil exercises, when given in quantities, a relaxing effect on the bowels. This effect of linseed-oil no doubt is beneficial when the seed is given with much chaff or other not very digestible food; but it counteracts the rapid fattening of the animal if too much linseed is mixed with the chaff or other dry food.

As a rule, therefore, linseed ought to be given to fattening beasts more sparingly than cake, which, containing much less oil than the seed from which it is obtained, is not so liable to cause the effects which an overdose of seed produces.

2. Oil-cakes (Linsed, rape, poppy, cotton-seed, and mustard-cake).—Of all the various oil-cakes which are used for feeding or fattening, linseed-cake is employed most abundantly, and justly prized as the most valuable kind of cake. Rape-cake, lately imported in large quantities from the Continent, where rape is much grown, is now also much employed for feeding cattle and sheep. Poppy-cake likewise is a valuable feeding material, but occurs only occasionally in trade.

Of the other varieties of oil-cake which are now and then offered for sale, we will only mention here cotton-seed-cake and mustard-cake. Cotton-seed-cake has lately been introduced into England, and been found a very valuable feeding substance. Allusion is made here to mustard-cake because it is frequently sold as rape-cake, which it indeed resembles closely.

Many samples of these different oil-cakes, from various countries, have lately been analysed by Professors Way, Anderson, and myself. These analyses have shown that the composition of even one and the same kind of cake is liable to considerable fluctuations, arising principally from the mode in which the cake is manufactured. But as the observed differences in composition do not materially affect the practical deductions to which the analysis of oil-cakes give rise, I shall content myself by presenting in the subjoined table the average composition of oil-cakes, as calculated from a large number of analyses.

AVERAGE COMPOSITION OF OIL-CAKES.

	LINSEED CAKE.	RAPE CAKE.	POPPY CAKE.	COTTON SEEDCAKE.	MUSTARD CAKE.
Moisture	12·44	10·68	11·63	11·19	11·90
Oil	12·79	11·10	5·75	9·08	6·69
Nitrogenized or flesh-forming principles	27·28	29·53	31·46	25·16	23·48
Substances not containing nitrogen:					
Heat-giving substances	41·36	40·90	38·18	48·93	52·14
Mineral matters (ash)	6·13	7·79	12·98	5·64	5·79
	100·00	100·00	100·00	100·00	100·00

The ash which remains behind on burning any of these oil-cakes contains a large proportion of phosphoric acid, lime, and potash. Oil-cakes thus contain much of the constituents of which the bony skeleton of the animal body is made up.

In explanation of the table just mentioned, I would observe that the difference in the proportion of oil and flesh-forming matters obtained in the analysis of different samples of cakes of the same kind are quite as large, or sometimes even larger, than the differences which are here stated in the average composition of cakes of different kinds. Thus, for examples, it is stated in the above tabulated results that linseed-cake contains an average of 12·79 per cent. of oil, and rape-cake 11·10 per cent.; but it does not follow from this that linseed-cake always contains more oil than rape-cake. Generally it does contain somewhat more oil than most linseed-cakes.

This remark, indeed, applies to all feeding materials. We are too much in the habit of speaking of the composition of cake, turnips, mangolds, or hay, as if these complex mixtures of substances were simple chemical combinations, presenting us with a fixed composition, whereas the differences in two samples of the same produce are often very great. Any one who has tried practically the nutritive effect of good and badly-made hay, or of turnip grown on good turnip land and on peaty land, knows well that there is a vast difference between hay and hay, or a turnip and a turnip. In speaking of the nutritive value of any article of food too precise a language is out of place; and it is simply absurd to draw nice general conclusions from small differences which the analysis of different feeding-materials may have yielded. Unless the differences are strongly marked and constantly observed in a great number of cases, it is unsafe and irrational to attach a precise nutritive value to different articles of food, especially if the opinion is founded solely upon analytical data, and not corroborated by actual experimental trials: for, after all, the chemical composition alone of an article of food is insufficient to determine its practical value.

The history of oil-cakes presents us with a striking example, illustrating the truth of these remarks.

Good rape-cake contains nearly as much oil, and even more flesh-forming principles, than the best linseed-cake. In a purely chemical point of view, rape-cake ought to be, if not superior, at least quite as nutritious as linseed-cake. Notwithstanding a certain diversity of opinion entertained by practical men respecting the merits of both cakes, I believe an extended experience of the best stock farmers has proved beyond dispute, the weight for weight, linseed-cake is much better than rape-cake. It is not, I believe, difficult to account for this superiority.

In the first place, I would observe that rape-cake has a strong, hot taste, and is not liked much by cattle; whereas good linseed-cake is sweet and agreeable to the taste. The natural appetite of animals, to a certain extent, it strikes me, may be regarded by us as a guide to what is good or bad for them; and, though a dislike for a certain food may be overcome in time, I believe an animal will never get on so well upon food which it naturally dislikes as upon another for which it is greedy.

2. In the second place, it may be stated that the oil of rape-seed naturally possesses a disagreeable smell and taste, and is apt to turn rancid. Rape-cake, which contains about 11 per cent. of this oil, thus has a great tendency to become rancid, and consequently unpalatable to cattle.

3. In the third place, I would observe that rape-cake contains a much larger proportion of indigestible woody fibre than linseed-cake; whereas the latter contains on an average about 9 per cent. of woody matter, the former contains as much as 20 per cent., and even more.

As stated above, the proportion of substances not containing nitrogen is almost as great in rape as in linseed-cake. But as in the case of rape-cake, about one-half of these substances consists of woody fibre, which is of no use whatever to the animal, and as linseed-cake contains only 9 per cent. of indigestible fibre, it is clear that linseed-cake must be superior in this respect to rape-cake.

4. Lastly, it may be as well to bear in mind that good linseed-cake is hardly if ever adulterated, and seldom mixed with foreign seeds, whereas

rape-cake contains more frequently than any other description of cake the seeds of weeds. The experienced eye will find no difficulty in recognizing in rape-cake the seeds of mustard, charlock, and other weeds. Some of these seeds possess a disagreeable, bitter, or acrid taste, and possibly may possess poisonous properties.

I would direct special attention to the fact that rape-cake often contains a considerable proportion of mustard-seed. In Belgium, France, and Germany, where much rape is grown on account of the oil which its seed furnishes, the fields are often very foul with mustard; but as mustard itself is grown on account of its oleaginous seed, no care is taken to eradicate it, and hence it is that rape-cake contains frequently much of the expressed seeds of mustard. This admixture is injurious if the cake is given to fattening cattle in any quantity. Sheep do not appear to be affected so much as cattle by mustard. Rape-cake, which is rarely quite free from mustard, therefore, may be given with greater advantage to sheep than to cattle.

The fact that some samples of rape-cake are full of mustard and others comparatively free from it, perhaps accounts also for the differences of opinion which farmers who have tried rape-cake entertain respecting its feeding value. Rape-cake, free from foreign seeds and well kept, may indeed be a valuable and economic article of food; but there is often rape-cake sold to farmers which contains so much mustard that it is difficult to decide whether the cake is rape or a mustard cake. Such cake should never be used for feeding purposes, for it is certain to injure the condition of the animals to which it is given.

Linseed-cake is manufactured in England; in America, France, Holland, Germany, Russia, Belgium, Italy, and other continental countries, and imported into England under names denoting the country in which they have been manufactured.

English cake is generally preferred to all other varieties, and fetches usually a higher price in the market. However, much depends upon the fancy of the purchaser: thus whilst in most localities English cake is preferred to American, I am told the latter fetches a higher price in Exeter market than English.

This circumstance led me to ascertain whether there was any real difference in the composition of two samples of American and English linseed, which were bought last season at Exeter, with a greater expenditure of £1 per ton for the American cake. Without mentioning the details of my examination, I will briefly state that both cakes were of excellent qualities, and that the differences in the composition were so trifling, that both might be regarded, for practical purposes, to be identical. Neither in their chemical composition, nor in their physical properties, could any marked difference be detected which might account for the higher price paid for the American cake in Exeter market.

English cake, it is true, generally, though by no means always contains more oil than American or other foreign linseed-cakes, but the differences in the relative proportions of oil in various cakes are too inconsiderable to account for the higher estimation in which English or American cakes are held. The superior value of home-made, and also of most American cakes, I believe depends not so much on their chemical composition, as upon the condition in which the cake is found in the market. Good home-made cake, and most American cakes, are always dry and free from moldiness and rancid smell; they have an agreeable flavor and mild sweet taste, and for these reasons are more highly appreciated than other foreign cakes, which generally possess a more or less rancid smell and taste, and appear often moldy or damp. Moreover, on the Continent the extraction of the oil from the linseed is frequently aided by a degree of heat which impairs the flavor, and consequently deteriorates the value of the cake. On the whole, greater care is bestowed on the manufacture of English cake than on that of cakes imported from other countries. Besides, English cake is prepared only in a limited extent, and always finds a ready sale; no time is therefore allowed for the oil still remaining in the cake to become rancid. Foreign cakes, on the contrary, in passing through different hands before they reach their final destination, often attain a considerable age, which impairs the flavor and deteriorates greatly the value of the cake, especially if it is kept in damp places. Like all organic substances, oil-cake is subject to changes, which do not improve its qualities. The fresher it is the better it is adapted for feeding purposes.

Foreign linseed-cakes, with the exception of American cakes, are seldom so free from foreign seeds as English cakes, and this no doubt is another reason why home-made cake is more highly prized by the practical feeder.

MUSTARD-CAKE.—Mustard-cake is imported into England from the Continent, and extensively used in the hop districts of Kent as an excellent manure. This is the only safe use to which it can be applied. But, as it is much cheaper than linseed or rape-cake, and resembles intimately rape-cake, it is now and then mixed with this cake by unscrupulous dealers; and instances are on record that even pure mustard-cake has been sold as rape cake.

When mustard-cake or rape-cake, containing much mustard-seed, is made with cold water into a thick paste, and this paste is kept for about six hours, it acquires the pungent taste and strong irritating smell peculiar to mustard-seed. This pungent taste and smell is caused by the volatile or essential oil of mustard, which is produced under the influence of cold water from myronic acid and myron, two inodorous and tasteless constituents of mustard-seed. Myronic acid is peculiar to mustard; myron resembles in its chemical character albumen, and like all nitrogenized substances, gradually changes myronic acid in the presence of cold or moderately warm water and air into the essential oil of mustard. At the temperature of boiling water myron becomes coagulated, and in this state is incapable of changing myronic acid into essential oil of mustard.

Mustard-cake in a dry state has neither a pungent smell nor taste. It resembles, indeed, in its appearance, smell, and taste, rape-cake. If mustard-cake is kept, however, for some time in the mouth, it tastes bitter, acrid, and becomes more and more pungent, the longer it is kept between the teeth. On grinding, moreover, it gives a bright yellow powder, altogether different in appearance from powdered rape-cake. By these characters, and especially by the pungent smell which mustard-cake develops when mixed with cold water, mustard-cake is readily distinguished from rape-cake.

Neither mustard, nor rape-cake containing much mustard-seed, should ever be used for feeding-purposes, inasmuch as the pungent oil of mustard, which is gradually generated in the stomach of the beast fed upon such cakes, acts as an irritating poison, which may cause serious injury, and even death.

Not long ago a case of poisoning with mustard-cake was brought under my notice. A gentleman residing at Bibury, a village eight miles from Cirencester, Gloucestershire, lost three valuable beasts, which had been supplied with a small quantity of oil-cake, a portion of which was forwarded to me for examination. The day before the cake was given to them they were perfectly well; and after having eaten some cake, they became suddenly so ill that two died before the veterinary surgeon could administer an efficient remedy. The examination showed that the cake which caused this mischief was either altogether a mustard-cake, or contained a very large proportion of mustard-seed. There remained thus no doubt that the beasts died from the effects of the pungent oil of mustard.

As the formation of the essential oil of mustard is prevented by boiling water, and rape-cake often contains mustard-seed in a degree which cannot but exercise an injurious effect upon the health of animals, I would recommend to mix all rape-cake with boiling water before it is given to cattle. By this simple means any injury which rape-cake containing mustard-seed would produce, when not submitted to the action of boiling water, may be entirely prevented; but unless the water is in a perfect state of ebullition, it will fail to accomplish this desirable end.

In conclusion of these remarks on oil-cakes, I suggest to purchasers of cake to submit it to the following easy test:—

1. Examine a bit of cake as to its taste and smell; observe that it is fresh, and free from any moldiness.

2. Examine another piece with a common pocket lens. This examination will show whether the cake is a linseed or rape-cake, inasmuch as the form of linseed and rape-seed are widely different. Much more difficult is it to distinguish by the lens mustard from rape-cake.

3. Mix in a tumbler about 1 oz. of the cake, broken into small pieces, with 6 oz. of cold water. Good linseed-cake will form, under these circumstances, a stiff, agreeably-tasting jelly, without separating any water. Rape-cake will become much less gelatinous, and separate a yellowish or brown, rather bitter-tasting liquid. Mustard-cake likewise will become little gelatinous, and separate a brown liquid, which possesses the characteristic taste and smell of essential oil of mustard. Rape-cake fraudulently or naturally mixed with mustard-seed, under these circumstances will exhibit a similar behavior to that of mustard-cake, and by the degree of pungency of taste and smell when compared with pure mustard-cake, will afford means of estimating approximately the amount of mustard which the cake contains.

3. Leguminous Seeds (Beans, Peas, Lentils, Tares, and Fenugreek-seed).—The average composition of beans, peas, and lentils, as calculated from the analyses made by Horsford, Krocker, Einhof, Braconnot, and Boussingault, is represented in the following table:—

	PEAS.	FIELD BEANS.	LENTILS.
Legumin	23·4	23·3	24·0
Starch	37·0	36·0	38·0
Fatty matters	2·0	2·0	2·5
Grape sugar	2·0	2·0	8·5
Gum	5·0	4·5	
Woody fibre	10.0	10·0	12·0
Pectic acid	4·0	4·0	
Inorganic matters (ash)	2·5	3·4	2·5
Water	14·1	14·8	12·5
	100·0	100·0	100·0

These analytical results, arranged in groups, yield the following average numbers:—

	PEAS.	FIELD BEANS.	LENTILS.
Nitrogenized or flesh-forming constituents	23·4	23·3	24·0
Substances free from nitrogen, fitted to support respiration, and to lay on fat—			
a. Starch, sugar, fat, etc	50.0	48·5	52·0
b. Woody fibre	10·0	10·0	9·[illegible]*
Ash (bone materials)	2·5	3·4	2·5
Water	14·1	14·8	1[illegible]·5
	100·0	100·0	100·0

* No separate determination of woody fibre having been made, this number has been assumed in this calculation.

Still more recently, several kinds of beans, peas, lentils, and tares have been analysed by Dr. Anderson. The principal results of this analytical investigation are contained in the subjoined table:—

	WATER.	LEGUMIN	FATTY MATTERS	STARCH, SUGAR, &C	ASH.
Field beans grown in Scotland	12·56	27·05	1·58	55·69	3·12
Foreign field beans......	12·21	23·49	1·51	59·65	3·14
Hopetoun tares, grown in 1849	16·09	28·32	1·49	52·61	1·49
Summer tares, foreign	12·13	26·54	1·26	57·72	2·35
Winter tares, foreign................ .	15·[illegible]0	26·73	1·59	53·04	1·59
Gray field peas........................	11·94	24·25	3·30	57·99	2·52
Maple peas	13·63	19·43	1·72	63·1[illegible]	[illegible]·04
Large Scottish lentils	12·51	24·25	1·78	58·78	2·68
Lentils, foreign......	12·31	24·57	1·51	58·82	2·79

It will be observed that all these leguminous seeds resemble each other so closely in composition, that for all practical purposes, the nutritive value of beans, peas, lentils, and tares in so far as this can be determined by analysis, may be considered identical.

The characteristic constituents of leguminous seed is legumin—a substance which resembles so intimately the cheesy matter or curd of milk, that it has received the name of vegetable casein.

Tares appear to be richer in legumin than the other leguminous seeds, which, on an average, contain as much of this flesh-producing substance as good oil-cake.

As far as the power of animals to lay on muscle is dependent on the nitrogenized principles contained in the food they eat, peas, beans, lentils, and tares are as valuable as oil-cakes, but as they contain much less oil, and are not so easy digested, these leguminous seeds are decidedly inferior to oil-cake as feeding materials. Compared with oats, barley, and other grain, peas, beans, lentils, &c., are much richer in muscle-producing matter. Notwithstanding this, oats and barley meal are much better adapted to fattening beasts than peas or bean-meal.

In feeding experiments with sheep, fed in conjunction with bulky food upon lentils and upon oats, I found oats to produce a much more considerable increase in the life-weight of the sheep than an equal weight of lentils. These, and other actual feeding experiments, have convinced me that the increase in life-weight of the animals is much more regulated by the supply of easily digested starchy or fat-producing food than by the supply of the muscle-forming constituents of food, provided the latter are furnished in the food in moderate quantities.

Beans, peas and lentils, given to fattening beasts in moderate quantities, along with some bulky food, such as chaff, hay, or roots, I believe constitute a valuable addition to such food. Beyond a certain degree, however, the supply of beans or bean-meal cannot be increased with advantage; for the well-known binding and heating effects of peas and bean-meal show plainly that the organism of cattle requires for its healthy condition a more bulky and less concentrated food.

On the other hand, working horses cannot be fed with a more economic or better food than with beans—a fact which is well known to every farmer. The high feeding value of beans, when given to working horses, is readily explained by the great waste of muscle to which working horses are subject, which waste is readily and cheaply supplied in beans, a food very rich in flesh-forming constituents.

Fenugreek-seed.—Fenugreek is the seed of Trigonella fœnugræcum—a plant which is much grown in the east, on account of the leguminous seed which it furnishes. This seed has a peculiar aromatic smell, and a slightly bitter aromatic taste. Ground into a powder it is frequently employed by veterinary surgeons to promote the appetite of horses, and also enters into the composition of curry-powder. Fenugreek seed is used occasionally in England for feeding purposes, and is described by those who have tried it as an excellent food for fattening sheep. A sample of the seed forwarded to me by E. Holland, Esq., of Dumbleton, on analysis, yielding the following results:—

COMPOSITION OF FENUGREEK SEED.

Water	11·994
Flesh forming constituents (chiefly legumin)	26·665
Starch, gum, and pectin	37·111
Sugar	2·220
Fatty matters and some essential oil	8·320
Woody fibre	10·820
Inorganic matter (ash)	2·870
	100·000

It will be observed that, like all leguminous seeds, fenugreek contains a large amount of flesh-forming constituents: it resembles thus in composition peas, beans, and lentils, but it is distinguished from these seeds by a much larger amount of fatty matters. This fully explains its high value as a feeding material. I am informed by Mr. Holland, that sheep to which it was given got fat in a remarkably short time. But a curious circumstance connected with the use of this seed was brought to light, which showed that notwithstanding its highly nutritious qualities, it is unavailable for practical purposes. It was found, namely, that it imparted a peculiar disagreeable flavour to the mutton. This flavour no doubt arose from the essential oil contained in the seed. An interesting example is thus presented to us in fenugreek-seed, which illustrates that purely practical considerations will often guide the feeder of stock in the rejection of food, and that it is impossible to predict by analysis, or even by actual feeding experiments, the economic value of an article of food.

4. CEREAL GRAINS (Wheat, Oats, Barley, Indian Corn.)—The average composition of the cereal grains generally employed in England for feeding purposes is stated in the following table:—

	WHEAT.	OATS.	BARLEY.	IND. CORN.
Water	12·26	13·09	14·65	14·96
Flesh forming constituents	11·64	11·55	10·84	11·27
Heat and fat producing substances	68·74	63·34	68·31	67·48
Woody indigestible fibre	2·61	9·00	3·45	5·02
Inorganic matters (ash)	1·15	2·72	2·75	1·27
	100·00	100.00	100·00	100·00

It deserves to be noticed likewise, that wheat and barley contain but a small proportion of ready-made fatty matters (about 2 per cent.,) whereas oats contain on an average of 6 per cent. of oil, and Indian corn from 8 to 9 per cent.

In these analysis the indigestible fibre has been determined separately, and thus a much better opinion of the real nutritive value of grain can be formed than would have been possible, had the determination of this important point been neglected. In explanation of these results, it must be stated that the proportion of woody fibre does not vary much in different samples of wheat, but that exceedingly great differences in the amount of woody fibre are observed in barley, and especially in oats.

I am inclined to attribute to this circumstance the diversity of opinion which is entertained by practical feeders respecting the feeding properties of barley and oats. There can indeed be no doubt that in some localities of England, where the soil is peculiarly well adapted to the growth of barley, this farinaceous grain is superior in nutritive power to oats; and on the other hand, a district remarkable for good and plump oats may well produce more nutritious oats than barley. We are thus not entitled to say in a general way that oats are more nutritious than barley, or *vice versa.* Both opinions may be perfectly true in special instances. In Scotland, celebrated for excellent oats, farmers are much more in the habit of giving oats to fattening beasts than the English farmer, who prefers barley-meal to oatmeal for that purpose. There are good grounds for this choice of food, for English oats, I believe, are generally inferior in nutritive power to Scottish oats. On the other hand, the soil and climate of Scotland appear to be much less favorable to the production of fine samples of barley than the rich barley soils which abound in several counties of England. The examination of several samples of English barley, of Scottish and of English oats, has indeed shown me that the predilection for oats by the farmers of Scotland, and that for barley by the English feeder of stock, is not merely a whim, but is founded on strictly scientific principles. Thus I found good English barley quite as rich in nutritive substances as Scottish oats, and a marked difference in the oats produced by the two countries. To mention only one instance, I would observe that, in the analysis of two samples of oats, one grown in England, the other in Scotland, I found about one per cent. more flesh-forming substances in the Scottish oatmeal than in the English. The white Scottish oats, moreover, weighed 42 lbs. per bushel, and yielded, per 100 lbs., 71½ lbs. of fine oatmeal, and 28½ lbs. of husk; while the black English oats weighed only 37½ lbs. per bushel, and yielded 66¼ lbs. of oatmeal and 33¾ lbs. of husk. The superior oats were sold 4s. 6d. dearer per bushel; but notwithstanding this higher price, a careful calculation, of which I need not here mention the particulars, has led me to the conclusion that it is more economical to pay 4s. 6d. more per bushel for Scottish oats than for the English. This example thus affords a direct proof of the correctness of the prevailing opinion that Scottish oats are better than English, and I have no doubt that in those counties of England where barley or barley-meal is preferred to oats or oatmeal by the farmer, the former will be found in reality superior to the oats grown in the district. It likewise shows that a practice generally followed by good farmers in one locality ought not to be lightly discarded, and that apparent practical differences of opinion often may be reconciled by judicious scientific inquiry.

The analysis mentioned above show that the cereal grains have an analagous composition, and contain a large amount of fat-producing substances. This general character distinguishes them from the leguminous seed, containing a large proportion of flesh-forming principles, and therefore not so well adapted to fattening purposes as oat or barely meal. Indian corn, in addition to much starch, which in the animal system is readily transformed into fat, contains more ready-made fatty matter than any other cereal grain. For this reason, Indian corn is superior in fattening properties to oats and barley, and deserves to be employed as a food for fattening beasts much more extensively than it is at present. It also has been found a most useful fattening material when given to pigs.

As it may be interesting to compare the composition of wheaten flour and oatmeal with that of the whole grain, I append the following tabular statements. The results represent the composition of wheaten flour and oatmeal used as human food. In the best fine Scottish oatmeal as much as 18 per cent. of muscle-producing substances has been detected, whereas in the finest wheaten flour the proportion of these substances hardly amounts to 9 per cent. The more thoroughly the husk is removed by sifting from oatmeal, the more nutritious it becomes, but the contrary holds good in the case of wheaten flour. Hence it follows that bread made of the whole grain of wheat is more nutritious than bread made of the finest flour.

AVERAGE COMPOSITION OF WHEATEN FLOUR AND OATMEAL.

	WHEATEN FLOUR.	OATMEAL.
Water	13·50	13·09
Flesh-forming substances	11·48	15·68
Fat and heat-producing substances	73·52	6[illegible]·17
Woody fibre	0·63	1·[illegible]9
Mineral matters (ash)	0·[illegible]2	1·17
	100·[illegible]0	100·00

5. Refuse Grain, &c. (Bran, Malt-dust, Barley-dust, Oat-dust, Rice-dust, Brosemeal Brock, Pea-hulls, Distillery refuse, Brewer's Grains).—The above materials are the more important refuse substances from various grains, which are now and then employed for feeding purposes.

Bran.—It is worthy of observation, that bran contains a larger amount of fatty matters and flesh-forming constituents than the whole grain of wheat, and for these reasons it constitutes a valuable refuse. It is mostly given to horses, but may also be given with advantage to milking-cows and to pigs. Bran contains much less woody fibre than most of the above enumerated refuse materials, and with the exception of malt-dust, is decidedly the most nutritious of the substances in that list.

MALT-DUST is obtained in the preparation of malt from barley. The small rootlets or radicles which protrude from sprouted barley, after being kiln-dried, constitute the commercial malt-dust, which of course can only be obtained in limited quantity. It is used principally as food for sheep, which like it, and get on upon it very well, if it is supplied to them along with some hay and turnips. Malt-dust, it will be observed, contains a very large amount of flesh-forming constituents, and ought therefore to possess a very high nutritive value. However, I believe its practical value as an article of food, though by no means distinctly ascertained, is much smaller than from its composition might be expected.

BARLEY-DUST is used to some extent in feeding cattle, as well as pigs. Now and then it can be obtained at a price, which renders it a much more economical food than barley-meal, from which it is distinguished principally by a larger amount of woody fibre.

OAT-DUST.—Mixed with chaff and thoroughly saturated with water, this refuse is extensively employed, either alone or with roots, in feeding cattle. It ought not to be given to cattle in a dry state, for it is very slowly moistened, and therefore apt to form dust balls in the stomach. When given to dairy cows it is found to increase the yield of butter.

BROSE-MEAL BROCK is the refuse obtained in making peas-meal. Brose-meal brock contains about as much muscle-substance as barley-meal, but too much indigestible fibre, and too little starch and fat-producing substances. It is employed in feeding, as a cheap substitue for bean-meal, and used like it.

PEA-HULLS FROM MAPLE PEAS.—In making split peas, the outer skins of the pea are removed and sold under the name of pea-hulls, as another cheap substitute for bean-meal. Pea-hulls, however, do not possess much value as a feeding substance, and ought therefore not to be employed unless they ean be got at a very cheap rate.

RICE-DUST OR RICE-MEAL, is a refuse obtained in cleaning rice for our market, and consists of the husks and external layers of rice, together with fragments of the grain itself, with some accidental foreign impurities. In Liverpool it is produced in large quanties, and often sold much above its real value. Rice-dust is said to increase the yield of milk, and is employed therefore to some extent by Cheshire farmers for feeding milk cows. It has also been found to be a good food for fattening pigs.

Brewer's Grains.—A hundred pounds of fresh brewer's grains were found, by Johnson, to contain—

Water	75 85
Gum	1 06
Husk	21 28
Flesh-forming substances	0·62
Inorganic matter, or ash	1·19

Brewer's grains weigh about 46 lbs. to the bushel, and cost 3d to 3 1-2d for this weight. The proportion of water present in brewer's grains is large, whilst that of flesh-forming constituents is but small. The greater part of the solid matter consists of husk. For these reasons the nutritive value of this refuse does not range high. But though the solid part consists principally of husk, the experience of cow feeders shows that it is not by any means worthless for the feeding of milk cows. Turnips are the kind of food most usually given with brewer's grains; half a bushel of the latter and 25 lbs. of turnips per day being a fair allowance for a dairy cow.

Distillery Refuse.—The liquid which remains in the still after the spirit has been drawn off, when the fermented worts distilled by the spirit manufacturer, is called distillery refuse. It is a muddy, more or less thick, liquid, which may be turned to a profitable account by employing it as a feeding material for cows or pigs. Kept for some time in tanks it turns sour, and in this state is generally given to pigs. It is highly esteemed by dairymen, according to whose experience it promotes the abundant secretion of rich milk. Two samples of distillery refuse from a whisky distillery in the island of Islay were analysed some years ago by the late Professor Johnston. The one contained the more fluid portion of the liquid, the other the thicker matter, which subsides in the tank into which the liquid runs when it is first drawn from the stills.

The following results were obtained in the analysis of these two liquids:

1st. The thinner liquid: An imperial gallon left on evaporation 4235 grains, or five gallons contained upwards of 3 lbs. of dry solid matters, consisting of—

	Grains.
Organic matter	3871
Inorganic matter	364
	4235

The organic matter consisted of some unchanged sugar and gum, and albuminous and other compounds in a more or less altered condition.

2d. The thicker liquid, which is deposited at the bottom of the tank, is of sufficient consistence to be given alone as food for pigs.

An imperial gallon of this liquid left 10,884 grains of dry solid matter, or no less than three pounds of dry food in every two gallons.

This solid matter consisted of—

	Grains.
Gum, sugar, albuminous and other organic compounds	10,290
Inorganic matters (ash)	594
	10,884

6. Roots (Potatoes, Parsnips, Carrots, Swedes, Mangolds, and Turnips).—All the roots which are grown as food for man or beast are distinguished from most articles of food described above by a large amount of water. The proportion of water in roots varies in the different species from 75 to 90 per cent., and it is principally on account of the small amount of solid matter that roots are much less nutritious than an equal weight of most of the feeding materials which have been described above.

We shall mention first the composition of potatoes; then state that of carrots and parsnips; next, that of mangolds; and, lastly, in a separate table, the average composition of swedes and turnips.

Potatoes.—The different species of potatoes vary considerably in composition, and even one and the same variety of potatoes, when grown on different soils, or with different manures, or, in short, under different circumstances, will exhibit great variation in its composition. Since this is the case, it would be of no practical value to transcribe here the analysis which have been made with the various species of potatoes that are cultivated in this country. We shall, therefore, leave these details unnoticed, and state at once the average composition of potatoes, as calculated from a great number of the most trustworthy analyses.

AVERAGE COMPOSITION OF POTATOES, IN ROUND NUMBERS.

	IN NATURAL STATE	CALCULATED DRY.
Water	75 0	....
Starch	15 5	62 0
Fatty matters	·2	·3
Gum and sugar, etc	3 0	12 0
Albumen and casein	2 3	9 2
Fibre	3 0	12 0
Inorganic matters (ash)	1 0	4 0
	100 0	100 0

Arranged in groups according to the chief classes of food-constituents, the average composition of potatoes may be expressed as follows:

	IN NATURAL STATE.	CALCULATED DRY.
Flesh-forming constituents	2 3	9·2
Substances free from nitrogen, and fitted to support respiration or to lay on fat:—		
a. Starch, sugar, &c	18·7	74·8
b Fibre	3 0	12 0
Inorganic matters (ash)	1 0	4 0
Water	75·0	....
	100·0	100·0

It follows from these average results that good potatoes consist of 3-4 of water, and 1-4 of solid matter. Occasionally the proportion of water in potatoes rises as high as 80 per cent.; the best mealy potatoes often, on the contrary, contain but 70 per cent., and 68 per cent. of water. With the variations in the amount of water and solid matter, the proportions of the various constituents composing the solid matter must, of course, be subject to more or less considerable variations. Thus, whilst one sample of potatoes yields from 15 to 16 per cent. of starch, another may yield only 12 per cent.; or whilst one kind contains 2 1-2 per cent. of flesh forming constituents, another contains only 1 1-2 per cent. On account of these variations in composition it is extremely difficult to attach a precise nutritive value to potatoes. No kind of agricultural produce is liable to greater changes in composition,—a circumstance which, I believe, well explains the diversity of opinions which practical men entertain with respect to the feeding qualities of potatoes. But though it is impossible to state in precise language what is the feeding value of potatoes, it may be observed that they are beyond dispute the most valuable of all roots grown for food, and especially well adapted for fattening purposes.

In general it may be remarked in this place, that for all practical purposes the comparative nutritive value of different roots may be estimated with tolerable accuracy by the amount of water which the various species contain. Following this simple rule we obtain, as the most nutritious of roots, potatoes; next follow parsnips, then carrots, after which mangold follows; next we have swedes, and last turnips. Practical experience, if I am not mistaken, has shown that the different roots follow each other as regards their nutritive value in the same order, namely:—1. Potatoes; 2. Parsnips; 3. Carrots; 4. Mangolds; 5. Swedes; 6. Turnips.

Roots.—Parsnips and Carrots.—Parsnips and carrots are justly esteemed as valuable feeding substances, which are in this country generally given to pigs or to horses. Not long ago I submitted both kinds of roots grown on the farm attached to the Royal Agricultural College to a minute analysis. The calcareous soil in the neighborhood of Cirencester, on the whole, is not favorable to the growth of these roots, it being in most instances too stony and too shallow; the roots for this reason remain comparatively small; and though on some of the better soils as much as thirty tons are grown, eighteen tons per acre are deemed a good average crop of parsnips or carrots in this part of the country.

A comparison of the results with each other will show:—

1. That there is a general resemblance in the composition of parsnips and carrots.

2. That parsnips, however, differ in composition from white carrots by containing less sugar, the deficiency of which is replaced by starch, a substance not occurring in carrots.

3. That white Belgian carrots generally contain five to six per cent. more water than parsnips. Thus fresh parsnips contain on an average 18 per cent. of solid substances, whilst fresh carrots on an average contain but 12 per cent. Hence the greater nutritive value of parsnips as compared with carrots.

4. That parsnips contain twice as much ready formed fat as carrots. They ought, therefore, to be superior as a fattening material in the feeding of stock.

5. That the proportion of cellular fibre in parsnips is very much greater than in carrots. In both it is large.

The cellular or woody fibre in parsnips, carrots, turnips, mangolds, and swedes, must not be regarded as useless in the animal economy, for there can be little doubt that the soft and young fibres of these roots are readily converted in the stomach of animals into gum and sugar, and applied in the system to feed the respiration, or for the laying on of fat. Compared with the turnips we find that parsnips contain 6 or 8 per cent. less water, and with mangolds 5 or 6 per cent. less. There is thus nearly twice as much dry solid matter in parsnips as in turnips, and consequently a ton of parsnips ought to go as far as a fattening material as two tons of white turnips.

Roots.—Mangolds.—Mangolds have been analysed by Professor Way, Johnston, Wolff, and myself, but as it will be of no practical utility to mention these various analyses in detail, I shall leave them unnoticed, and state at once the average composition of good mangold wurtzel, which has been calculated from 13 published analyses of this root:—

	In natural state.	Calculated dry.
Water	87·78	....
Flesh-forming constituents	1·54	12 60
Woody fibre	1·12	9·16
Sugar	6 10	49 91
Pectin, gum, &c	2 50	20·45
Inorganic matters (ash)	96	7 88
	100 00	100 00

Mangolds, it will be observed, contains on an average as much water and dry matters as carrots, and on the whole, are almost as nutritious as carrots, if they are given to fattening beasts after a few months' keeping. When newly taken out of the ground mangold wurtzels contains a peculiar acrid substance, which has a tendency to scour animals fed upon the fresh root. Although it has not yet been shown whether or not this acrid principle disappears on storing away mangolds for some time, it is a well known fact that, after a few months' keeping, mangolds have not this tendency to scour, and are much more nutritious than in a fresh state. The superior fattening value of stored mangolds, when compared with the fresh roots, may be due to the absence of this acrid principle in old roots, but doubtless it must be attributed also to the larger amount of sugar which stored mangolds contain. An examination of fresh and old mangolds, namely, has shown me that, on keeping, the pectin in the fresh roots is gradually transformed into sugar, which appears to be more conducive to the rapid fattening of beasts than pectin. For these reasons mangold wurtzel ought not to be supplied to animals before the latter end of December or the beginning of January.

Before stating the composition of turnips and swedes, I would draw attention to the remarkable fact, which perhaps may be new to some, that mangolds appear to be about the worst description of roots that can be given to sheep. Two years ago I found this to be the case, when feeding various lots of sheep, with a view of ascertaining practically the relative value of different feeding materials. For several days the sheep refused to eat the sliced mangolds, and were content with the small quantity of hay which was given to them at the same time, and only after four weeks they became reconciled in some degree to the taste of mangolds, but did not get on well upon this food. Although these sheep were supplied with a fixed and limited quantity of hay, and as much sliced mangolds as they would eat, I found at the end of four months that they had not increased a single pound, whilst my experimental sheep fed upon swedes and hay increased on an average at the rate of 2½ lbs. per week. On further inquiry I have learned that this observation is confirmed by many practical feeders. Mangolds, therefore, ought not to be given to sheep. This peculiarity of mangolds thus shows that a feeding substance which, like this root, is justly esteemed on account of its fattening properties when given to beasts may not possess any great nutritive value when given to sheep. Another direct proof is here afforded of the fact, that the chemical composition of food does not solely determine its adaptation to a particular purpose, for like mangolds, other feeding materials may be rich in nutritive substances, and valuable when given to fattening beasts, whilst it does not agree at all with the constitution of sheep.

Turnips and Swedes.—The composition of different kind of turnips, and consequently their nutritive value, present us with great variations. But, inasmuch as one and the same variety, when grown upon different soils, often presents us with quite as great variations in the amount of the various constituents which are found in general in turnips or swedes, we cannot attach a fixed nutritive value to each variety of turnip. Indeed practical experience has shown that in one locality a particular kind of turnip succeeds better, and is found to go further as an article of food, than another variety, whilst the same kind of turnip which is much appreciated in one place is held in very low estimation by the farmers of another district. It is thus, strictly speaking, incorrect to pronounce one kind of turnip to be always less or more nutritive than another.

On an average, turnips contain from 89 to 92 per cent. of water, and 8 to 12 per cent. of dry solid matter. Swedes, usually, though by no means always, contain less water than any other variety of turnips; they are generally firmer and keep better than white turnips. On the whole swedes are more nutritious than other species of this root. In white and yellow turnips the per centage of water is generally higher, and averages 90 to 91 per cent. The nutritive value of turnips is often estimated by the amount of nitrogen which they contain. The best roots, however, do not always contain a very high per centage of nitrogen, and it is therefore impracticable to determine the nutritive value of these roots by the amount of nitrogen which they contain. Mr. Lawes, of Rothamsted, indeed, has shown lately in some well-conducted feeding experiments, that those turnips which are richest in nitrogen are by no means the most nutritious. The influence which the soil exercises on the qualities of swedes and turnips is well known to practical men. Thus roots grown on peaty or very stiff clay soils are not near as good as others of the same kind grown on good turnip loam. The climate and season likewise in a remarkable degree affect the qualities of turnips. As these roots succeed best in a moist climate, we can explain why they produce a more abundant and nutritious crop in Scotland than in the south of England.

Another circumstance which affects the qualities of turnips is the mode of growth. Roots grown rapidly, generally speaking, are not as nutritious, and do not keep so well as turnips, the growth of which is not forced so rapidly by stimulating manures. It has been asserted that turnips grown with guano are less nutritious than those grown with farm-yard manure, and Dr. Anderson's analyses indeed appear to countenance this very prevalent opinion. However, this must be received with considerable latitude, for although it is quite true that many turnips grown with guano are very watery, and therefore not very nutritious, it does not follow that invariably roots grown with farm-yard manure are more valuable. It depends entirely on the nature of the soil and the quantity of guano employed, whether a watery root is produced or not. As far as our present experience goes, it would follow that a crop of turnips raised entirely by means of a large amount of Peruvian guano is watery, and does not keep well; whereas no difference in the qualities is observed in roots grown with farm-yard manure and turnips raised with guano, if this manure is sparingly employed and the land is in good condition. Peruvian guano, moreover, for economical reasons, ought not to be used in large quantities for raising a crop of turnips, as it is apt to produce abundance of tops at the expense of the bulbs. The cheaper Saldanha Bay guano, however, which contains a very large amount of phosphates, or those constituents which benefit root-crops in a special manner, may be used with advantage, and no fear need be entertained that this description of guano will produce a watery root.

7. Green Food (Natural Grasses).—The nutritive value of the various natural grasses and of green food in general was formerly determined simply by ascertaining what preparation of substances, soluble and insoluble in water, green food contained. The green food was considered the more nutritious, the greater the proportion of substances which it yielded to water. In this way Sinclair endeavored to determine the nutritive value of most natural and artificial grasses. The method employed by Sinclair, however, is very defective, and yields results which are inconsistent with practical experience. Sinclair's method of analysis and results thus are obsolete, and have to be rejected. The more refined methods of chemical investigation with which we are at present acquainted, and the increased knowledge of the process of nutrition, have enabled Professor Way to supply the agriculturist with a series of trustworthy analyses of most natural and artificial grasses.

Natural and artificial grasses are much more nutritious when in a young state than at the period when they are in full flower, inasmuch as the woody fibre increases towards the period of maturity so extremely rapid that often a few days' difference in the time of cutting grass for hay greatly affects the nutritive value of the latter. For this reason, perhaps, it would have been better to submit all the grasses to analysis at haymaking time. However, a good many grasses have been examined at that period, and we are thus enabled to form an opinion of the qualities of the hay which these grasses will produce.

It is worthy of observation that the grasses of irrigated meadows are much more nutritious than those of non-irrigated meadows. This, no doubt, is due to the disappearance of inferior grasses from irrigated meadows, but perhaps also to the circumstance that the grass on such meadows is always cut earlier than on ordinary meadows.

8. Artificial Grasses.—Under this head we have to consider the composition of the various kinds of clover, sainfoin, lucerne, vetch, rib-grass, burnet, and of millefoil.

Analytical results give rise to several observations:—

1. It will be seen that rape is much more nutritious than green rye, and contains as large a proportion of flesh-forming constituents as the best kinds of food which are used in a green state.

2. But not only is rape rich in flesh-forming matters, but it contains also a considerable quantity of oily or fatty matters. It will be observed that the fresh leaves contain of these fatty matters more than a half per cent., and the perfect dry substance above five per cent. So large a proportion of fatty matters, as far as I know, does not occur in any other green food.

The occurrence of so considerable a quantity of fatty matters explains at once, in an intelligible manner, the high fattening properties which distinguish rape as a sheep-feed.

Rape requires to be grown on good land. In poor soils it never comes to anything, and it is not worthy the trouble of cultivating. On land of moderate fertility, or on good rich land, an occasional crop of rape, I am inclined to believe, would supply the farmer with a larger amount of feeding material than is afforded in a crop of turnips grown under the same circumstances. Weight for weight, rape is richer in flesh-forming matters, and especially in fatty substances, than turnips; and as a crop of rape per acre is often heavier than a turnip crop, the more extended cultivation of rape appears to be desirable wherever it is admissible to introduce it.

With respect to the feeding value of green rye, it appears that it is inferior to the better sorts of clover.

9. Hay and Straw (Clover-Hay and Hay of Artificial Grasses).—The composition of clover-hay, and the hay of artificial grasses, necessarily is regulated by that of the fresh plants which are grown for hay, and which we have seen differ often considerably in composition. Moreover, the composition of hay, and which in its nutritive qualities, depend very much upon the time at which the plants are cut down, on the state of the weather at haymaking time, and the care bestowed upon the haymaking process. For these reasons it is not practicable to attach a precise nutritive value to clover-hay.

Dr. Anderson states the composition of clover-hay of the second cutting, and grown in the field as follows:

Moisture	16·84
Flesh-forming substances	13 52
Non nitrogenized matters	64.43
Mineral matters (ash)	5 51
	100·00

The leaves are much more nutritious than the stems, which decrease rapidly in value at the period of maturity.

Meadow Hay and Aftermath.—Like clover-hay, ordinary meadow hay and aftermath are liable to considerable variations in composition. The same circumstances which affect the nutritive value of the hay of artificial grasses determine the value of the hay of natural grasses. Taking the mean of 25 analyses of common meadow hay, the composition of the latter may be stated as follows:

Water	14 61
Flesh-forming constituents	8 44
Respiratory and fatty matters	43·63
Woody fibre	27·16
Mineral matters (ash)	6·16

The composition of the hay produced by the several natural grasses analyzed by Professor Way has been stated already under the head of natural grasses. It will be observed that the average composition of hay from 23 different natural grasses agrees well with the average composition of meadow hay, which has just been stated. Well made hay, made of grass, cut rather earlier than is done usually, is richer in flesh-forming matters than ordinary meadow hay. The following analyses by Mr. Wolff may represent the composition of meadow hay of superior quality:

Water	16.94
Flesh-forming matters	10·69
Respiratory and fatty matters	40·17
Woody fibre	27 16
Mineral matters (ash)	5·04
	100·00

On the other hand, the two subjoined analyses by Dr. Anderson may express the composition of inferior meadow hay:

	FRESH HAY.	HAY ONE YEAR OLD.
Water	16 54	13·13
Flesh-forming matters (nitrogenized matters)	6·16	4 00
Non-nitrogenized substances	69·89	77 61
Mineral matters (ash)	7·41	5 26

It is generally believed that aftermath is less nutritious than hay. This may, indeed, be the case, for the aftermath, which is made at a later period of the year, when rainy days are more abundant, often remains a long time in the field before it can be stacked, and thus is deteriorated in value by unpropitious weather. When, however, aftermath is cut not too late in the season, and fair and warm weather allows it being made rapidly into hay it is quite as valuable as the hay of the first cut. That it may be even more nutritious than the first hay, appears from the following comparative experiments by Dr. Keyser:

	HAY.	AFTERMATH.
Water	13·38	13 06
Flesh-forming matters	9 06	10·75
Respiratory and fatty matters	42 74	49·74
Woody fibre	27·15	19·02
Mineral matters (ash)	7 76	7·46
	100·00	100·00

These results show that the preparation of flesh-forming matters is greater, and that of woody fibre smaller, in aftermath than in the hay of the same meadow, and that consequently the former is the more valuable of the two. It ought to be mentioned that the hay was repeatedly washed by heavy rains, whereas the aftermath was harvested in very favorable weather, in consequence of which the former had a bleached appearance, whilst in the latter the green color and aromatic taste were preserved: the aftermath, moreover, was softer and finer than the hay.

The differences in the composition of the straw of our cereal, are trifling. There is but a small amount of flesh-forming matters and a large amount of indigestible woody fibre in straw, which fully explains its low feeding value. Oat-straw, however, when still somewhat green at the top, is much more nutritious than the sample, the composition of which is here stated.

Having stated the composition of most articles of food which are employed by the British farmer for feeding or fattening of stock, some considerations may find here an appropriate place, which ought to be well weighed in estimating the nutritive value of food and its adaptation to particular purposes.

It having been shown by analysis that all the richer kinds of food contain a large amount of flesh-forming constituents, and that no article of food entirely deficient in these principles can support the healthy existence or growth of animals, great importance is necessarily attached to this class of substances in food. We have seen, however, that though essential to the very existence of animals, food must contain a number of other constituents in addition to the flesh-forming substance, if it is to meet all the wants of the animal body. It follows from this that the endeavor to determine the relative nutritive value of different articles of food, by merely taking into account the proportion of flesh-forming constituents contained in them, must lead to erroneous conclusions, and that consequently the tables of nutrition, which have been constructed by some who have over-estimated the practical importance of the nitrogenized compounds in food, have not that practical value which it was believed at one time they possessed. The amount of flesh-forming matters in food does afford useful indications as to its fitness for particular purposes; but it can never become the rule whereby we can measure the comparative nutritive value of the various feeding materials. Food best adapted for producing muscle, when supplied to animals in large quantities, does not sustain their healthy condition, because it is ill suited to feed respiration. Other food, again, is peculiarly well adapted for the laying on of fat, but does not supply in sufficient quantity the daily waste to which the muscles of animals are exposed, nor does it contain the materials from which the bones are formed, and for these reasons does not meet the wants of the growing nor even of the fattening beast. In short, a mixed food, containing both flesh-forming and respiratory substances, as well as fat-producing and saline constituents, and bone-materials, is necessary to preserve the health of an animal, and the nitrogenized or flesh-forming principles alone cannot determine the practical feeding value of food.

In estimating the practical value of an article of food, we must take into consideration—

1. The Age of the Animal.—Young and growing animals require a more concentrated and more readily digestible food than full-grown or store beasts, *i. e.*, food being, comparatively speaking, rich in nitrogenized matters and poor in indigestible woody fibre.

The food upon which growing stock is fed, not only has to supply the daily waste of muscle, but must also increase the weight of the animals;

and as the process of renewal in young animals, moreover, proceeds more rapidly than in full-grown stock, the food of the former should contain a larger supply of flesh-forming substances and of bone-materials. Hence the great value of linseed-cake and of linseed-jelly for young stock, and the poor condition of young beasts fed upon too much chaff. The yet tender organs of digestion necessitate a more digestible food than that upon which store beasts may be fed with economy, and thus the same food which may be valuable for store beasts will often be found totally unfit for young stock.

2. The various kinds of Animals.—We know by experience that the best food for horses is by no means the best for cows or sheep, and hence the nutritive value of an article of food will be different in relation to horses from what it is in relation to cattle. The organization of the digestive organs of our domestic animals fully accounts for the different effects which are often produced by the same article of food when given to different kinds of animals. Thus, whilst beans are highly nutritious when given to horses, their value for fattening cattle is far less striking, and whilst cut straw, given by itself, may support store cattle, it cannot sustain for any length of time the life of sheep or horses. The nutritive value of food thus varies with the description of the animals to which it is given.

3. The Natural Disposition or Temper of the Animals.—Whilst some animals, like the Herefordshire cows and short-horns, are naturally good fatteners, Welsh cattle and Kerry cows, to mention only a few instances, never will become very fat, even if they are kept for a long time on abundant supplies of the choicest food. The practical value of food thus is likewise influenced by the natural disposition of the animal which is kept upon it.

4. The Purposes for which Animals are kept.—The effect which food is capable of producing is also influenced by the purposes for which animals are kept on the farm. The value of food necessarily will be a different one, if we speak in relation to working animals, or fattening beasts, or cows kept for dairy purposes. Thus for instance, the same amount and kind of food which in summer is hardly capable of keeping working horses in good condition, is more than sufficient to render them plump and fat in a short time in winter, when they are retained for days and weeks together in the stable. The nutritive value of food thus is influenced by the work done by the animal. The harder it is kept at work, the greater the waste in muscle, and consequently the richer the food

ought to be in flesh-forming matters which is given to working horses or bullocks.

Highly nitrogenized food, however, though of great value when given to working animals, does little good, and may even do harm when given in too large a proportion to fattening beasts. Valuable food for fattening stock is food rich in starch, and still more so, food rich in ready-made fat; or, to speak generally, food not so well adapted for working animals, because it does not contain a sufficient quantity of muscle material.

These few examples will show that the opinion which is entertained respecting the nutritive value of food cannot be invariably the same, but is regulated, among other circumstances, by the purpose for which the animals are kept on the farm.

The fitness of the same kind of food thus varies with the age, natural disposition, and kind of the animals to which it is given, as well as with the purposes for which they are kept on the farm; and it is therefore quite impossible to classify the various articles of food in an order which will indicate their relative feeding value in all cases.

But supposing the composition of food to be known, and the wants of the animals are well considered, it is still impossible in all cases to estimate beforehand what practical effect a feeding substance will produce, for it may be rich in flesh-forming substances, and contain fat and heat-producing compounds, as well as saline and earthy matters; and yet it may be, comparatively speaking, poor food, inasmuch as its constituents are not assimilated by the animal organism. The digestibility of food, consequently, is a point which ought to be well kept in view in estimating its nutritive value. Our knowledge of this process of digestion, unfortunately, is so limited, that we cannot speak definitely of all the conditions which regulate the digestibility of food. Still, however, a few substances may be pointed out by way of example, which influence the assimilation of food by the animal system.

Among other conditions the digestibility of food depends—

1. On the Kinds of Animals.—The same description of food which is assimilated in a great measure by one kind of animal remains almost wholly undigested when given to another. Thus it has been proved by direct experiments that cows will extract a great deal of nourishment from cut straw, whilst horses do not possess the power in the same degree of appropriating nourishment from cut straw, and sheep likewise do not appear to digest chaff so readily as cattle.

2. On the amount and character of the Woody Fibre contained in Food.—Feeding materials, containing but a small amount of woody

fibre, are generally more readily digested than those articles of food which, like straw, principally consist of woody fibre. Hence barley-meal, oats, and grain in general, substances rich in starchy compounds, are so well adapted to the rapid fattening of animals.

The condition of the woody fibre further affects the nutritive value of food in no mean degree. Whilst the woody fibre in roots left too long in a growing state on the land, or the fibre of grass and clover left standing until it become dead-ripe, is not readily digested, there can be no doubt that the soft fibre of young grass, clover, and roots, is readily assimilated in the animal organism and transformed into starch, sugar, and finally into fat. It is for this reason that grain crops, more especially oats, when harvested before the plants have become dead-ripe, produce straw which is greatly more nutritious than the straw of dead-ripe grain crops. In some parts of Scotland the custom prevails to cut the oat when the top of the haulm is still somewhat green; and it is upon straw of that description that store cattle are kept during the winter almost entirely.

3. On the amount of Flesh-forming Substances.—Food too rich in these constituents is not readily digested by cattle, whilst working horses are greatly benefited by food of that description. Thus, bean-meal or peas ought to be given sparingly to cattle, because beans and peas contain a very large amount of flesh-forming substances, which render them indigestible when given to cattle.

On the Bulk of the Food.—The normal functions of the digestive organs not only depend on the composition of the food, but also on the volume. The volume or bulk of food contributes to the healthy activity of the digestive organs, by exercising a stimulating effect on the nerves which govern them. The whole organization of ruminating animals necessitates the supply of bulky food to keep the animal in good condition. Experience shows that horses require a less bulky and more concentrated food than cattle; but if we reverse the case and feed cattle with too concentrated a food and horses with too bulky a feeding substance, much of the food will remain undigested.

On the form in which Food is presented to the Animal.—It sometimes happens that an article of food is said to possess little value, which, properly prepared, may be given to cattle with much advantage. Thus, straw cut into chaff—and, better still, steamed afterwards when mixed with sliced roots—constitutes a very acceptable food for cattle. The bruising of oats, barley cake, etc., the making of linseed into jelly, the steaming of hay, and cooking of food, are illustrations, showing how, by an alteration in the form of a feeding material, its digestibility, and with it its nutritive value becomes enhanced.

The benefit of steaming or cooking of food is principally due to this circumstance. It does not add anything new to the food; it does not call into existence any fresh nutritious matter; but brings the nourishment present in the food in an unfit condition, into a state in which it is more readily assimilated by the animal. Steaming, moreover, reduces the bulk of food, and masticates, so to speak, the food for the animal. The animal, therefore, is enabled to consume in a given time a larger quantity of food, and so save to some extent the work of mastication, which, like every movement of the muscle, is attended with a certain loss of the substance of the beast. The quieter and warmer we keep the animal, and the more we facilitate the assimilation of food, the more rapidly it will become fat. By steaming, likewise, the disagreeable smell of musty hay or cake is destroyed, and on the whole, steamed food becomes more palatable.

On small Proportions of Substances with which we may not even be acquainted.—Professor Liebig's researches on the juices of flesh have made us acquainted with a remarkable crystalized substance, to which he has given the name Kreatine. This substance appears to exercise a remarkable function in the digestion of food. Liebig also showed the presence of phosphate of potash and lactic acid in the juice of flesh, and considers these constituents indispensable for the digestion of meat. He has indeed proved that flesh, from which all juice is perfectly extracted by water, is so indigestible, that even dogs will refuse to eat.

The total amount of the compounds which appear to play so important a function in the digestion of meat is but very small. Now, if the digestibility of flesh is determined in a great measure by small quantities of substances, the importance of which remained unnoticed until the master researches of a Liebig on the juices of flesh made us acquainted with the influence the above mentioned substances play in the process of digestion—is it not likely that vegetable food may contain small quantities of compounds which exercise a similar influence?

In conclusion it may be observed, that the economical value of food is further influenced—

1. By prejudicial substances which Food may contain.—Thus, for instance, mustard cake cannot be used as a feeding material, notwithstanding its containing a large amount of flesh-forming and fat-producing substances, because in the stomach of the animal fed upon it, it gives rise to the production of the poisonous irritating essential oil of mustard; or, the refuse cake, produced in the manufacture of castor oil, cannot be used

for feeding purposes on account of the drastic effects which the oil, still remaining in the cake, will produce in the animal system.

2. By the Mechanical effect the Food produces.—An illustration in point is offered in bran, which, on account of its sharp edges, stimulates the nerves of the digestive canals to such an extent that much of it passes through the system undigested. Otherwise bran ought to be very nutritious, for it contains even more flesh-forming matters, as well as more fatty matter, than wheaten flour. Could not these relaxing effects of bran which, I believe, are principally due to its mechanical condition, be overcome by the cooking or steaming of the bran?

3. By the Physical condition of Food.—It is so self-evident that mouldy, fusty food cannot be so good as it is in a fresh state, that I need not dwell on this point. Every one knows that the fresher cake and food in general—(there are some exceptions, as for instance, mangolds, which become better on keeping)—the better it is adapted for feeding purposes.

4. By the flavour which it imparts to the Meat or Milk.—The economical value of an article of food is also regulated by the flavour which it imparts either to the meat or the milk. An article of food may be excellent for producing flesh or milk, and yet, on account of the disagreeable flavour which it imparts to either the one or the other, it may not be desirable to employ it as a feeding material. The case of fenugreek seed, to which reference is made above, fully proves this.

These remarks, and others which will suggest themselves to practical men, show that chemical composition of food alone cannot determine its economic value, but that a variety of circumstances have to be taken into account before we can arrive at anything like a correct view of the nutritive value of a feeding material.

HORSES.

It is a matter of great difficulty to trace clearly to its source the general horse stock of Ohio. Good horses were introduced into different portions of the State at a very early day, but most of the stock produced in Ohio previous to the introduction of railways that gave any indications of superiority was at once transferred to the East.

The original of the horse stock which become diffused throughout Columbiana, Stark, Wayne, Richland, Holmes, Tuscarawas, Carroll, Harrison and Jefferson counties was a horse of large size, heavy and slow gait—perhaps of Flemish origin, but most assuredly of that breed known as the Conestoga. The emigration to these counties, especially to the four first named, commenced as early as 1807, and was chiefly from Pennsylvania; between 1820 and 1830 this tide of immigration attained its maximum. The best strains of these heavy draft horses were introduced by the "*Dunkers*," "Mennonists" and "Omish"—three religious sects whose members are invariably agriculturists, and who never engage in merchandizing, nor become artizans for livelihood purposes. In Stark, Wayne, Columbiana, Holmes and Richland counties, they as a general thing congregate in communities, where the neatness of their farms, the excellent condition of all their stock, and the primitive simplicity of manners is proverbial.

As early as 1828 the French began to settle in Stark county, and introduced if not the pure, at least an excellent cross of the Norman horse. In the same county prior to 1830 were to be found horses claiming to be of "*Selim*," "*Florizel*," "*Eclipse*," "*Post Boy*" and "*Timoleon*" stock. These crossed upon the descent of the Norman and Conestoga produced an excellent class of horses for farm purposes.

There were horses claiming to be blooded stock on the Reserve as early as 1825. A Doctor Miles introduced into Lake county, (then Geauga) the Morgan horse as early as 1836. Of the blood stock first brought to the Scioto valley region, says Col. S. D. Harris, in his contribution to Frank Forrester's History of the Horse in America, were several mares introduced from the south branch of the Potomac, Va., by John I. Van Meter, and later the stallion "Spread Eagle," from the same region, bred by Abel Seymour, and a close descendent of Gen. Cocke's "Spread Eagle," of Surry county, Va., which was foaled in 1802, got by imported "Spread Eagle," running back through Moreton's "Traveller," to a Spanish mare. The stock of this stallion seems to have been most diffused and esteemed, of any single horse's ever brought to southern Ohio. He was afterward owned by Felix Renick, of Chillicothe, and after farther service in Ohio was taken back to Hardin county, Va., on account of the popularity of his stock in that region, where he died, upon the common, at an advanced age. Most of the blood stock of this region runs back more or less to Sir Archy.

From the same quarter came a few of the "Diomed" stock, principally esteemed as saddle horses. In the adjoining vicinity of Fairfield county, was introduced the horse known as "Printer," a longish bodied, low and very muscular animal, a breed which old Mr. Van Meter says he knew when a boy in Virginia, and which he says are nearly identical with the present Morgan stock. Many of these animals were excellent quarter nags—good in a short race, but with too little bone for the muscle. The oldest stallion of this strain in the country is now owned near Lancaster, Ohio, and has won many a small purse in scrub races.

Next to this portion of the Scioto valley, another point of introduction, as contributing largely to fixing the style of the early horses in Ohio, was that part of eastern Ohio, about Steubenville, in the vicinity of Wheeling, Va., and south-western Pennsylvania; and the horses brought in from those States have been of far greater variety in style. The first to be noticed was a large French draught-horse, called "Salisbury," from the name of his owner, which bred well upon the heavy Flemish and Conestoga mares of the Pennsylvania wagoners, who in that day did the principal carrying business into Ohio from the eastern cities.

Another famous stallion of this region, was "Shylock," of medium size and a good roadster. "Pirate," by Maryland "Potomac," was a smaller sized horse, and belonged to the class of running stock. "Chilton" was another favorite of the class of running stock. Then came a class of horses which were diffused all over eastern Ohio and western Virginia, whose popularity, even at this day, is second to none. They are the "Tuckahoe," the "Hiatoga," and the "Timoleon." These are well knit, lively and servicable horses. Most of the good mares in eastern Ohio are based upon "Consul" blood; the "Eclipse" stock is also considerably interwoven, and the kindred of "Sir Archy" and "Duroc."

In northern Ohio, which received the immigration from the north-eastern States, the horse stock was quite miscellaneous, and showed more ill-breeding than in the two sections before noted. They seemed to be, in too many instances, the worst scrub breeding from run-out English and Flemish mares, showing a great number of narrow-chested, leggy, pale, dun and sorrel animals, without constitution or action. Many of the first settlers brought tolerably good teams with them, but for want of suitable stallions, the race was not kept up.

This is a brief and general view of the horse stock of Ohio as late as the year 1835, when the great speculative movements of emigration from the east and immigration to the west, set the world crazy to make money; and, in the upheaving of business, farm-stock took a rise with the rest. Hitherto, a few of the best horses had been annually culled out and taken to eastern markets; and, as prices were not sufficient to stimulate to improvement, this had the effect to sink the general character of the stock by the early removal of the best specimens for breeding.

About the year 1840, the Bellfounder stallion, raised by T. T. Kissam, of New York City, foaled in 1832, was sent to Cleveland, Ohio, by Lewis F. Allen, whence he was shortly taken to south-western Ohio, where he stood two years. Thence he was taken to central Ohio, where he stood long enough to show the superiority of his stock, and in the mean time the stock in the south-west had shown such excellence that he was repurchased at $1,000 to return to Butler county, where he now remains in a green old age. This stock has proved capital for roadsters, and forms the best of the carriage and light-harness stock in central Ohio.

Before this time, the stallion known as "Kentucky Whip," was brought to the Scioto valley, where he has left a fine progeny, and died at an advanced age. In the same region, was also introduced from Kentucky some Bertrand stock, which did not however become permanently popular. And soon afterward, the fast boys of that region brought out some of the Boston stock, which is very apt to turn up at this day, where there is a call for something lively.

Gov. Allen Trimble, of Highland county, at the time of which we are speaking, was propogating the Eclipse stock in great purity, and thus introduced a class of stylish carriage horses, which were soon after still increased by the bringing into Warren county of "Cadmus," the sire of the famous mare "Pocahontas," and also of the "Walker Cadmus," now owned near Wheeling, Va. Of this, or a more lofty style, was another contribution in the "Clay Trustee," sired by imported "Trustee," foaled 1845, and raised by the late Henry Clay, of Kentucky, and brought to Ohio by John Van Pearse, of Lancaster.

In the year 1847, Messrs. Wm. H. and Jas. D. Ladd, of Jefferson county, Ohio, near Steubenville, brought from Vermont an excellent Morgan stallion, "Morgan Tiger," sired by David Hill's "Black Hawk," and out of a Sherman Morgan mare. With the exception of a Bulrush Morgan stallion, introduced into Trumbull county by N. E. Austin, this was probably the first of the Morgan stock brought west for breeding purposes. Morgan Tiger stood in Jefferson county until the season of 1851, when he was accidentally disabled and killed. His stock has proved among the best of that famous race, embracing about a hundred and fifty colts, which have mostly been sold at high prices and taken farther west. On the heels of this popularity, the introduction of Morgan and Black Hawk stallions to the west has been rapid, until there is hardly a district where they are not to be found, though many of them are only distant relations of the famous individuals of that breed.

The prejudices of many farmers are in favor of a larger style of horses than the Morgans, which has led to the importation of several animals, among which are two Normandy stallions, one in Pickaway county, and the other in Union, which by judicious crossing upon the best of the Flemish mares, produces a fine large draught stock. Other gentlemen, desiring to keep up high style, have brought in several famous old stallions, chief of which are imported "Monarch," owned by Reber and Kutz, of Fairfield county, "Grey Eagle," brought from Kentucky, by Messrs. Smith, of Richland, and "Bush Messenger," from Maine, by Messrs. Ladd, of Jefferson county. The Scioto Valley Horse Company have also the imported "White Hall," standing in Ross and Jackson counties, and the Butler County Horse Company have "Gray Highlander" and "Victor" from Kentucky. In northern Ohio, besides the noted Morgans, "Onderdonk," "Napoleon," "Flying Cloud," Eastman's "Green Mountain," &c., the trotting stallion, "Kennebec," in Trumbull county, is owned by L. Pelton, and the half Arabian "Hassan," got by the stallion which the Emperor of Morrocco presented to President Van Buren, and owned by Chas. Cornwell, of Salem, Columbiana county.

Joshua Clements, in his contribution on the Horse Stock in Southern Ohio, to the same work says:

The original stock of horses was brought from New Jersey, Long Island, Virginia and Maryland. About 1825 some good stallions were brought into Ohio, but we have no authentic date of any good brood mares having been introduced.

None were imported from England with undoubted pedigree, prior to 1825.

Among the early importations of horses from the old States, the first exerting a decided influence upon our stock was one Blossom, thorough-bred stallion from New Jersey, by Mr. R. Phillips.

In 1825, Mr. William P. Strader brought from New Jersey two fine stallions, Defiance, by Ball's Florizel, out of Miss Dance; she by Roe Buck, &c., and Flag of Truce by Sir Solomon.

About the same time several stallions were brought from Kentucky, into western Ohio. They were by Cook & Blackburn's Whip, he by imported Whip.

A few years later, about 1827, a fine stallion, by imported Expedition, was brought from New Jersey, and about the same time the Messenger and imported Diomed stock were also introduced. These horses stood in a part of Warren county, called the "Jersey Settlement," and their influence is still very marked in horses for all work.

The farmers of the "Jersey Settlement" are owners of the best stock in this part of the State.

In 1829 or 1830, Governors McArthur and Trimble brought from Virginia some fine thoroughbred stock, descendants of old Sir Archie and the Medleys, the best of Virginia blood. With this importation was a lot of fine brood mares and the stallion Tariff, by Sir Archie and out of Bet Bounce; she by imported Sir Harry.

These gentlemen, McArthur and Trimble, established a large stock farm for raising thoroughbreds in Ross county, near Chillicothe. The influence of that importation was very great, and is still apparent in that region.

About the year 1831, Mr. M. Beach brought from New Jersey and Long Island several fine horses and brood mares, among them the Orphan Boy, out of Maid of the Oaks by Spread Eagle. The Admiral, by imported Barefoot, and several fine brood mares and colts from the stock farm of Messrs. Bathgate and Purdy, New York.

These stallions, Orphan Boy and Admiral, stood in Hamilton, Butler, Warren and Montgomery counties. Their influence for roadsters and all work is still to be seen.

About the same time Mr. David Buchanan introduced some fine thoroughbred stock from Kentucky, descendants of old Sir Archie, and some of the most noted of his get, such as Bertram's, Kosciusko's, Whipster's, Whip, Hambletonian's and Spread Eagle's. Their influence is also apparent amongst roadsters, hacks, &c.

In 1832 Mr. John Garner brought to this section the stallion Robert Burns, by Stockholder, standing for a number of years in this and adjoining counties south, producing a very durable stock. Many of his get however were effected with string-halt, as was the sire.

In the same year, Mr. Peter Voorhees brought from Kentucky a brown horse, Friendly Tiger, descendant of Cook and Blackman's Whip. This stock for "all work," had no superior, and were particularly valuable for coach horses.

Cadmus, by American Eclipse, out of Dievernon, she by Florizel and Washington, by Timoleon out of Ariadne, she by imported Citizen, were imported from the old States in 1838. Washington stood in Dayton two seasons, getting some of the finest stock we have.

In 1839 Capt. Riley's imported barb horse, Mayzube, was brought to Ohio. Some of his get were very durable, tough, hardy horses, as farm horses and roadsters.

In 1840, Civil John by Tariff, the son of Sir Archie, out of Mary Haxhall by Haxhall's Moses—good stock. Also a Medoc horse brought from Kentucky.

In 1842 or 1843, Mr. William V. Barkalow, of Franklin, Warren county, introduced Commodore Stockton's imported horse, Langford, also ten or twelve fine brood mares and fillies, and established a stock farm in the "Jersey Settlement." Among the mares, both native and imported, were of the former, Miss Mattie and Caroline by Eclipse. These were of the best. The get of Langford and Eclipse mares constitute decidedly the best cross we have, all large, fine, good temper, gentle and kind, and of the most durable. We have at present very few well authenticated pedigrees of brood mares in western Ohio; the cause is negligence, very little attention being given to the register. Also in 1842, the famous old horse, Bellfounder, not more than a half bred, if that, took up his quarters in Butler county. His get are large, moderate trotters, looked upon as good coach horses, of early maturity, doing their best at 4 and 5 years, and old horses at 7 and 8. Also the half bred Archie Lightfoot, from Kentucky, son of Archie of Transport; getting fine, large coach horses, early maturity—bays mostly—not lasting.

In 1845 and 1846, two fine thoroughbred Kentucky horses, Gazan and Marco, bred by Dr. Warfield, Lexington, Ky., both got by his famous horse, Sir Leslie, son of Sir William, he by Sir Archie, made three or four seasons in south-west Ohio. The stock is stylish, superior quality; both of the horses are now in western Illinois, and are greatly prized for their produce.

Young Cadmus by Cadmus, he by Eclipse, dam by Sumpter, son of Sir Archie, was bred in Warren county.

This horse is the sire of the famous pacing mare, Pocahontas, now owned on Long Island. She was raised in this region. Many of Young Cadmus's get are of the best we have. A stock farm in an adjoining county has some fine stock, some of them probably thoroughbred, but I am unable to give their pedigrees.

There is a stock farm being established in Fairfield county, east of us. They have purchased of Mr. Lewis G. Morris, of Mt. Fordham, N. Y., the celebrated imported horse, Monarch, also Fashion, and some others.

A trotting stallion, Cassius M. Clay, stood in Cincinnati in 1855, but I know nothing of his stock.

White Hall, a Messenger horse, was at Chillicothe, and a horse called Highlander, in Butler county, both doubtful.

There has been recently introduced in this region a small, and I believe, very indifferent horse, claiming to come from Vermont, and by the famous old Justice Morgan. These horses, Morgans of to-day, all that I have seen are very unprepossessing. Square shoulders, short body, head and limbs, scrubby, not suited for anything—badly gotten up, and bogus stock in general.

Road horses for "all work" are mostly the produce of early importations from the old States of New York, New Jersey, Maryland and Virginia. The very best are the descendants of imported Messenger, imported Diomed and imported Expedition.

Draught horses are mostly of the old Pennsylvania stock, large and strong, built something like an elephant, and will do as much in proportion.

As early as 1825, we had a few race courses. Annual fall meetings were held at Cincinnati, Chillicothe, Dayton and Hamilton. The nnmber of race courses increased considerably up to 1838. Since then the races have been published in the "Spirit." In the fall of 1838, the Buckeye course, near Cincinnati, was established, regular meetings were held and sport fine. The contending horses, mostly from Kentucky, were Roanoke, Bertrand, Archie, Muckle Johns, Woodpeckers, &c. About the same time the Chillicothe course opened anew; the reports were published, which can be seen by reference to the "Spirit." There were at that time abour 15 regular race courses in the State.

Meetings were held at Columbus and Dayton every fall, and racing was continued over these courses until 1846. There were also some additions of new courses in the northern part of the State. In 1846, however, it all died away, and has never been revived.

The action of our *wise* Legislature has done this, there is not a single course in Ohio, where regular meetings are held for turf racing. There have been a few trotting matches. The Queen City course belongs to Ohio, but is situated in Kentucky, it is the only show we have. The interest that was becoming so prominent in the raising of *blood stock* has subsided, and with that of course, our stock must depreciate.

The most recent importation of horse stock from Europe was that of the "Darby Plains Importing Company" of Union county. The sale took place on the 30th day of December, 1857, in the village of Milford Centre, Union county. The following is a list of the names of the purchasers, and prices realized, as well as the pedigrees of the different animals sold:

SALE OF IMPORTED HORSES.

DEFIANCE. (Dapple Grey.) Weighs 1640 lbs. English Draft Stallion. Defiance is 5 yrs. old, 16 1-2 hands high; was got by John Bull. Dam by Master George, gr. dam by Old Barnaby. John Bull was got by Old John Bull, his dam by England's Glory; g. dam by Alexander.

England's Glory was got by Abraham Newland, his dam by Smith's Old Black, of Ashby.

Alexander was got by Old Sampson; dam by Old Stitcher, &c., &c.

Sampson obtained a premium of £60, at Edinburgh and Glasgow, Scotland.

Sold to Geo. Burnham, Union county, for $2,750.

Eber. (Cleveland Bay Stallion.) Weighs 1100 lbs.

Eber is 2 yrs. old; about 15 hands, 3 inches high; was got by Postempore. Dam by Master Richard; gr. dam by Paul; gr. gr. dam by Old Severton.

Postempore by Stockport, out of Miss Gill, by Viator. Gr. dam Lady Fractious, by Comus; gr. gr. dam Vaultress, by Walton; gr. gr. gr. dam by Election.

Master Richard by Dick Andrews; dam by Matchem Regulus, sister to Ancaster Starling.

Paul by Hamiltonian, out of Caroline, by Phenomenon; gr. dam Faith, by Pacolet, &c., &c.

Sold to F. U. Stokes, Urbana, Champaign county, for $2,050.

Lady Sykes. (Dapple Grey.) Thorough-bred Mare.

Was bred by Sir Tatton Sykes, of Sledmere, Yorkshire, England. Foaled in 1850.

Lady Sykes is by Slight-of-Hand; dam Wicket, by Stumps; gr. dam by Old Phantom, out of sister to Consul by Camillus, by Shuttle.

Lady Sykes is supposed to be with foal by Rifleman.

Rifleman was got by Touchstone; dam Camp Follower, by Colonel; gr. dam Galatea, by Amadis; gr. gr. dam Pauline, by Sir Peter.

Pauline was the winner of the St. Leger, in 1807.

For further particulars, refer to vol. 8, English Stud Book.

Sold to E. M. Bennett, Woodstock, O., for $750.

Niger. (Black.) Clydesdale Stallion. Weighs 1100 lbs.

Niger is 5 yrs. old, 16 1-2 hands high; was got by Masterman. Dam by England's Glory; gr. dam by Pacey's horse, of Bassingham; gr. gr. dam by Old Sampson.

Old Sampson by Merryman; Merryman by Blaze; Blaze by Old Merryman, &c.

Sold to A. P. Howard, Woodstock, O., for $1,800.

Young Sir Tatton. (Chestnut.) Thorough-bred Stallion.

Was bred by Sir Tatton Sykes, of Sledmere, Yorkshire, England. Foaled in 1856.

Was got by Daniel O'Rourke. Dam sister to Driffield, by Hampton; gr. dam by Comus; gr. gr. dam by Smolensko, sister to Orphan, by Camillus.

For further particulars, refer to vol. 8, English Stud Book.

Sold to Jas. Fullington, Milford Centre, for $1,300.

Hiram. Cleveland Bay Stallion.

Hiram is 5 yrs. old, 16 1-2 hands high, got by Volunteer. Dam by Cleveland Lad; gr. dam by Goodless Turk; gr. gr. dam by Old Prince; gr. gr. gr. dam by Conqueror, &c.

Sold to T. M. Kimball, Woodstock, O., for $1,900.

Mickey Free. (Brown.) Thorough-bred Stallion.

Mickey Free is 13 yrs. old, 15 hands and 1 inch high; was got by Irish Bird-catcher. Dam Annie, by Wonderer; gr. dam Caroline, by Whalebone; gr. gr. dam Marianne, by Mufti.

For further particulars, refer to vol. 8, English Stud Book.

Sold to P. B. Reed, Urbana, O., for $555.

Also, of the same importation, Two Norman Stallions, one 5 yrs. old, sold to A. Bronson, Milford Centre, for $1,500; and the other 6 yrs. old, 16 hands high, sold to J. O. Baker, Milford Centre, for $1,825.

Also, One Norman Mare, 5 yrs. old, 16 hands high, dapple grey, and supposed to be with foal by a superior Norman Stallion. Sold to Charles Fullington, Union county, for $825.

PRESENT CONDITION OF HORSE STOCK IN OHIO.

The following, gleaned from the reports of the county agricultural societies, will perhaps be as good an index of the condition of the State in relation to Horses, as can with any degree of reliability be stated. For statistics of horses, the reader is referred to page 48 of this report.

Ashland—Produces 600 annually; many exported. Boston blood is preferred.

Belmont—500 horses raised annually; 300 exported. *Invincible* is now kept in the county. Morgans, Tuckahoes, Snaps, and Messengers are some of the favorite breeds.

Carroll—Probably 500 horses are exported from the county. Not much improvement is being made. We find strong heavy horses command the best prices, and are most in demand.

There is no necessity for having balky horses, if the proper steps are taken to break them when colts. My plan is to commence to break them in the fall and winter, after they are two years old, first by putting on a bitting bridle and turning them in a lot until they become used to the bit, then put on the harness and drive them by the side of steady horses attached to a sled, light wagon, or any kind of carriage, but the load should not be greater than that one horse could draw it under all circumstances, until the colt learns that when he throws his weight into the collar the weight behind him yields in proportion to his exertion. Then under all circumstances he will press forward, and know nothing of being balky.

Champaign—Several Norman horses imported.

Clark—Morgans preferred.

Clermont—Horses don't want breaking, but require *education*, and that to be instilled by kindness.

Columbiana—There are at present about 10,000 horses in the county; average value at 3 years, about $100. About 3,500 head are annually produced. The stock of our horses is getting much better than formerly; the young stock show a decided improvement.

Delaware—There has doubtless been a great improvement in horses, by the introduction of "Morgan" and other blooded stallions, as also from the high price of horses, inducing their owners to give them better keeping.

Defiance—About 400 horses are annually produced, and 300 exported. The common stock is being improved by crossing with the Morgans.

Erie—For general purposes Morgans are preferred, because of their strength, endurance, and activity combined. For draft and farm purposes, the larger breeds are preferred, such as King Alfred, because of their superior strength and hardiness.

Fairfield—In the matter of horses, it is only necessary to name "Monarch," "Trustee," "Young Toage," and others. The farmers generally have liberally bred to the stallions named, and it can now be safely said that one or two years will show a vast number of these most useful animals, of the most improved breeds.

Geauga—Morgans preferred for fashion's sake.

Greene—We have all the fancy breeds, such as Morgans and others. A large horse, such as the Bellfounders generally are, are much preferred.

Guernsey—There are a good many annually produced, and annually exported to eastern markets, but I have not sufficient data from which to form reliable estimates of their different numbers.

More attention is being paid to horses since their price has run up so high, than formerly. We have as yet no particular breed or class to which decided preference is given. Improvement is sought to be obtained from the selection of breeders, both male and female, combining figure, form and action, with sufficient size for all work, from the best horses in use in the county, whose pedigree or race is not known. A Bellfounder stallion, introduced some three years ago, now owned by Mr. Grummon, bids fair to improve our stock, but his first colts being rising two years old only, are yet too young to bring into service, and this is the only sure test of worth. He is a bay, of fine size, form and action. Should his get inherit his color, size, figure, form, and action, combined with endurance, docility, and kind disposition, he will be a valuable acquisition to our stock.

Dealers have been paying from $120 to $150 for our best geldings for market. M. SARCHET.

Hamilton—Improvement in horses is progressing regularly, by the introduction of foreign stock of different grades, from the Arabian to the English Draft; and perhaps there are too many good ones already in our county, for it seems in some cases that many farmers hesitate in deciding as to their merits. Morgans are in general favor here.

Hancock—Many horses are annually sold to the eastern markets.

Highland—About 800 annually produced, and 400 exported.

Hocking—Many annually produced; Imported Monarch and Clay Trustee, and others, are improving our stock.

Huron—About 1500 produced and 400 exported. The English are preferred for speed, and the French for endurance.

Jackson—500 produced, and all exported.

Knox—Morgans are getting in favor.

Lawrence—No improvement—no exportation.

Marion—About 3,000 produced, and all exported; heavy draft stock preferred.

Medina—Morgans preferred for crossing with common stock, producing a hardy, gentle, and active stock.

Miami—Produce 1500 and export 700 annually. Morgans preferred for activity, hardiness, and gentleness.

Morgan—Produce 3,000 annually; export 500.

Morrow—Morgan, Bellfounder and Eclipse stock preferred.

Muskingum—We raise about 1200 annually, and export say 600. Of late there is great improvement in our draft stock; they now are large and heavy, with good action. We have tried blooded stock as well as the Morgan stock, but they have proved too light for our hills, and do not sell as well in eastern markets.

Richland—We raise a great many horses in the county, and some very good ones. A large number are exported. Mansfield is said to be as good a market as any in the State. Eastern purchasers congregate here annually, and take away large droves. There are great inducements and much disposition to improve the breeds. Some Kentucky horses have been imported here, among which is "*Gray Eagle.*" The Camden blood is much valued for strength, fleetness, and endurance. The Morgan and Black Hawk strains are regarded as excellent roadsters.

To break colts *well*, begin to handle them when very young, and treat them kindly—feed well. The best way to cure balky horses is to *break* their necks.

Sandusky—Morgans for carriages, and a large breed for draft.

Seneca—About 1500 head of horses raised in the county annually; average value, $125. A large number have been sold the past year, and exported from the county. Quite an interest is taken in the improvement of this stock in the county, and some of the best stock in the State has been introduced.

Summit—Great improvement has been made here in the horse. We prefer the Morgan for activity and docility. In good nature it excels all others. When crossed upon the common stock an excellent strain of horses is produced. The Blucher stock has been successfully bred here for several years; it is well liked.

Tuscarawas—There has been a decided improvement in horses for the last few years, arising from the introduction of the Morgan and Messenger with our common draft mares, as it imparts more vigor, activity, and endurance. Kind and gentle treatment is the best method of "*breaking.*"

Warren—The interest in horse-breeding has not abated any for the last ten years. Our Fairs have been as ably represented, from the entire horse down to the sucking colt following its dam, as any county in the State. The number of fine horses taken from the county, and the prices paid for them, indicate the character of the stock bred here. Several horses have been brought here from Kentucky, New York, and New Jersey, in addition to the old stock that was justly celebrated before them. Horses are improving. Morgans are just now most in favor, but the Messenger blood is also sought for. There are two or three very fine stallions of the latter strain in the county.

Wayne—Chiefly heavy draft.

Williams—But few exported. The Morgan is considered the best for all purposes.

Tame the colt by gentle treatment, halter break, then break thoroughly with a bitting bridle, then ride and harness, then work single by hauling light drafts until the horse learns to pull; then work two together, but treat mildly.

SHEEP AND WOOL.

There is as much difference of opinion with regard to sheep as there is with respect to cattle and hogs; some prefer the Spanish Merino, and state as a reason for their preference the large yield of fine, high-priced wool; others, for the same reason, prefer the French Merino; others are partial to the Oxford breed, and contend, as do those who prefer the Cotswolds, that the profit lies in the large yield of wool, and appear to be satisfied that the difference in quality is amply compensated in the quantity. In some districts are to be *found* those who prefer the native or half breeds for both wool and mutton.

There is no doubt that the remoteness or proximity to market has a very great influence in deciding what kind of sheep are most profitable for mutton. When this subject is critically examined it is found that the long and middle wooled sheep in the vicinity of cities are always preferred, certainly chiefly on account of their mutton qualities, whilst remote from cities, and where wool is regarded as the source of profit, the various breeds of fine sheep are preferred.

Some are disposed to regard the native variety as being more hardy than the improved breeds, asserting that they can neither withstand the cold nor scarcity of food as well as the natives. This may be partly prejudice and partly from a want of having properly considered the surrounding circumstances. The improved sheep require acclimatization, and to become accustomed to our soil and food. France, Germany and England have a much more moist climate than ours, and it is only the fourth or fifth generation of sheep which can be said to be acclimated. Adult persons from Europe seldom become acclimated here in less than ten years, whilst immigrants of fifty years of age *never* become thoroughly acclimated. No one will dispute the hardiness and power of endurance of the French or German laborer, yet during the first half dozen years of his sojourn in this climate he is much more susceptible to miasmatic and marasmatic influences than is the native. It appears to us, therefore, that those who assert that the improved breeds of sheep are not as hardy as the native varieties, have made no allowance for climatological differences, change of food, &c. Those partial to the improved breeds consider them equally as hardy as the native variety.

Chancellor Livingston of the State of New York, after he had introduced the Merino sheep into the United States from France, published a treatise, in 1810, on the management of the Merino sheep and their fine wool. In which he set forth with much other valuable matter, that three Merino sheep could be pastured as well on one acre of grass as two of the common native sheep. And that one-third less provender or food would keep the same number of Merinos compared with the same number of the natives. Livingston wrote his treatise near half a century ago, since which time the vast improvement in agriculture, demonstrates that if the season be favorable, as many more Merinos can be kept on an acre of land, as could be forty or fifty years ago.

From statistics now in this office, it appears that the natural increase of the flocks is about four-fifths annually.

Mr. Sherrard, of Jefferson county, communicates that, which if it be a fact, is one of the utmost importance in determining the sex of the unyeaned lambs, or rather of the production of sex at will. This is a subject which for years has engaged the attention not of breeders only, but of physiologists; but up to the present time, all the hypotheses presented by them are not borne out by facts. Mr. Sherrard says: "If there be a buck kept for every ten ewes, there will be more ram than ewe lambs; a buck to every twenty ewes will produce about an equal number of each sex, but if one buck only is permitted to serve thirty ewes, the proportion of ewe lambs will be greatly increased.

For statistics of sheep see page 52.

Annexed are several communications on the subject of sheep:

Clermont—Sheep are rather receding from popular favor, and the number of good flocks is every day diminishing. There is no lack of confidence in the profit of raising good wool or mutton in our county, but the serious losses occasioned by *dogs*, and the difficulty of effectually protecting the flocks against this intolerable nuisance, has deterred new capital from entering this field, and gradually driven that already in, to abandon it.

Sheep and Wool.—For mutton, many years ago, the Southdowns were imported into our country, direct from England, and still exist. The Lincolnshire, the New Leicester have made but little progress. For wool, the Merinos, descended from the Humphreys importation through the flocks of Atwood, Hammond, Remile, though not numerous, are in the right hands; and when they have fair play will not fail to take, as they deserve, the first rank among fine wool sheep, not only in our own country, but in the world. T. S. HUMRICKHOUSE.

Warren—Although I have made wool-growing a business for 15 years, I cannot say which are the best breeds. Locality should always determine the kind of sheep grown either for wool or mutton. Labor is too dear for us to go into any minute experiments. The object is to make the sheep perform as much of the labor in getting their own living as possible by providing pasture in summer and winter. Our native blue grass makes a fine winter pasture not only for sheep, but for cattle and young horses. It keeps green through the winter and only in inclement weather do they require other food. A straw rick, or hay fed in cribs, for them to run to will carry them through the winter in good condition.

EZRA CARPENTER.

The following statements, condensed from the county reports, present at a glance the sentiment with regard to sheep, in a very brief yet detailed manner:

What variety or breeds of sheep are preferred—reason—variety best for mutton?

Are improved breeds as hardy as natives?

Ashland—Long wool, because have hardier constitution, produce more wool and good mutton.

Belmont—Merino crossed with common 3-4 Merino, good wool, good mutton; are as hardy as natives.

Carroll—Merinos and their grades, on account of fineness of fleece.

Champaign—Southdown; are as hardy as natives.

Clark—Costwold, Liecester, Lincoln, produce most mutton.

Columbiana—Spanish Merino for wool, Southdown, Leicester and Cotswold for mutton; are as hardy as natives.

Coshocton—Merino for wool.

Crawford—Spanish Merino, most wool, heartiest sheep, most profitable; are as hardy as natives.

Delaware—Saxony and Merino for wool, Southdowns for mutton; Southdowns most hardy.

Erie—Merino, prized for wool, Leicestershire for mutton; are as hardy as natives.

Franklin—French Merino cross upon the Saxon.

Geauga—Spanish and French Merino, good wool, good mutton; are as hardy as natives.

Greene—Spanish Merino, Leicestershire, Natives for wool, Southdowns for mutton; are as hardy as natives.

Guernsey—Merino, compact form, good constitution, heavy fleece, good mutton; are as hardy as natives.

Hancock—Cross common with Spanish and French Merino; are as hardy as natives.

Hardin—Merino for fine fleece, Southdowns for mutton—mostly natives in county; imported not as hardy as natives.

Highland—Mostly common, a few Saxon and Long Wooled.

Hocking—Coarse Wooled for mutton.

Huron—Spanish Merino, size and fineness of fleece, Liecestershire for mutton; not as hardy as natives.

Jackson—Saxons and Merinos, mostly native.

Jefferson—Spanish and French Merino for wool; are not as hardy as natives.

Knox—Saxon, Spanish Merino, Silesian, for fine wool, Liecestershire and Southdown for mutton.

Lawrence—Mostly natives.

Lorain—Southdown, Leicestershire, Cotswold, Merino, French Merino.

Mahoning—Spanish Merino, fine form, easy keeping, large yield of wool, long wooled for mutton.

Medina—Merino, Spanish for wool, French for mutton; are as hardy as natives.

Miami—Breeders prefer full bloods, farmers prefer crosses on account of the carcass.

Morgan—Spanish Merino.

Morrow—Merino, finer and better wool, middle and long wooled for mutton; are as hardy as natives.

Muskingum—Merino for wool, Southdown, Cotswold and Lester, are the *fancy* now.

Portage—Spanish Merino for wool, Leicestershire for mutton; are as hardy as natives.

Putnam—Natives, few Merinos.

Richland—Spanish and French Merino, for quantity and quality of wool, Leicestershire for mutton.

Sandusky—Merino and grades, hardiness and quality of wool, long wool for mutton; are as hardy as natives.

Shelby—Spanish Merino for wool, Southdowns for mutton; not as hardy as natives.

Summit—French and Spanish Merino for wool, Southdown, Leicestershire and Cotswold for mutton; not as hardy as natives.

Trumbull—French and Spanish Merino and Saxony for wool, New Oxford, Leicestershire, Cotswold, and Southdown for mutton; not as hardy as natives.

Tuscarawas—French and Spanish Merino, hardy, thrifty, more wool, &c., Southdowns for mutton; are as hardy as natives.

Union—French Merino for wool, Cotswold for mutton.

Van Wert—Not many raised on account of wolves; common.

Wayne—Merinos for wool, Southdowns for mutton; are as hardy as natives.

Williams—English crossed with Merino and Saxony.

Wyandott—Spanish and Silesian cross, largest quantity of wool, preferred by manufacturers; are as hardy as natives.

HOGS.

In Ohio the raising of pork has always been and still is, a very important branch of productive labor. There is, however, comparatively less attention paid to this business than in former years, but there are still vast quantities of pork exported from Ohio, in different conditions, to wit: on foot, by railroad, slaughtered and exported in the whole carcass, and in the shape of hams, shoulders and sides smoked, and as pickled pork in barrels. We are unable to give an exact estimate of the amount thus exported, and still less of the quantity used within the State, but the exports amount to many millions of pounds annually, and probably exceed the home consumption of this article of food, which we are happy to say is on the decline, in large portions of the State, particularly the north; and although, in mining and large manufacturing districts, the use of pork has increased, yet, the whole State being considered, pork is yielding its place to beef and mutton, as an article of food.

In Ohio there are many different breeds of hogs raised, a few of which are held in high esteem, and these we will more particularly mention, as they have obtained a prominence in public favor in accordance with their value as profitable stock or palatable food.

The so called native breeds, that is those introduced by the first settlers of the State, were better calculated for the conditions attending the early periods of our history, when the lands were wild and infested with beasts of prey, than for existing circumstances. Their fleetness, and strength of head, neck and tusk, and a thick, rough coat were desirable qualities, for the protection of the animal from wild beasts and weather, and to enable him to gain his sustenance in the wilds. But the directly opposite qualities,—sluggishness, small-bone, fine head and thin coat are now desirable points, in his present easy circumstances.

The Suffolk breed has been highly esteemed in many places on account of their early maturity, and the tenderness of their flesh, and are still the most sought after in many counties, where they have entirely superseded the native breeds. In other counties, where improvements have been made in the breeds of swine, different races have found favor, among the most noted of these are the Byfield, Russian, Chester, Berkshire, China, Leicestershire, Shaker and Irish Grazier, all of which are in favor with some one or other of our correspondents, and these variously crossed and commingled are likely to produce a breed in Ohio, if carefully cultivated, which will possess all the qualities which in the hog are desirable. The weight of opinion seems, at present to be in favor of the Suffolk and its crosses, while others have as strong preference for the other breeds named, but are merely numerically in the minority. Our correspondent from Muskingum says, that they never have had a breed equal in the totality of good qualities to the improved Berkshire. The old fashioned breeds, with long legs, bodies, ears, and noses, are not the kinds most desirable, as they are hard to fatten, and are not good for food when made as fat as their nature permits, and will of necessity soon give way to better animals. Any breed of hogs which have short legs, ears and noses, and a fine coat of bristles, will fatten easily and yield for pork a palatable food; and when the short, chubby make, and smallness of bone is properly modified by crossing with the large boned breeds, we will obtain size on the one side, and great disposition to fatten readily on the other, which will, together, furnish us every desideratum for pork for home consumption and the market. A good mixture of this kind would be the China with the Berkshire breeds. The principle here indicated will be sufficient to guide the intelligent farmer in selecting his breed of hogs, and each one should make perfection of his stock, a matter of constant attention.

Merely raising hogs is not, however, making *pork*, and "cultivation" is necessary to secure, as Mr. Springer of Muskingum county observes in his correspondence, a "superior quality of pork." He recommends, and the experience of all who have observed, or experimented in the matter, confirm his assertion, that to make good pork, boars should be castrated while sucking, and the sows should be spayed as early as practicable. If this be not done early the quality of the flesh will be quite inferior, and cannot be much improved by any amount of care afterwards. Pigs intended for family use should be slaughtered at ages varying from nine to fifteen months, as the quality of the pork made from old animals is quite inferior—and Mr. Springer says, in addition, that plenty of salt and good strong brine are all that is wanted to make the best of pork in the land.

To insure good pork for home consumption and the market, such care must be taken of hogs as will secure them a healthy and thrifty condition. This care, in general, has reference to their habits and food, both before and at the time of fattening. Before fattening, and while growing, as to size, hogs should have a sufficiently large pasture to afford them plenty of exercise, and should have access to clean water, in abundance, and such food as may be necessary to keep them constantly thrifty.

At the time when they are put up for fattening, only healthy animals should be selected, and these should be put in pens where they can be well sheltered from the inclemencies of the weather, and scrupulous regard should be had to cleanliness, for as one of our correspondents truly remarks, "dirt don't make fat," but on the contrary it operates injuriously, while cleanliness and comfort will greatly aid in favoring the quietude of the animal and improve his digestion, upon which his speedy fattening depends.

The food for hogs should be ground and cooked, as whole grain is not well masticated, and is, consequently, imperfectly digested, and lost, whole or half grains of raw corn being often found in the bowels and excrements of hogs. While mush or other cooked food, being more easily digested, the animal gets the greater part of the nutritious elements contained in it with less exertion. Experiments have proved conclusively that 100 bushels of corn will produce 50 pounds more of pork if ground than if fed in the ear, and 100 pounds more if made into mush One hundred bushels of corn ground and made into mush will produce 700 pounds of pork. Some statements say only 500 pounds, and some as much as 800, but the great majority of reports place it at 700 pounds, which is doubtless fully within the truth, and these reports, made in answer to questions made upon this subject, justify the opinion that cooked food will produce nearly fifty per cent. more pork than the same food given in the raw and unground state. Our Huron county correspondent says "corn unground produces 600 pounds of pork, ground 650 pounds, and made into mush 700 pounds." And this experiment seems to be confirmed in principle by all who report on the subject.

The less exertion required, and the greater quietude secured to an animal, as all observing stock growers and dairymen know, the more readily hogs fatten, and the more productive are cows kept for dairy purposes; and it is because swine at distilleries are freed from the necessity of even masticating their food, that they fatten so much more readily than in any other circumstances.

One of our correspondents recommends the administration to hogs of a mixture three parts of ashes and one of salt, as a preventive and cure of kidney worms. And for costiveness, a table-spoonful of copperas, which has been desiccated and pulverized, is recommended by the same writer, to be administered as often as the hog shows symptoms of the complaint. Small doses of sulphur would also be useful for swine, as a means of improving his condition, making him less liable to measles.

CURING PORK.

The mode of curing pork has been the subject of inquiry, and in answer to our questions we have received various replies as to method, some of which we subjoin. Mr. Springer, of Muskingum, says: "Put on plenty of salt, and nothing more is wanted; and when warm weather sets in, put plenty of salt in the brine, and there will be no danger of having sour meat."

Some packers keep their methods secret, a thing which in an enlightened community cannot be considered other than reprehensible.

Mr. Carpenter, of Warren county, recommends the following method: "Cut and trim the pork, and cool until the animal heat is dissipated. Rub the hams on the flesh side with one ounce of finely pulverized saltpetre (too much will give an unpleasant taste, and dry the hams too much, as the season advances). Rub also with as much New Orleans sugar as will adhere; put into clean casks, not large enough to cause the meat to be pressed so much as to express the juice; sprinkle the bottom of the cask and each layer of hams (flesh side up) with a layer of Liverpool salt. In twenty-four hours pour on brine made of Liverpool salt, strong enough to bear an egg, in which is dissolved three lbs. of sugar, including what was rubbed on, for every 100 lbs. of hams (or pork); fill the cask with brine, and let it stand in moderately cold weather four weeks, in very cold weather five weeks, as meat does not take salt as fast in cold as warm weather. Salt which contains lime should not be used to salt meat or butter. At the end of four or five weeks smoke well with green hickory or sugar-tree; then wrap well with heavy wrapping paper. Make bags of cotton shirting, into which the smoked meat can be slipped loosely; tie tightly at the hock end, leaving the ham hang loosely in the bag; hang in a dry cool place, and they are ready for use, and will keep for years."

Mr. Best, of Muskingum county, advises to cut up, cool, and rub a mixture of salt, sugar, and saltpetre, barrel flesh side up, sprinkle each layer with black pepper until covered, then cover with a layer of salt and a little sugar; on the third day, cover with a strong brine, containing a little sugar and saltpetre, and in from four to six weeks take out and smoke, *on dry days only.*

Gen. Bierce, of Akron, recommends smoking the casks with smoke from corn cobs.

Mr. Parrish, of Erie, says: "Take half a bushel of coarse salt to make a barrel of brine. For hams take 8 lbs. of salt, 4 lbs. sugar, 1-4 lb. saltpetre, and a table-spoonful of saleratus, to every hundred pounds of hams; rub this mixture on the flesh side, pack this side up, and in a few days cover with brine."

HOG CHOLERA.

Among matters of great interest to stock-raising farmers, the diseases of domestic animals hold a prominent place, and among these diseases, forcing themselves upon public attention by their destructive ravages, one, among swine, has been so violent and fatal in its attacks upon hogs as to have been made the object of special investigation, in many parts of the country. This disease is known by the name of "Hog Cholera," and we will give the result of a comparison of reports upon this subject, by a number of persons to whom the farming community are certainly indebted for the care they have exercised in investigating this disease and its nature; and to those persons from whom we have directly or indirectly received our information upon this subject, we express our acknowledgments, even though their names may not perhaps be particularly mentioned in our consolidated report.

"Hog cholera has," to use the words of the State Chemist of Maryland, "existed a long time" in the country, and it has prevailed with great fatality in many widely distant places—in Maryland, Kentucky, and Indiana, and in the southern part of Ohio; and its existence in parts from which we have no reports is very probable.

The symptoms of the disease, and the parts affected, differ according to the reports of different investigators, but there is a sufficient similarity in these to lead us to conclude that the fatal "Hog Cholera" is a term indicative of but one disease, although the descriptions of it, by different parties, do not perfectly agree.

Mr. J. Higgins, State Chemist of Maryland, who has carefully investigated the disease, describes the symptoms as lassitude, loss of appetite, hoarseness or "husky grunt, approaching to a cough," slight diarrhœa, yellowish urine, weakness, seeming paralysis of the hind parts, or small of the back, tottering gait, and speedily death.

Mr. Sutton, of Aurora, Indiana, gives a more detailed account of the symptoms of the disease, which may be summed up in the following short review:

First, debility, drooping of the head, and soon after diarrhœa, the discharges being yellow when the animal was fed on slop, and dark colored when corn constituted the food. Frequently there was vomiting; sometimes bloody evacuations, with tenesmus resembling dysentery. In some cases there was cough and difficult breathing; in others, inflammation of the throat, loss of voice, and swelling of the tongue, bleeding from the nose, which might be swelled, swelling and inflammation of the eyes, the legs, ears, or some other part of the surface. Sometimes there were gangrenous spots on the legs, belly, flank, &c. Some became, apparently, delirious, others blind, and nearly all which were attacked died in from two to five days. "These symptoms," says Mr. Sutton, "were combined in almost every variety."

The examinations made of the bodies of hogs, which had died of this disease, reveal the fact that various organs, in different cases, were the seat of inflammations, and with this fact terminated the exact resemblance of different cases. Mr. Higgins found, in the cases examined by him, an apparently healthy condition of all the organs except the lungs and bronchial tubes, and these were affected in different degrees, by inflammation, from simple engorgement, in some cases, to complete destruction of the lung tissue in others, but he did not find any well-defined abscess in any of the lungs examined by him. The left upper lung, according to his observation, was generally the most affected of the two. He examined the blood of healthy pigs and of those about to die of this disease, and found the proportion of fibrine in the healthy as 2.33 to 1000.00, and in the diseased as 5.60 to 1000.00, with a larger but less firm and bright clot than in healthy blood.

Mr. Sutton examined 47 hogs, dead of this disease, and found no two precisely alike. He found in all a diffusive form of inflammation in some organ or tissue, seemingly of the erysipelatous kind. In different cases this inflammation was found upon the skin and subjacent tissues, which were of a dark purple, and infiltrated with serum. In most of his cases the mucous membrane of the stomach was inflamed, bright red, and tumified. Blood was sometimes found in the stomach, which was also occasionally filled with food. If there had been dysentery or diarrhœa, the intestines were more or less marked by inflammatory action, in various parts, in different cases. Sometimes the bladder participated in the inflammatory condition, and, too, blood was occasionally found effused into it. In eighteen of his cases the peritoneum was inflamed, and in some of them adhesions between the different contigious peritoneal surfaces had taken place. To quote his language: "Suffice it to say, that I found the liver, the lungs, the pleura, the peritoneum, the mucous membrane of the bronchia, the trachea, and larynx, all at different times bearing marks of inflammation: frequently one or both lungs were engorged or hepatized, and adhering to the ribs." Other informants corroborate the observation here mentioned, and some give the additional fact that in their cases large numbers of intestinal worms, resembling the *ascarides*, or the *lumbricoides*, were found in the small intestine, not far from its connection to the stomach, in vast numbers; and in some of such cases, if they did not cause, they at least greatly added to the inflammatory condition.

From all the sources of information at present attainable, our conclusion is that the disease is of the kind called in human species erysipelas, attacking different cases in different parts, and with greater or less fatality, according to various surrounding or concomitant conditions.

From all the observations made, and some very carefully conducted experiments, instituted for the purpose of determining the question, we are fully persuaded that the disease is contagious in its character, however it may originate at first, and, too, it seems, so far as observation has gone to establish the fact, that it occurs but once in the same individual, in this respect resembling the contagious diseases to which the human family is subject.

Its period of incubation, that is, the time from exposure to attack, is about fourteen days.

It is not, as has been supposed, occasioned by the slop of distilleries or strychnine, but distilleries being places where large numbers of swine are usually kept, a contagious disease would rapidly spread, and thus give rise to the supposition that it was occasioned by the still-slop, which may perhaps in a few instances act as a predisposing agent. But, from the facts observed, those animals fed on slop, at least after exposure to the disease, are in less danger of death than those fed on corn, or other hard food.

The fatality of this disease is very great, and the range of country over which it has prevailed is immense, including nearly the whole of the largely pork raising districts of the country, north and south.

At some of the large distilleries along the river bordering Ohio, Kentucky, and Indiana, the deaths of hogs are numerated by thousands in a few months. The number estimated to have died of this disease within one hundred miles of Cincinnati, since its prevalence, only a few months, is 60,000. The per cent. of those exposed which take the disease is from 30 to 60, and nearly all which are attacked die.

The cause seems to be due to some generally predisposing condition of the atmosphere, affecting the animals with a predisposition, and then some specific animal poison to which the hog is alone susceptible. Those hogs which were inoculated with the poison died of the disease, yet the occasional wounds of Mr. Sutton, the dissector of many of these animals, were not followed by any bad consequences, nor were those of others who were much occupied with the sick and dying animals.

No plan of treatment as yet instituted, has been crowned with such success in the cure of the disease as to render its recommendation as the best that may be found, a matter of propriety, yet the success attending some modes of treating the disease make them worthy of at least further trial.

Dr. Dougherty, of Paris, Kentucky, who found vast numbers of worms in the small intestines, attributed the disease to their presence, and thinks no treatment of avail after the intervention of the inflammation. He thinks the disease "incommunicable," and recommends the use of medicines before the outbreak of the disease, to dislodge the worms.

Mr. R. A. Sherrard, who observed the disease in Jefferson county, Ohio, where it occurred not only around distilleries, but in other places recommends the use of the following mixture: Epsom salts, 1 lb.; powdered sulphur, $\frac{1}{2}$ lb.; powdered copperas, (sulphate of iron,) $\frac{1}{2}$ lb.; tartarized antimony, 4 ozs. Mix all together and give to each affected hog one teaspoonful once a day for a week, then leave off a week, and another week give the medicine, and so on alternately as long as may be needed. Some farmers use as a preventative powdered copperas and flour of sulphur with a small portion of saltpetre mixed together in teaspoonful doses. It has proved, so it is said, successful either as a preventive or cure.

Bleeding has been suggested in cases of inflammation of the lungs in this complaint. One farmer thought he had benefited his hogs greatly by driving them through and feeding them in water. When diarrhœa or dysentery is a prominent symptom, linseed oil and laudanum or castor oil, laudanum and turpentine might prove serviceable. Soap in small doses has been used with some benefit seemingly.

The important matter to be attended to, and that which promises the best results is to keep the diseased hogs separated from the healthy. Keep the pens scrupulously clean, and when infected hogs are in the neighborhood every farmer should keep his stock confined to prevent contagion. Some recommend, as disinfectant agents, the use of washes, for pens where the disease has appeared, of solution of sulphate of iron, chloride of lime, chloride of soda, &c., or lining the pens with water slacked lime.

General conclusions: Hog cholera is properly a disease contagious, or infectious in its nature, resembling erysipelas, or "plague" in the human subject. It prevails widely, as noticed by the journals, and our correspondents in Southern Ohio, and in nearly or quite all the pork raising States. It is highly fatal, and attacks large numbers proportionally of the animals exposed. It occurs but once in the same hog. It can be innoculated. Seclusion from the disease is the only sure method known of preventing it. No entirely reliable treatment has yet been discovered. Some other diseases may have been mistaken for this one, and hence notices by different persons of a disease the same in name may differ. This disease has no well established name, and might be properly called as suggested by Mr. Sutton, of Aurora, Indiana, "the hog plague." We would recommend a careful dissection of the hogs which die of the disease, and records of the successful modes of treatment instituted by farmers and hog owners, to be collected and made available to the public. Physicians could do much towards remedying this evil, and in fact, all the maladies of our domestic animals by giving more attention to these matters, and would, we are confident, be rewarded by a better acquaintance with the diseases which afflict the human family and it is scarcely necessary to say that all subjects involving the interests, or in any manner the comfort of man, is a legitimate and proper subject for investigation by him.

FRUIT CULTURE IN OHIO.

The value of fruit as food, and its influence in promoting health when freely used in the family, are beginning to be well understood by intelligent people. Hence we find an increasing demand for good fruits in all our towns and cities, and farmers are devoting more attention than formerly to their orchards and fruit gardens. No State in the Union, it is believed, possesses as a whole greater advantages of soil and climate for the production of good fruits, and it may be safely asserted that in no other State has there been so large an amount of money expended during the past ten years in the purchase of fruit trees.

Unfortunately, however, a large proportion of this expenditure has resulted only in failure and disappointment. The severity of the winters of late, and other causes, have been so disastrous to fruit trees and fruit crops, in most parts of Ohio, that little progress has been made in this department of agriculture, and many cultivators have become in a measure disheartened.

The causes of these failures, and the best means of avoiding them in the future, have been the subjects of much discussion in the agricultural journals and the various horticultural and pomological societies; and although it is found that considerable difference of opinion exists on some theoretical points, the practical conclusions arrived at are generally the same.

The commencement of the series of disasters referred to, was the *severe drought* of the summer of 1855. An unusually large number of fruit trees had been planted that season, most of which perished before the end of summer; and the few that survived along with those of the previous year's planting, were generally attacked by *borers*, (which are most destructive in dry seasons,) and many of them ruined thereby. Next followed the extraordinary severe winter of 1855–6, which was the most disastrous to fruit trees of any winter that ever occurred in Ohio—killing nearly all the peach trees outright, and many of the apple, pear, cherry, grape, &c. At first it was supposed that no very general injury had been done to apple trees, as they did not show the extent of the mischief as soon as others. But before the end of summer many of the trees in most orchards gave unmistakable evidence of disease, the cause of which could only be attributed to the past winter. Again the following year, and up to the present time many apple-trees have continued to sicken and die, no doubt from the same cause, so that many persons have concluded that all the orchards that were of bearing age at the time of the hard winter, received such injury therefrom as will cause them prematurely to decay. The past winter, also, though mild in its general character, was very injurious to fruit-trees, in consequence of the severe and sudden changes of temperature—causing the destruction of many young peach and cherry trees, and much injury to the young wood of apple trees. This it is believed, is the cause of the falling of the young fruit, and the sickly color of the leaves in orchards throughout many parts of the State at the present time. (June 1858.)

Such disasters resulting from the vicissitudes of the seasons are more or less liable to occur in all countries, and cannot be fully guarded against by human forethought, although something might be done to lessen the amount of injury that would occur in most cases of the kind, if people would profit by the lessons derived from the past. Care should be taken to select the locations for orchards where the soil, elevation, exposure, &c., are such as are found to afford the greatest immunity from these injuries. The selection of varieties of fruit is also a matter of importance; for it is found that some varieties are much hardier and better able to withstand severe changes of temperature than others. Attention to these two points will also in a great measure afford protection against several other evils, as the *scab*, *fungus*, *bitter-rot*, *&c.*, of which more complaint than usual has been made by fruit growers the past two or three years.

These evils, (*scab*, *rot*, *&c.*,) prevail most in the southern and central parts of the State, especially on strong limestone soils, and in valleys or level districts. Many experiments have been tried to remedy these by special manure and particular modes of pruning or culture, but with no valuable results. It is found, however, that these maladies affect mainly varieties of apples which had their origin in northern States or countries, and there are enough others of good quality, natives of our own or more southern latitudes, which are nearly or quite exempt from these diseases. A knowledge of these facts might have saved to the people of central and southern Ohio, many thousands of dollars, paid for eastern and northern apple trees, of varieties unsuited to the soil and climate; and hundreds of bearing orchards now almost worthless, might have been highly valuable had they been composed of such varieties as are suited to their locations. A large proportion of the bearing fruit trees in Ohio, were obtained from the nurseries in western and central New York, and distributed through the country by agents or venders. The varieties are mostly such as are found of rapid growth, easy to raise, and of well known fair quality in the State where produced, thus having a good name in the books and catalogues, although nothing was known in regard to their adaptedness to the wants of distant purchasers. Whereas, it is found that of all the leading varieties of winter apples thus furnished from eastern nurseries, as *Baldwin*, *Spitzenberg*, *R. I. Greening*, *Roxbury Russet*, *Red Canada*, *Hubbardston's Nonsuch*, *&c.*, not one is a reliable or profitable fruit in most parts of central and southern Ohio; while on the other hand, of all the most approved and reliable kinds for this region, such as *Wine Sap*, *White Pippin*. *Rawle's Janette*, *Rome Beauty*, *Smith's Cider*, *Yellow Bellflower*, *&c.*, not one has commonly been found in the assortments of these itinerant tree dealers.

Many other varieties might be named, which are found of great excellence, and free from disease, in sections of country where eastern or northern kinds are quite worthless. It is therefore of the first importance that persons about to plant orchards should carefully inquire what varieties are best adapted to their particular soil and locality, and not suffer themselves to be misguided by the fruit books, catalogues, *pictures* or agents of nurserymen in distant States. It is unfortunate that at the present time there is no reliable work on fruits that can be recommended as affording to the people of Ohio the information they need on this subject, but it is hoped that this desideratum will be supplied during the coming year through the labors of Dr. J. A. Warder, of Cincinnati, who, it has been announced is engaged on a work of this kind, and whose qualifications for the task give assurance that the performance will do credit to himself and to the west.

The Ohio Pomological Society, (organized in 1847,) composed of nurserymen and fruit growers, has done valuable service in bringing to notice the varieties of fruits found most valuable in different sections of this and other States, also in correcting the erroneous names by which many of them were known in different parts of the country, and in diffusing information generally respecting fruits and fruit culture in Ohio. There remains much work of this kind for the Society to do, and all persons interested in the promotion of fruit culture in our State and the west, should lend it their co-operation.

A New Insect Enemy.—A species of *Canker Worm* has made its appearance, and committed sad ravages on the apple trees in a number of counties in the central and western parts of the State, during the past few years. It was first noticed about six or seven years ago, and has rapidly spread, so that the past season it was found in fifteen or twenty counties of this State, as appears from information given to this office, and from notices in the papers it is also found in parts of Indiana, Illinois and Iowa. This worm or caterpillar is about an inch in length, of grayish variable color, smaller than the common orchard caterpillar, and differs from it in being smoother, and having but ten feet instead of sixteen, also in its mode of traveling, which is by looping up the body, then straightening itself, progressing its length at a time—hence it is commonly called the *span-worm* or *measuring-worm.*

These worms make their appearance upon apple trees, (and sometimes the *elm*,) as early in spring as the young leaves will afford them food. They do not live in a web or nest like the common caterpillar while young, (hence they cannot be readily seen or destroyed,) but distribute themselves singly and uniformly over the branches, and soon devour the young leaves and tender shoots, leaving the trees bare and rusty as though scorched with fire. After feeding for about four weeks the worms let themselves down by a silken thread from the tree, and enter the ground where they change to the chrysalis state and finally appear as whitish moths, early the following spring, or during open weather in winter. The male moths have wings, *but the females none*, hence it is a *mystery* which is not yet explained, how these insects become so rapidly diffused over the country.

On sending some of these worms to Dr. ASA FITCH, of Albany, the Entomologist of the N. Y. State Ag. Society, he expressed the belief that they were probably identical with the *canker worm* of the Eastern States, or a closely allied species, but he could not determine fully without specimens of the perfect insect. It was the first intimation he had had of any species of canker worm being found in the western country, and he thought there was reason to apprehend it would prove very troublesome to fruit growers; though as many kinds of insect tribes "come and go" often very suddenly and without visible cause, we may hope that this pest will some day take its departure as suddenly as it made its appearance. No easy or practicable method of preventing the ravages of these worms has been discovered, excepting such as are directed to preventing the female moths from ascending the tree to deposit their eggs, by means of bands of tar, or similar articles placed around the trunks (on strips of cloth or strong paper,) but this requires much care and labor in order to be effectual, hence but few persons will practice it. Plenty of poultry kept in the orchard when the millers are coming from the ground, may lessen their numbers.

Other insects, as caterpillars, borers, apple worm, curculios, &c., are more or less prevalent and injurious to the fruit trees in Ohio, as in other States, but their ravages are not often very severe or extensive, except when they seem to be invited by the negligence of cultivators or a sickly condition of the trees arising from other causes.

Export of Apples.—Notwithstanding the injury done to orchards by the winter of 1855–'6 there was a fair crop of fruit the past season in most parts of the State, and as usual, large quantities, both green and dried, were exported to other States. No complete statistics of this trade have been obtained, but from a few returns made to this office the following items are extracted:

From Portage county the report says, "Fruit is the present season an article of export to an extent never before known. Green apples have brought from 90 cents to $1.10 per barrel, and many hundreds of barrels have been exported; but a still larger amount is exported in a dried state. One of our merchants has already purchased *twenty-five tons* of dried apples this fall, and it is thought the season is not more than half over. It is estimated that in the village of Ravenna, with about six stores, there will be purchased this season not less than *one hundred and twenty-five tons* of dried apples, at an average price of about 6 1-2 cents per pound."

From Lake county there was exported the present season about $25,000 worth of green and dried apples.

From Summit county, "Large quantities exported, both green and dry; 3,000 barrels of green apples shipped west."

Geauga, *Huron*, *Erie*, *Richland*, *Wayne*, and a number of other counties, say exported largely, both green and dry.

The railroads throughout the interior of the State have opened up a demand for green apples, which has given quite a stimulus to orchard planting in some counties where but little attention was formerly given to fruit culture.

The Peach Crop is at best an uncertain one in all parts of our country; but previous to the general destruction of trees by the winter of 1855–'6, it was commonly regarded as a remunerative one on the whole, and in some cases, afforded very large profits. In the most favorable localities, as on sandy lands along the lake shore, and on elevated free stone ridges in the south-east quarter of the State, the trees have generally escaped injury by the winters, and fair crops of fruit are obtained almost every season, bringing large profits to the owners. If our winters are likely to prove frequently destructive to peach trees in most parts of the State, it would be well for enterprising men to engage largely in the culture of this fruit in those places where the crop is the surest and where rail roads or steamboats afford ready means of transportation to market. Much of the soil of Ohio is too clayey and rich for the healthy growth of the peach tree; hence cultivators should select for this fruit the most sandy and elevated portions of their grounds, and in ordinary cases give the trees no manure, only stirring the soil during summer to prevent the roots from getting grass-bound, or suffering from drought.

Cherries, of the larger varieties (Heart and Bigarreau), do not succeed well in the central and southern parts of Ohio, or where the soil is strong and clayey. In such localities the growth of the trees is too luxuriant and the wood too tender to endure the cold of winter or the heat of summer. But on the more sandy soils in the northern and eastern parts of the State, the cherry, like the peach, thrives and produces well. Occasionally we find good crops of cherries on pretty stiff soils, where somewhat porous and gravelly, and especially if the trees have been *trained low*, or other means adopted to shield the trunks from the sun and winds. The *bursting of the bark* of the trunk is the most common form of injury sustained by cherry trees; and this is best prevented by securing a low dwarfish growth, or by fastening boards or forest bark around the trunks. The first of these objects is secured by nurserymen using the *Mahaleb*, or the *Morello*, for stocks.

The *Duke* and *Morello* cherries, being naturally of slower and dwarfish growth, endure the vicissitudes of climate much better, and may be grown successfully on most ordinary soils, although these also flourish best on sandy or gravelly lands. Some of the varieties of Morello cherries are highly productive and valuable for cooking, also profitable for market, and there is no good reason why our markets should not be well supplied with them, excepting that cultivators have not given attention to the subject.

Pear culture is only just beginning to receive attention in Ohio, but enough has been done in the way of experiment to show that our climate and soil generally are well adapted to this fruit; and it is a fortunate circumstance that our strong clayey soils, which are unsuited for the peach and cherry, are the best adapted for the pear—and those who have a supply of good pears can afford to go without peaches and cherries. With a judicious selection of varieties, and proper skill in ripening the winter sorts, a supply of this luscious fruit may be had for the table nine months in the year; and by cultivating a good proportion of dwarf trees one can begin to enjoy the fruits of his labor in a year or two after planting, instead of having to wait ten or more years as formerly. Much has yet to be learned, however, by the people of Ohio, in regard to the best varieties of pears for their soil and climate, as well as the best modes of culture. Some varieties that were formerly propagated and sold as dwarfs have been found unsuited to that mode of growing, never forming a perfect union with the stock, consequently being short-lived. This mistake (which is now avoided by intelligent nurserymen) has been the occasion of some prejudice against dwarf pear trees, leading some persons to conclude that such trees are generally short-lived, which is not true. Another complaint made against dwarf pear trees is, that they require rich soil and extra culture. This is true, in the main, and no one should plant such trees who intends to let them "take their chance" among grass and weeds, as is too commonly done with other trees. But while it is admitted that they require good culture to make them productive or profitable, it is also claimed that they *pay richly* for the extra care and labor bestowed upon them. It is not claimed, however, that dwarf trees will "in the long run" be found the most profitable for market purposes. Further experiments are wanting to settle this and many other questions relating to pear culture.

Grapes deserve more extended notice than the limits of this article will allow. Besides the extensive culture of this fruit in southern Ohio, for wine, there is reason for the belief that choice table grapes will in time be produced so abundantly in other parts of the State as to become an extensive article of export, as well as a common article of diet. Already it is stated that 7,000 pounds of table grapes and 3,600 gallons of wine are annually exported from Kelly's Island (near Sandusky), and from the vicinity of Cleveland very large quantities of Isabella grapes have annually been exported for several years past. These and other experiments are suggestive of what may be expected in "the good time coming," when such varieties as the *Delaware* and *Rebecca* grapes shall become generally diffused, and "knowledge shall be increased" so that people generally will understand all about the selection of soils and the best modes of culture, &c. There is very much to be learned and done before this desirable time can arrive, and all who can in any way contribute towards hastening its approach, should "learn to labor and to wait."

Currants and *Gooseberries* are called *small fruits* in the catalogues, but those who have had experience in their use as summer fruits for the family, will testify that they deserve a larger place than is usually assigned them in the farmer's garden. Currants are among the most wholesome and refreshing fruits, and can be used in the greatest varieties of ways. It is also the easiest grown, and the surest of all fruit crops, so that no one who has any ground need be without it. It is also a profitable fruit to raise for the market, and its use is increasing in our towns and cities. The *Gooseberry* (the Houghton or American variety) equals the currant for ease of culture and abundant produce, and although less generally known, is much esteemed for cooking and preserving. It is also becoming a popular market fruit, and must be considered as among the best of the "fruits for the million."

The following is a list of the answers received to the question, "which are the six best varieties of winter apples?"

Ashland—Rambo, Vandeviers, "Kizer," Bellflower, Butter, and Spitzenberg.

Belmont—Roxbury Russet, Rambo, Pearmain, Baldwin, Bellflower, R. I. Greening.

Carroll—Roxbury Russet, R. I. Greening, Gate Apple, Spitzenberg, Pennocks, Rambo.

Champaign—Baldwin, R. I. Greening, Roxbury Russet.

Clark—Princes' Early Harvest, Rambo, Yellow Bellflower, Golden-Russet, Pippin, Winesap, Canada Red, Baldwin.

Clermont—Pryor Red, Romanite, Pennock, Bellflower, Roxbury Russet, Winesap.

Columbiana—Switch Willow, Roxbury Russet, Rambo, Lopside, Waldower, Gilliflower.

Coshocton—R. I. Greening, Putnam Russet, Newtown Pippin, Spitzenberg, Baldwin, Seek-no-further.

Crawford—Pippin, R. I. Greening, Spitzenberg, Rambo, Bellflower, Northern Spy, Golden Russet.

Cuyahoga—Belmont, R. I. Greening, Spitzenberg, Canada Red, Baldwin, Baltimore Pippin.

Darke—Bellflower, Newtown Pippin, Rambo, Pennock, Golden Russet, R. I. Greening.

Defiance—R. I. Greening, Yellow Bellflower, Roxbury Russet, Baldwin, Rock Rimmon.

Kelly's Island—Belmont, Peck's Pleasant, Rambo, Spitzenberg.

Erie—Spitzenberg, Baldwin, Belmont, Streak, R. I. Greening, Seek-no-further.

Gallia—Rome Beauty, Roxbury Russet, Pryor's Red, Spitzenberg, Northern Spy, Willow Twig.

Hancock—Bellflower, Roxbury Russet, Hoop, Spitzenberg, R. I. Greening, Baldwin, Pippins.

Highland—Golden Russet, Bellflower, Rambo, Ox-eye, Rawle's Janette, Winesap.

Hocking—Rambo, Russet, Rock Rimmon, Seek-no-further, Pippin, Greening.

Huron—R. I. Greening, Baldwin, Rambo, Spitzenberg, Pippin, Russet.

Jackson—Romanite, Rambo, R. I. Greening, Golden Russet, Pearmain, Yellow Bellflower, Newtown Pippin.

Jefferson—Gate, Wells, Newtown Pippin, Spitzenberg, Roxbury Russet, Switch Willow.

Knox—Rambo, Tulpehocken, Golden Russet, Limber Limb Pippin, R. I. Greening, Newtown Pippin.

Lake—Peck's Pleasant, R. I. Greening, Roxbury Russet, Belmont, Spitzenberg, Bellflower.

Licking—R. I. Greening, Seek-no-further, Yellow Bellflower, Gate, Rambo, Northern Spy.

Logan—Rambo, Winesap, Baldwin, Spitzenberg, R. I. Greening, Bellflower.

Lorain—Belmont, Baldwin, Canada Red, Peck's Pleasant, R. I. Greening, Spitzenberg.

Lucas—Baldwin, Bellflower, Newtown Pippin, R. I. Greening, Spitzenberg.

Medina—R. I. Greening, Seek-no-further, Nonesuch, Spitzenburg, Roxbury Russet, Pearmain.

Meigs—Russet, Rambo, Rome Beauty, Romanite, Lady Washington, Yellow Bellflower.

Miami—Yellow Bellflower, Newtown Pippin, Janette, Chandler, Baldwin, Fallawalder.

Monroe—Roxbury Russet, Winter Queen, Greening, Bellflower, Spitzenberg.

Montgomery—Smith's Cider, Romanite (*Gilpin of Downing,*) White Pippin, Winesap, Yellow Bellflower, Vandevere Pippin.

Muskingum—Pearmain, Early Sweet, Roxbury Russet, Ladies' Sweet, Newtown Pippin, Spitzenberg.

Portage—Yellow Bellflower, Swaar, Belmont, Spitzenberg Rambo, Roxbury Russet.

Sandusky—R. I. Greening, Spitzenberg, Roxbury Russet, Baldwin, Newton Pippin, Vandervere.

Stark—Rambo, Fallawalder, Rome Beauty, Golden Pippin, Canada Red, Baldwin.

Summit—Greening, Baldwin, Spitzenberg, Russet, Canada Red, Northern Spy, Rambo.

Trumbull—Spitzenberg, Roxbury Russet, R. I. Greening, Baldwin, Golden Gate, Rambo.

Tuscarawas—Newtown Pippin, Rambo, Northern Spy, Baldwin, Swaar, American Golden Russet.

Union—R. I. Greening, Spitzenberg, Roxbury Russet, Winesap, Bellflower, Rambo.

Van Wert—R. I. Greening, Swaar, Russet, Pippins, Tulpehocken, Rambo.

Washington—Rome Beauty, Russet, Romanite, Rawles Janette, Baldwin, Spitzenberg, R. I. Greening.

Wayne—Rambo, Canada Red, Baldwin, Spitzenberg, Greening.

Williams—R. I. Greening, Roxbury Russet, Bellflower, Rambo, Seek-no-further, Lady Blush.

Wood—Rambo, Bellflower, Smoke House, Vandervere, Roxbury Russet, R. I. Greening.

(Only about half of the counties in the State are reported in this list, and the omissions are mostly in the Southwest.)

GRASS AND HAY.

The grasses most generally cultivated for hay are, as will be seen by the annexed table, Timothy (*Phleum pratense,*) and Red-Top (*Agrostis vulgaris.*) The Red Clover is also grown to a considerable extent for not only hay but pasturage and seed. The Blue Grass (*Poa pratensis,*) or June grass as it is called in many places, is indigenous to Ohio, more especially in limestone districts, and although it is employed as a pasture grass, it is seldom cultivated. Orchard grass (*Dacty lis glomerata,*) is being successfully introduced in many portions of the State. The Fescue grasses have not been introduced to any considerable extent. Several years since "*Alfalfa*" was distributed throughout this State by the Patent Office, but it failed to be esteemed by Ohio farmers. Sainfoin was also distributed by the same institution; it is held in good repute by those who cultivated it in Europe, but American farmers do not readily abandon the plants grown by their fathers and grand-fathers. Many years must therefore elapse and some grass be introduced possessing extraordinary nutritive as well as some other desirable qualities, before the culture of Timothy and Red Top will be abandoned; except indeed, the farmers should conclude that grain and straw are a good substitute for Hay, as is indicated in the communication below by Mr. Carpenter.

The amount of land devoted to Meadow is evidently increasing, and in stock growing districts will be increasing in proportion as the demand for stock increases. Throughout certain districts however, where cereals forms the great staple, all arable lands will be devoted to the growth of them. (*See page* 18 *for statistical tables.*)

But notwithstanding the unavoidable conclusion that the best interests dictate that great attention should be given to the meadows, and the habits and characters of the grasses carefully studied, so as to produce pasturage at the earliest possible period in the spring, as well as the latest time in the autumn, and not procure less than the ordinary amount of Hay from the meadows; yet it is in isolated cases only, that any attention is paid to the adaptation of plants to the soil.

It is essentially necessary to the prosperity of the agricultural interest, that some system be devised by which artificial meadows may be produced—that is, that meadows may be made of plow land. There are many insect enemies to the grasses, as well as fungi or parasitic funguss, which attach themselves to the grass and render it if not absolutely deleterious, at least unfit for cattle to eat as hay. If an artificial meadow could be produced which would equal the natural one in productiveness, then when it is found that the army worm has invaded the meadow, or that the natural grasses are ergotted, the natural meadow might for a series of years be cultivated in some of the cereals, whilst the artificial one would produce the requisite forage.

The following observations may be of importance to those who may feel disposed to experiment in this direction.

I. An uncultivated plant growing on a thin soil will become larger and softer when grown on a better soil—or the same result can be produced by the proper application of manure.

II. The greater the number of varieties of grasses grown in a meadow the greater will be the aggregate production of pasturage or hay.

III. To obtain the greatest aggregate product of pasturage or hay on a dry soil, some other kind of forage plants should be mixed with the grasses.

IV. The mixtures, or varieties of grass which are indigenous on a natural meadow should be regarded as the kinds approved by nature for that location, and should serve as a guide to conduct the experiment on similar soils.

V. Natural grasses of alliedspecies, generally, and often times families have very similar habits; by a knowledge of botanical classification worthless plants may be superceded by valuable ones, of the same genius and perhaps species.

Experience alone can determine the length of time that a plant will thrive in any soil, as well as what other plants are most congenial, and which most deleterious to it. There are several kinds which have the peculiar qualities of being able to accommodate themselves to the most diverse situations, as the lolium perenne, whilst others like the Kentucky Blue Grass, (Poa Pratensis,) in a few years exterminate all other kinds and obtain complete "possession of the field."

VII. An inordinate proportion of widely spreading grasses is deleterious to the development of the blady ones, which of course reduces the aggregate production.

VIII. Grasses thrive for a long period of time on the same spot. Many instances can be adduced of the same enclosure, serving profitably for either pasture or meadow during a lapse of fifty years; in some instances during an entire century.

IX. Every soil which is so formed as to retain moisture at a depth which can be reached by the roots of grasses, may be made a good pasturage, and with proper management, a good meadow.

X. Top dressing is in no case more strongly to be recommended than in the cultivation of pasture or meadow grasses—there is no place where it pays better.

Each species is peculiarly adapted to a certain kind of soil. It would grow perhaps on a different soil, but would not be so well developed on any as that on which it is indigenous. The following classification of plants with regard to the soil on which they grow the most luxuriantly is based upon the observation of many eminent botanists, as well as confirmed by the experience of many practical agriculturists:

CLAY SOIL—OR A SOIL IN WHICH CLAY PREDOMINATES.

Botanical Name.	Common Name.
Lolium perenne.	Perennial rye grass.
Alopecuris pratensis.	Meadow Foxtail.
Phleum pratense.	Timothy or Herds grass.
Milium effusum.	Spreading millet grass.
Holcus lunatus.	Soft grass.
Avena elatior.	Soft oat grass.
Melica nutans.	Wood melic grass.
Festuca elatior.	Tall Fescue.
" pratensis.	Meadow "
Dactylis glomerata.	Orchard grass.
Bromus arvensis.	Taper field Brome grass.
Poa compressa.	Virginia blue, or wire grass.
Cynosurus cristatus.	Crested dog's tail grass.

HUMUS, OR VEGETABLE MOULD SOIL.

Triticum repens.	Couch or quick grass.
Poa annua.	Annual meadow grass.
Agrostis vulgaris.	Red top.

MARLY SOIL.

Avena pratensis.	Narrow leaved oat grass.
" pubescens.	Downy oat grass.
" flavescens.	Yellow oat grass.
Bromus inermis.	Hairy wood Brome grass.

TURFY SOIL.

Melica cœrula.	Purple melic grass.
Holcus lunatus.	Soft grass.
Aira cœspitosa.	Turfy hair grass.
Glyceria fluitans.	Floating manna grass.

LIME.

Brachypodium pinnatus.	Spiked Fescue grass.
Poa pratensis.	June grass, or Kentucky Blue Grass.

SANDY SOIL.

Elymus arenarius.	Sand rye grass.
Arundo arenaria.	Sea sand reed grass.
Aira canescens.	Gray hair grass.
" caryophylla.	Silver hair grass.
" flexusa.	Common hair grass.

Botanical Name.	Common Name.
Panicum glabrum.	Panic grass.
" sanguinales.	Finger grass.
" crus galli.	Barn yard grass.
" viride.	Wild timothy.
" glaucum.	Foxtail.
Festuca ovina.	Sheep's Fescue.
" decumbens.	Heath grass.
Kœleria cristata.	
Poa bulbosa.	Bulbous meadow grass.
Anthoxanthum odoratum.	Sweet scented vernal grass.
Phleum arenarium.	Sea cats tail grass.
Phleum Bœhmeri.	Purple stalked cat's tail grass.
Stipa pennata.	Common feather grass.
Trifolium arvense.	Hares' foot trefoil.
" repens.	White clover.

The time is not far distant when many inclosures now used as natural meadow must be occupied by some other crop, on account of the great amount of ergot which for several years has been infesting them.

Ergot is a solid, brittle, yet somewhat flexible grain, from a third of an inch to an inch and a half long, from half a line to three lines in thickness, cylindrical or obscurely triangular, tapering towards each end, obtuse at the extremities, usually curved like the spur of a cock, marked with one or two longitudinal furrows, often irregularly cracked or fissured, of a violet brown color, and often somewhat glaucous externally, yellowish white, or violet white within, of an unpleasant smell when in mass, resembling that of putrid fish, and of a taste which is at first scarcely perceptible, but ultimately disagreeable and slightly acrid. Under the microscope, the surface appears to be more or less covered with sporidia, which occasion its glaucous aspect; and the interior structure is found to be composed of minute roundish cells, containing according to Queckett, particles of oil.

HISTORY AND PROPERTIES OF ERGOT.

The fungoid plant said to exist in Ergot has been termed, by different authors, Sclerotium, Spermœdia, Clavus, and Sphacelia segetum. Others class it as one of the Gasteromycetes, a sub-order or cohort belonging to the natural order fungi; but it is not a mere malformation of the real grain of rye, as was formerly believed. It belongs to the tribe *Mucedines* and sub-order *Concomycetes* of the order *Fungaceæ* of Fries.

A good microscope will show the amylum or starch which in other instances is contained in the cellular structures to have been changed into exceedingly small grains; amylum, therefore, in ergot is entirely absent.

Ergot is produced not only in rye, but in a great many other grasses, viz: in millet, Bromus secalinus, Triticum repens, Lolium perenne, Elymus arenarius, Poa pratensis, or June Grass, and other meadow grasses, as well as in barley, rice, Indian corn, etc. Hence it is extensively disseminated.

Amylum and gluten—these elements so rich in nitrogen—have disappeared in the Ergot, and instead of them, according to analyses made by *Wiggers*, are found fatty elements, viz: fungin, vegetable osmazome and ergotin. This latter is considered by *Wiggers* as being the poisonous one, and the osmazome as that element which in medicines excites the action of the uterine organs.

A recent analysis of Ergot by M. Legrip, shows it to be composed of

Fixed oil	34.50
Starch	2.75
Albumen	1 00
Inulin	2 25
Gum	2.50
Uncrystalizible sugar	1.25
Brown resin	2.75
Fungin	3.50
Vegeto animal matter	13 50
Osmazone	0.75
Fatty acid	0 50
Lignin	24 50
Coloring principle	0 50
Oderous principle not isolated.	
Fungate of potassa	2.25
Chloride of sodium	0.50
Sulph. of lime and magnesia	0.50
Subphosphate of lime	1.25
Oxide of iron	0.25
Silica	0 15
Water	2.50
Loss	2.35
	100.00

The cellular texture originally forming the embryo of the rye, consists of an inner bed of a white color and hard consistency, surrounded by a white and juicy mass. The fungoid plant—the cause of the ergot—takes root at first below the developing embryo as a tender and fibrous gasteromycus, or skin-fungus; by degrees it embraces the outer and white bed of the same, and finally unites with the latter. By means of this union the ergot is formed.

Others deny the existence of any fungus or fungoid plant whatever. Our eminent naturalist, (Karl Mueller,) says:

"Ergot, according to my observations, is decidedly the transformed embryo or the rye grain. It is caused when the embryo remains unimpregnated at the time of the rye's blooming. The embryo will consequently be regularly developed, like the impregnated ones of the ear, but afterwards it will remain behind them and swell and receive those poisonous qualities which it is known to contain."

Its cause is not finally agreed upon by naturalists or botanists, although the general received opinion is that advanced by M. Leveille of Paris, in 1826. According to this writer, "at the earliest stage of the flower, a soft viscid tubercle may be seen surmounting the germ, the character of which it changes, without preventing its growth. The germ becomes of a dark color, and increasing in size pushes the tubercle before it, which also expands and exudes a viscid matter, which spreads over the germ, and drying upon its surface, gives it a thin yellowish coating." This tubercle was considered a fungus by M. Leveille, and named *Sphacelia Segetum*. Mr. Queckett of London, to whom the scientific world is indebted for many discoveries in vegetable physiology, has devoted considerable atten tion to ergot. His investigations confirm the general view of the nature of ergot as announced by M. Leveille, but do not agree with the Parisian's view as to the character of the parasitic plant. Queckett says, "the beginning of the growth of the ergot is marked by the appearance, about the young grain and its appendages, of multitudes of minute filaments like cobwebs, which run over all its parts, cementing anthers and stigma together, and of a white coating upon the surface of the grain, from which, upon immersion in water, innumerable minute particles separate and after a time sink in the fluid. These particles, when examined by the microscope, prove to be the reproductive agents, germs, or *sporidia* of a species of fungus, which vegetate with the utmost facility on any extraneous body, under proper conditions of warmth and moisture, and exhibit under such circumstances, all the characters of the genus *Oidium*. Their average length is about the four thousandth part of an inch."

Poor and wet soils, and rainy seasons, and intense heat succeeding rains, have been supposed to be favorable to the development of the ergot; but more recent observations indicate that these conditions exercise very little or no influence whatever on its production. In a letter to Prof. Wood, Mr. J. P. Wetherell states that in two seasons he had found rye sown very late, so as scarcely to come up before spring, to be almost universally ergotted; while neighboring rye sown at the proper season, in the same kind of soil, precisely, had nothing of the disease, though the seed was the same in both cases.

As soon as ergot has ripened it falls upon the soil. But its history by no means terminates with this fall, and the subsequent changes are of the greatest interest. These being observable by the naked eye, may readily be made by every person soon after the ergot reaches the soil, especially in a damp and warm situation; a vast number of small and spongy bodies are developed from it. Fig. 35, B. B. C. C. D. E. They burst from the body of the ergot apparently, and elevate themselves upon their round and white little stems. Fig. 35, B. C. D. & E. These are fungoid plants, whose mucilaginous heads are soon covered with little grains round, in the center of these heads a cavity is formed containing their organs of generation, (F.) These latter consist of a mucilaginous substance in which a vast number of extremely small bodies are found, condensing by degrees and finally producing a number of slender bodies which unite with the body nearest to them.

A. Fig. 35 is an ergot from which are developed the fungoid plants. F. their organs of attachment.

The long continued and copious use of ergot is highly dangerous, even when no immediate effects are perceptible. Terrible and devastating epidemics in different parts of the continent of Europe, particularly in certain provinces of France, have long been ascribed to the use of bread made from rye contaminated with this degenerate grain.

Medical writers state that dry gangrene, typhus fever, and disorder of the nervous system, attended with convulsions, are the forms of disease which most frequently follow the use of this most unwholesome food. Interested parties have persistently denied that the epidemics were caused by the ergot, but accurate investigations upon the spot where they prevailed, conducted by competent gentlemen, together with experiments upon inferior animals, leave no room to doubt.

The grass in Ohio most seriously affected with ergot is the *Poa pratensis*, known on the Western Reserve as June grass, and in central aud southern Ohio as Kentucky Blue Grass. The ergot has been chiefly confined to the Reserve; in several cases in Portage county ergot was found in red top *agrostis vulgaris*, but I have found it in hay brought to the Columbus market, as well as in hay exposed for sale on farm wagons in the Cincinnati market. Fig. 36 is a well engraved head of ergotted *Poa pratensis*.

DESCRIPTION OF FIG. 36.

Fig. 1 is a spikelet in the normal condition, being in no way affected by disease. Figs. 2 exhibit the ergot as it appears to the naked eye, as a blackish, spur-like excrescence issuing from the point of the spikelet. Fig. 3 is a magnified view of the same. The back and base of the glumes are covered slightly with a fine cottony substance—this is also a parasitic fungus; but whether of the same species as that which by its germination within the ovule of the grass produces the peculiar form of ergot is unknown. We are not aware that this downy substance has been previously noticed. Fig. 5 is a glume or chaffy scale, separated from the spikelet, and exhibiting this fungus as it appears under the microscope. Fig. 4 is a grain of ergot, separated from its envelop and magnified. The surface is of a dark brown, nearly black color, and is rugged and uneven. Upon cutting it apart, the interior appears of a white color, surrounded with the thick, blackish external skin. This skin is the two outer layers of cells in the natural seed changed and much indurated.

Ergotted grass and hay has long since been considered very deleterious to cattle, as the following correspondence from the memoirs of the Philadelphia Agricultural Society very clearly indicates:

On the Hoof disease from eating hay affected with Ergot. By JAS. MEASE, M.D.

In the year 1803, the late Joseph Cooper, of New Jersey, informed me that he had observed the hay made of the natural green grass, or spear grass (*Poa viridis.*) growing on his fine meadows, on Petty's Island, made by banking out the Delaware, to be occasionally affected with a black spear, about one fourth or half an inch in length, somewhat resembling the ergot in rye, and that cattle eating such hay became affected with a disease in their hoofs, causing them sometimes to drop off. He ascribed the morbid production in the grass to neglect in supplying it with water from the river by means of sluices, during a dry season. Upon my mentioning the facts soon after to the late Wm. Rush, of Philadelphia, an extensive grasier, he confirmed them from his own observations at Blooming Grove, near Gray's Court, in the State of New York, in the winter succeeding the very dry summer of the year 1793. The hay was the produce of a bog meadow: it is presumed therefore, that it was made from the same natural grass that grew in the meadows of Joseph Cooper.

Some years after, Mr. W. S. Woodman, of Tredyffrin township, Chester county, Pennsylvania, communicated to me an account, in the following letter, of a similar disease, and from a like cause, among his father's cattle:

SIR:—Having observed the remark, in the portfolio for May, 1815, in the review of the third volume of the Memoirs of the Philadelphia Agricultural Society, that, "as yet, in America, we have never heard of any human person falling a victim to the ergot, nor indeed is it satisfactorily ascertained that it has ever been injurious to our animals," I think proper to communicate to you an account of a disease which, in 1802 or 1803, prevailed in this neighborhood amongst milk cows particularly; but which also affected other cattle and horses. You will perceive that it was analagous to the one supposed to be occasioned by ergot.

For my part I am entirely ignorant of the cause, but still I am unwilling to ascribe it to ergot, (with which rye in this neighborhood is more affected every year,) for this reason, that milk cows, which are never fed with rye by our farmers or butter-makers, exhibited more violent symptoms than oxen or horses.

The farmers attributed the disease to a peculiar mildew, which sometimes affects the grass on the bottom meadows of a small stream, the basin of which is very extensive, and very luxuriant, and entirely appropriated to meadow land, and suffered to lie under natural grass. No timothy or other grass seeds have ever been sown on it, to my knowledge.

The cattle affected did not appear to lose their appetite, and while they ate heartily of hay or other food, became daily more and more lean, manifesting great uneasiness, occasioned most probably by violent itching. Their hair in many places fell off, or was rubbed off by the animal, in striving to scratch itself. After these symptoms had continued for some time, one or both hind feet became sore, and the hoofs loose, at which period some of the animals began to grow better. Others lost their hoofs and part of their legs. Three of my father's cows lost both their hind feet, and some others in the neighborhood were equally as bad. The legs began by drying and growing much smaller from the hoofs to half way between the fetlock and hock; at which point it appeared as if a string of twine were tied very tight round the leg. Above this part the flesh was to all appearance in perfect health; the lower part was hard, black, and offensive.

When the lower part became quite dry, and little else than bone, it separated and fell off, after which the animals lived and ate heartily, hobbling along on the remaining stumps. They even began to grow fat. Their health seemed perfect. They would no doubt have lived long in this state, and were killed only from motives of compassion.

One cow belonging to my father, which had lost only one of her hind feet, and that at the first joint above the foot, bore a very strong vigorous calf, which lived and did well. The cow also afforded as much milk after as before her misfortune, and was pastured on the same grass to which her disease was attributed when in the state of hay.

I think the disease was never known but one season. The first symptom of it was observable in February, and it reached its crisis about the middle of May. Should this communication lead to any further observations on the nature and cause of the disease, I shall be much pleased, and they may be of great service to the agriculturist. Should the disease ever make its appearance, I shall be more particular in my observations.

I remain, very respectfully,

WM. T. WOODMAN.

P. S. It should be observed, that though we have every year more or less of the ergot, the quantity of it is never considerable. I think there is seldom more than one pint to a hundred bushels of rye. Different remedies were tried, but none of them afforded any relief.

Being desirous to ascertain whether the disease of the grass to which Mr. W. referred, had grown in meadows that had been deprived of their usual supply of water, I addressed a letter to him in reference to this point, and received the following answer:

TREDYFFRIN, *June* 10, 1815.

SIR: Your favor of the 30th ult. came to hand the 4th inst. Since the receipt of it, I have made numerous inquiries, for the purpose of obtaining additional information respecting the disease (of which I communicated an account), and on the season preceding its prevalence, &c.; but I regret to inform you that farmers, in general, are so deficient in observation, and so entirely out of the practice of recording facts, that I have not been able satisfactorily to ascertain whether the season in which the "injurious hay was made," was a dry one or not.

However, my father informs me that as nearly as he can recollect, about that period the ditch which conveyed water to his meadow became so filled with accumulations of mud and other matter, as to render the supply very imperfect. As a deficiency of watering appears to be the cause of the unwholesome qualities of the hay, it is highly probable the injurious hay was made during the season that water was wanting. But shortly after this time, the death of my grandfather in a great measure excluded my father from the benefit of the water. The original plantation being divided into two farms, and that of my father lying further down the stream, the water of the artificial course is exhausted before it reaches his land. It should, however, be remarked, that since that period he mows his grass while it is very young, and before the seeds are touched by the "smutty affection." Indeed, the farmers generally, in this neighborhood, since their cattle were affected with the disease, are careful to mow much earlier than they did formerly.

I am strongly induced to believe that Mr. Cooper ascribes the disease to the proper cause; for I have been correctly informed that a load of the injurious hay was sold to —— Rodgers, who at that time kept the Buck Tavern, in Second street, whose cow, in consequence of feeding on it, was affected with a disease of a similar nature.

Yours truly, &c., W. T. WOODMAN.

The disease prevailed to a great extent in Orange county, New York, in the year 1820, and is very well and minutely described by Dr. Arnell, corresponding secretary of the agricultural society of that county. The facts detailed by him leave no doubt of the death of numerous cattle in his vicinity, being caused by their eating hay made from some grass that was affected with the species of ergot, observed in the produce of the meadows before mentioned, for he especially mentions that the spear grass grew in the meadows, in the towns of Wallkill and Blooming Grove, where the disease prevailed, and in a bog-meadow soil. Dr. A. remarks that "the hay was cut in June, or beginning of July, immediately before harvest; that only cattle in good condition suffered from eating the diseased hay, the poor and meagre escaping."

The means of prevention, pointed out by Dr. Arnell, are similar to that judiciously recommended by Mr. Woodman, viz: to cut the grass early, before the ergot forms; or, if it be found in the grass, to defer cutting it until late, when experience proves that it may be safely used; for Dr. A. remarks that "the ergot then becomes dry, and shrivelled, without any of the flour, or vegeto-animal matter, which it usually contains." But the hay made from such late made grass must be of little value, because Dr. A. says truly, that "this spear grass is so early that if left to stand until the usual time of mowing meadows, it loses all its succulent and nutritious properties." This agrees with subsequent experience, with respect to the spear grass in Pennsylvania, where it ripens next in order to the early anthoxanthum odoratum, or sweet scented meadow grass. Still, however, it may be useful, by answering one purpose of food in all animals: to stimulate by distension, and to add to the stock of barnyard manure. The various remedies, tried to cure the disease in New York, are enumerated by Dr. Arnell. Those that succeeded were—

1. Poultices of soap, rye meal, and salt, to the legs and feet.
2. A wash of beef brine, composed of saltpetre and common salt,

applied several times a day, and after washing and rubbing the feet with the bitter-sweet ointment.

Of the animals thus treated, one only lost its hoofs.

In the treatment of the disease, the first object to be attended to is to remove the cause producing it. This is to be effected by drenches of castor oil, or sweet oil and molasses and water warmed, to which may be added, if found necessary, after the failure to operate of the first dose, half a pound of glauber salts, dissolved in warm water; and a handfull of common salt to every bucketfull of it, should be freely given. The use of hay free from ergot is as obviously indispensable. A handfull of salt should be given every day to promote digestion, and give tone to the system. The local applications must be of a stimulating nature, to rouse the activity of the circulation and of the absorbents, and to enable the part laboring under a deficiency of vital energy, to resume its healthy functions, or to throw off the disease. Fish or beef brine will answer as well as any, but they should be well rubbed on the feet and legs, for friction greatly tends to assist in restoring the health of the parts. To prevent the appearance of the ergot in the grass, care should be taken, when practicable, to supply the meadows with water in dry seasons.

A disease very similar to that described in the foregoing correspondence made its appearance in Portage, Summit and Ashtabula counties in 1857. The following extracts from a series of articles published in the Ohio Farmer and Ohio Cultivator embrace perhaps all that is known of the diagnosis, prognosis and remedy of the disease:

Symptoms, Cure and Observations. By W. PEIRCE, *Veterinary Surgeon.*

The toe of the foot appears to be the first part affected, and the end of the tail is affected in proportion to the progress of the disease. It becomes black and dead, and it varies from one to ten inches in length. The horns were evidently too warm, as well as a high animal heat over the entire surface. The pulsation was about sixty per minute. The membranes high colored. On examining the blood, it was found to be in a highly fevered condition. Those that were worst were extremely gaunt, and the respiration hurried and somewhat laborious. The appearance of the eye was good, appetite good, general appearance healthy, and muscle full.

We discovered in cutting off the toe of those that were not lame or swollen, that there was a vacuum between the coffin bone and the hoof, and no blood appeared. The appearance was that the vacuum was filled with a gas, as a kind of smoke burst out on cutting into the cavity. The affection appears to work back along the sole of the foot, and cracks at the heel. The first that were affected were supposed to have frozen their feet about four weeks ago; all those are now past recovery, their hind feet are already dead and dry above the pastern joint, and the tail perfectly dry and hard for ten inches, though still able to rise and walk a half a mile. The disease is confined to the hind parts in all those cattle.

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We have examined most of the cases in Portage county, and find without exception the ergot or spur, where we find the disease. Mr. Sanford of Edinburgh, had eleven head of cows all diseased, which was the only case in that town. Mr. Bassett of Randolph, had four cows all diseased, the only case in that town. On investigation, we found Mr. Sandford had purchased half of Mr. Basset's hay, and had hauled it home a distance of eight miles. All the cattle that eat of that mow of hay are either dead or badly diseased. Out of the fifteen head that eat this hay, seven were dead at last accounts. The ergot or spur was abundant in said hay.

We made a post mortem examination at Freedom, assisted by P. C. Bennett, M.D. The subject was a one year old heifer; she was killed for the purpose. A quantity of both arterial and venous blood was taken separately in vessels. On standing, no separation of either took place, and it was difficult to distinguish the two apart by the complexion. On opening, the whole internal appearance was small and pale. The spleen or milt was very pale, thin and hard. The liver was very pale, soft and flabby; it had lost all its concave and convex forms. The gall-bladder contained not more than one fluid drachm of bile. The heart was pale and soft. The pericardium contained about one-half pint of fluid. The hind feet appeared sound, or no cracks of either hoof or skin; on cutting through the bottom, we found gangrenous affection extensive, and a partial separation of the bones of the foot at the joints, but no mortification discoverable.

We have purchased five head of those diseased cattle, for the purpose of experiment. We are already convinced that the acute stages are fever, inflammation and congestion of the blood, by which the fibrine and globule are destroyed. It then assumes the form of debility, the gangrene and mortification are killed out, and the animal dies for want of blood.

* * * * * * * * *

Three head of the above mentioned five were considered hopeless, one old cow was much enfeebled, scarcely able to rise, and most of the time refused to set one hind foot to the ground. Two two year old steers much shrunken in muscle and bowels, and very lame. Two one year old steers not quite so bad. I commenced treating them all with diuretics and alteratives, medicines internally, and applying antiseptics to the lame feet. I used different articles of the same properties on different animals with the same results. The cattle all soon exhibited a favorable change of symptoms, which continued until they were turned to grass, since that time they have done as well as any other cattle in the same herd. Nearly all lost one, and some both shells of the hoof off one foot, but not until a new one had nearly grown out. They all appeared to feel well and playful as any cattle after treating them ten days, lameness excepted.

It has been stated in the prints that the ergot is the cause of cows casting untimely calves. This is not my experience; on the contrary, all the calves of such diseased cows appear healthy although not strong, and have taken the milk up to the time of the death of the mother, without inconvenience. Many new ideas have suggested themselves to me while treating the above cases; one I will here suggest for future observation: Does the ergot so affect the urinary organs, that the urine, coming in contact with the hind feet, causes gangrene and sloughing of the same? It has been observed that those cattle that run out to stacks, and not stabled, were less liable to lameness, although their systems suffered equally. Those that run out appear to be more affected in the nervous systems, stiffness of the joints, etc.

Mr. "U. B.," of Trumbull county, writing to the Ohio Cultivator, says:

At the time I was troubled with the disease, I had no knowledge of any remedy for the system, and only treated the feet, by cutting away the part affected, and washing daily with a strong solution of corrosive sublimate, until it produced some sensation, and then sweet or fish oil, until there seemed to be a new and healthy formation of the hoof, the old ones in most cases coming off. In some instances the first symptoms noticed by me was frozen feet, which I then and now consider the result, and not the cause of the disease, as the cattle were kept in comfortable stables. The symptoms following were much as described by Mr. P. But I have come to a different conclusion with regard to the causing the untimely dropping of calves. I think the effects are different upon various animals. Though I never had a cow diseased in the feet which lost her calf, yet in all cases of such untimely productions, where I have observed closely, there has been an unhealthy discharge by the mother and an unhealthy calf, they being sometimes many hours, and sometimes two days, showing great distress by turns, and the balance of the time much debility.

The suggestion of Mr. P. that the urine coming in contact with the feet, may cause that part to be affected, is worthy of consideration. I think the urine the most natural channel to work off the effect of the ergot, and if so, highly impregnated with the poison; and when the system becomes so debilitated that it cannot longer throw off the effects of the poison, then the crisis comes, which I think results in an internal abscess or diseased extremities, and it would be the most likely to locate where the parts were the most exposed. Debility would prevent a healthy circulation to the extremities, and the diseased drainings would doubly expose the hind feet. After the disease reaches this stage, if the weather is cold the feet are liable to be frozen, but healthy cattle are not liable to freeze their feet, even though much exposed. Last season we had more ergot than usual upon our meadows. We used wood ashes, saltpetre, sulphur and salt, freely, while using that kind of hay, and had no cases of the disease this season, among 65 head of cattle, mostly cows, but lost four calves.

The cattle cured by me were about 3 months in getting well.

QUERY.—Do the above named remedies, neutralize the effects of the ergot, or do they serve to correct the system, or both?

I never had a creature out of health that had eaten ten bushels or more of roots through the winter, and they look 20 per cent. better the next season. We use mostly carrots and parsnips.

To this Mr. Pierce replies:

Your correspondent, "U. B.," of Trumbull, is no doubt a close observer, as well as liberal in publishing his treatment, and yielding his opinion if in an error. His query is a very natural one, and would involve a lengthy article. However inadequate to the task, I will attempt it in as brief a manner as possible.

Taking it for granted that ergot affects cattle similar to humans, and that most authors agree that it is much disposed to putrifaction, especially at the extremities, and that large doses produce violent headache, and is only used to produce contraction on the uterus, when in active labor—this phenomena I can only explain by inferring that it stagnates the blood, the brain suffers, and the nerves sympathise by contracting—the uterine and urinary organs having the most complicated fibrilla, are the most sensitive and the first to exhibit it. The effect on the system would be to call the animal heat inward, leaving the surfaces and extremities cold: this would cause irritation in the already stagnant circulation, producing febrile symptoms. The system now is charged *plus* internally and *minus* externally. The arterial circulation is now quick and weak, the venous slow and laborious. The surfaces, and especially the extremities, now become absorbers, while the centres act the reverse,—hence the extremities would be subject to dry gangrene and mortification. The system laboring under this disease may be traced through the following stages,—fever, inflammation, congestion, gangrene and mortification. Those symptoms would be termed the acute stages of the disease, and the disease positive in its character. But the disease generally terminates in a character of debility and chronic form. This change of character and form we would attribute to the change effected in the blood. In inflammation and congestion, the fibrine or red blood globule, suffers, and actual gangrene and sloughing takes place in the globule. In gangrene on the surfaces or extremities, it always seeks vent; if obtained, sloughing takes place, and mortification is stayed for a time or altogether; otherwise, mortification immediately ensues. And as congestion of the blood is the forerunner of gangrene, so is inflammation of the blood the forerunner of the sloughing of the globule. And if mortification of the blood is stayed, a wasting of the fibrine ensues, and an accumulation of albumen and pus in the blood is the result. Hence the small, pale and flabby appearance of all the internal viscera, on post-mortem examination.

The physiology of the animal's extremities constitutes them natural absorbents, especially in cold weather; as cold contracts and heat expands, the extremities are not capable of contraction as is the more soft and fleshy parts, and in the cold the animal heat tends inwards, while the blood rushes to relieve the coldest parts, in all healthy bodies. But in this case the blood fills none of those important offices, hence the liability to freeze. The urine being warm, gives off ammonia rapidly, the extremities being cold, absorb freely, and ammonia being a stimulant, irritant and powerful absorbent, would cause gangrene and sloughing more readily. The process of the waste of animal fat is strictly a retrograde process of all the functions which accumulate it. The adipose tissues readily give off their deposit, the serous membrane becomes dry and hard, the mucous membrane becomes palled, emitting a serous fluid, the lymphatics are incapable of performing their office, the lacteals suffer for want of the true aliment, the hepatic circulation becomes clogged, and lodges at the extremities. This disease puts on its chronic form at the same time it assumes its negative character. Whenever its acute and positive character has performed its work, the disorganization of the globule commences, and the sustaining principle is checked. There is now a wasting or decomposition going on in the circulating fluid, and it would be immaterial at what point or stage of the blood this parasitic influence was introduced. The two first stages of the blood may be correct, and the systematic circulation diseased; this always is the case where the animal lingers a long time.

Where the sustaining principle is arrested in its first stages, death ensues.

The effects of ergot on cattle are thus explained, and from the fact that this disease between its commencement and termination assumes opposite characters, opposite treatments would be indicated, and it would take very nice discrimination in a common observer to determine at what time or point the treatment should be changed. The effects of ergot are exhibited on the milk of cows, by a decrease of quantity and oily properties, and a dingy or brown appearance, especially after the cream is removed. It may also, like some other poisons, be cumutative, so as to produce permanent contraction, or affect the brain,—hence we should expect more or less trouble hereafter in parturition of those especially affected and to come in early in the spring. The ergot is considered poisonous to all the inferior animals, as 24 drachms was once given to a terrier bitch, which proved fatal in 20 hours. It readily kills chickens, flies, etc.

In answer to the query of "U. B.," I would say, the articles prescribed are to cover the first symptoms; their properties are febrifuge, alterative, diuretic and antiseptic,—they serve to antidote the ergot as well as correct the system. When the animal is down with the disease, I apply to the sore parts a poultice composed of tar, lini oil, and molasses, equal parts, thickened to the proper consistency, with pulverized charcoal. Use tonics, alteratives, ant-acids, stimulants, etc., internally. I would also recommend active exercise twice a day in the early stages of lameness, in order to keep up a forced circulation: also give from ½ to 1 ounce of sweet spirits of nitre internally. Lime would no doubt be of much service with the salt, etc., to put on the hay, also a weak alkali sprinkled on the hay when fed, would serve as an antidote to the ergot.

W. PIERCE, V. S.

CATTLE DISEASES IN PORTAGE COUNTY.

In consequence of the appearance of a severe and fatal disease among cattle in some parts of Portage county, the past winter, the Farmer's Association of Edinburg appointed a committee to investigate the subject, and ascertain if possible the nature, cause and cure of the malady.

The report of this committee was forwarded to the Ohio Farmer for publication from which the following is extracted:

REPORT:

The disease is not caused by freezing; neither is it what has been called hoof-ail, foot-rot or fouls. Its first symptoms seem to be a deadness of the end of the tail, extending upwards till, in some cases, the flesh separates from the bone, and falls off. About the same time, there is a purple appearance just at the edge of the hair above the hoof. It then commences swelling, becomes feverish, extending upwards to the ancle, and in some instances causes a separation of the coffin bone from the pastern joint. The lameness is confined entirely to the hind feet—the blood is pale and thin, and in most cases, the animal retains a good appetite till near the last. The cause we apprehend to be, feeding on hay containing ergot (a parasite fungus growing within the glumes of various grasses) in considerable quantity. We arrive at this conclusion from the fact, that the hay fed by an individual who lost a large number of cows, contained much of this article, and also the person from whom he purchased the hay, lost cattle from the same disease; and in both instances, cattle fed on other hay were not affected.

In every well marked case of this disease, it has been ascertained that the hay on which the animal fed contained ergot. The hay in which the ergot was found the most, was the kind called June or Spear grass (*Poa pratensis*) growing in old meadows, where the soil is rich, and the growth rank. The severe frost on the 31st of May, 1856, is supposed by some to have been the cause of the disease in grass, by destroying the vitality of the seed before it arrived at perfection, while, by others it is attributed to extreme warm, growing weather in June, causing an overflow of sap.

Although we consider the whole subject involved in much obscurity and uncertainty, and requiring farther investigation, yet we are satisfied the best manner of treating the disease is immediate resort to cauterization, and a change of diet, whereby an increase of animal heat and vitality may be obtained, at the same time making an application of suitable remedies to the affected parts. *First*, by cutting off the toes until they bleed, and blue vitrol moderately applied to the affected parts have been found beneficial in several instances. A free use of salt and charcoal, in various ways is undoubtedly a good preventive; and a careful examination of the hay or grass on which the stock is fed is indispensible. If found in hay, it may be removed by threshing or tramping. Of the specific nature and properties of ergot, in hay, or whether it is not identical with that of rye, we are not well informed. The immediate effects of the latter, in large doses is well known; but it has no affinity to the ordinary known effects of vegetable poisons. What effect would be produced by its gradual and continued use, we are not in possession of sufficient information to warrant us in speaking positively; but we do suppose, after a careful examination, that it operates on the blood of the animal, and unless immediate remedies are applied, it proves fatal.

P. BARRON, M. D.,
R. M. HART,
J. Y. PEARSON,
JONAS BOND,
Committee.

The following resolution was unanimously adopted:

Resolved, Inasmuch as the evidence adduced is conclusive, that the ergot in hay is the cause of this disease, yet the association cannot decide that it is the real cause of a poison being introduced into the system, owing to our inability to analyze this substance; therefore, we desire to ask the editors of the agricultural journals for more information, and to obtain the chemical analysis of ergot.

EDINBURG, Portage county, May, 1857.

Mr. Castle of East Ashtabula, has, within a short time, lost seven head of cattle by poisoned hay.

There appears to be a question among some very nice people, whether the beef made of those cattle would not be a parasitic fungus, the same as the ergot. It would be enough for us to know that it requires a healthy animal to become fat, and if poor from disease, it would remain so, unless it recovered. We have been requested to state our views in this particular. We should have no more spleen against such beef, if fat in the fall, than any other animal that had recovered from some common ailment. The milk appears to be harmless during the disease for calves, pigs, etc.

CUTTING HAY.

From the subjoined tabular statement it will be observed that there exists a great diversity of opinion as to the proper time of cutting grass for hay. It will also be seen that Timothy is considered not only the best grass for hay but that it yields the largest amount. The following from the pen of Prof. J. P. Kirtland—one of those few and rare men that nature bestows on a continent, two or three only of such during a century; who although deeply learned in science, yet know how to direct it so as to obtain practical and useful results,—will be read with interest by those who cultivate Timothy. There is no doubt that Mr. McCrary has discovered a physiological principle or law, which may perhaps, be applicable as Prof. Kirtland intimates, to other than Timothy crops:

The proper time for cutting Timothy meadows, (herd-grass of New England,) with reference to securing the best qualities of hay, has been a fruitful subject of observation and remark. Little or no attention has been paid to the influence of the time and manner of cutting, over the health, permanency, and productiveness of such meadows. A vague idea prevails, among farmers, that, if the mowing be performed before the seed of this species of grass is ripe, it will run out, from a failure to re-seed the ground. Every observing farmer has noticed that, in some instances, extensive tracts of Timothy sward have suddenly died, soon after the removal of the crop of hay, while, in others, the sward continued healthy, and for a series of years produced abundantly of this grass. The rationale of such opposite results, under apparently similar circumstances, had never been explained, so far as my information extends.

My neighbor, Richard McCrary, an intelligent and practical farmer, has recently presented me with the annexed propositions and conclusions, as the result of his experience on this subject. These he illustrated by specimens of the grass, in every condition to which he alludes. It is hoped they will be thoroughly scanned, by persons competent to test their accuracy. If they bear this test, to Mr. McCrary the credit of the discovery of the facts solely belongs; and I have no doubt the community will consider him as having conferred an important benefit.

1. Timothy grass (*Phleum pratense*) is a perennial plant, which renews itself by an annual formation of "bulbs," or perhaps, more correctly speaking, tubers, in which all the vitality of the plant is concentrated during the winter. These form, in whatever locality the plant is selected, without reference to dryness or moisture. From these, proceed the stalks which support the leaves and head, and from the same source spread out the numerous fibres, forming the true roots.

2. To insure a perfect development of these tubers, a certain amount of nutrition must be assimilated in the leaves, and returned to the base of the plant, through the stalk.

3. As soon as this process of nutrition is completed, it becomes manifest by the appearance of a state of desiccation, or dryness, always commencing at a point directly above either the first or second joint of the stem, near the crown of the tuber. From this point, the desiccation gradually progresses upwards, and the last portion of the stalk that yields up its freshness is that adjoining the head. Coincident with the beginning of this process is the full development of the seeds, and with its progress they mature. Its earliest appearance is evidence that both the tubers and seeds have received their requisite supplies of nutrition, and that neither the stalk nor the leaves are longer necessary to aid them in completing

their maturity. A similar process occurs in the onion, just above the crown of the bulb, indicating the maturity of that organ.

4. If the stalk be cut from the tubers, before this evidence of maturity has appeared, the necessary supplies of nutrition will be arrested, their proper growth will cease, and an effort will be made to repair the injury, by sending out small lateral tubers, from which weak and unhealthy stalks will proceed, at the expense of the original tubers. All will ultimately perish, either by the droughts of autumn or the cold of winter.*

5. The tubers, together with one or two of the lower joints of the stalk, remain fresh and green, during the winter, if left to take their natural course; but if, by any means, this green portion be severed, at any season of the year, the result will be the death of the plant.

From the foregoing considerations it is concluded,

1. That Timothy grass cannot, under any circumstances, be adapted for pasture: as the close nipping of horses and sheep is fatal to the tubers, which are also extensively destroyed by swine.

2. The proper period for mowing Timothy is at any time after the process of desiccation has commenced on the stalk, as noted in Proposition 3. It is not very essential whether it is performed a week earlier or latter, provided it be postponed till that evidence of maturity has become manifest.

3. All attempts at close shaving the sward should be avoided, while using the scythe, and, in gauging mowing-machines, care should be taken to run them so high that they will not cut the Timothy below the second joint above the tuber.

The following communications are deemed worthy of a place in this connection:

Muskingum.—The best time to cut timothy is in the last stages of the milk, or paste state, for the following reasons: 1st. You have more time, as this state exists after your wheat is cut. 2d. It takes less trouble to make your hay; it being ripe, you must cut it down in the morning and put it up in the afternoon. 3d. A horse or cow will prefer it to that which is cut in blossom. 4th. It has more saccharine matter when ripe, which is the main principle of nourishment in vegetables; this you may know by the way it gums your scythe. 5th. It is not so hard on your meadows as to cut in blossom; your hay will never fail to heat or mow burn, unless you let it stand in the cock until it is fully cured. I sent a

* Florists know that if the stalk of the white lily be cut, prematurely, a similar result ensues; and that, by cutting off the stem and leaves of herbaceous peonies, before they are mature, the tubers will be so much impaired as to fail to bloom the next season.

gentleman in Zanesville, a month or two since, a load of hay that was fully ripe; he declared to me he never had hay that his horse ate so greedily. C. SPRINGER.

PORTAGE.—Timothy best on low lands inclined to be swampy; red top is heaviest on gravelly loam; along our streams or bottom lands, timothy about one and one quarter tons per acre. Many acres will far exceed this, but throughout the county this is a fair estimate. The best time for cutting herd grass is just after the yellow bloom falls off, and the blue blossom* is still hanging to the head. P. CONANT.

WARREN.—Hay and Grass: The number of acres devoted to meadow and pasture has been decreasing yearly since 1854. This being a good grain growing county, with a home market within from 6 to 10 cents of Cincinnati prices, has induced our farmers to diminish their live stock of all kinds, *Horses* and *Shanghais* excepted (the sooner the latter are exterminated the more profit to the country at large). Barley, wheat straw, and corn fodder are largely substituted for hay for horses and cattle. Many of our farmers and livery stable keepers are dispensing with the use of hay altogether; they say their stock require a little more grain to bring them out in fine condition in the spring. The threshing divests the straw of all dust, so injurious to horses subject to the heaves. They claim their stock are in better condition to go through a heavy summer's work, than on the best of hay, which has a tendency to shorten the wind.

Timothy is preferred for hay, but is an exhausting crop when the seed is allowed to ripen. Clover and timothy mixed will produce the greatest yield in weight per acre.

On all limestone soils the Blue Grass (*Poa pratensis*) is a native. Seed those lands with other grasses, such as timothy, clover, red top (*agrostis stricta* of Muhlenburgh), and in course of years, longer or shorter, according to the adaptation of the seasons to them, the Blue Grass will appropriate the ground to itself, and if the land has not been exhausted by previous croppings, will yield a greater per cent. in beef, milk, mutton, wool, and hog flesh, than any of the cultivated grasses; as with any other cultivated crop, the richer the ground the greater the per cent.

Most of the farmers let their timothy meadows partially ripen their seed before mowing. EZRA CARPENTER.

The annexed table is replete with statistical information, compiled from county reports relative to Hay and Grass:

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* This "blue blossom" is nothing more than the pistils or female portion of the plant, enlarged and exposed, after the anthers and filaments or male portion of the plant has disappeared. [KLIPPART.

GRASS AND HAY.

COUNTIES	NO. OF ACRES DEVOTED TO MEADOW AND PASTURE.	KIND OF GRASS BEST FOR HAY.	KINDS YIELD MOST.	BEST CROP—SOIL, KIND OF GRASS, MANAGEMENT.	AVERAGE PRODUCTION, 1857, PER ACRE.	BEST TIME TO CUT TIMOTHY.	ERGOT OR SMUT IN GRASSES.
Adams	29,000	Timothy and clover.	Timothy.				
Ashland	26,000	Timothy and clover.	Timothy.		1 ton.	When it is ripe and don't rain.	No.
Belmont	222,000	Timothy and clover.	Timothy and clover.	Low lands, timothy, subsoil and pul.	1½ tons.	Soon as the seed is ripe enough to grow.	No.
Carroll	15,000	Tim. and clov. mixed.	Tim. and clov. mixed.		1½ tons.	Diversity of opinion.	No.
Champaign ..	55,125	Timothy.	Tim. and clov. mixed.	Good soil, well manured, well plowed, and plenty of rain.	1½ tons.	Just out of blossom.	No.
Clark	40,000	Timothy.	Orchard grass and clover.	4 tons to the acre been raised on Mad River bottom lands.	1½ tons.	When blossom is falling.	No.
Clermont	70,000	Timothy.	Timothy.			Seed full in milk.	No.
Columbiana ..	40,000	Timothy and clover.	Timothy and clover.		2 tons.	Just after blossom drops.	
Crawford	50,000	Timothy.	Timothy.	Rich and deep, with clay subsoil.	1½ tons.	When head begins to turn yellow.	
Darke	23,000	Timothy.	Timothy.	Low wet land.	2 tons.	Blossom begins to fall.	No.
Defiance	6,000	Clover and timothy.	Timothy.	Heavy clay, well plowed.	2½ tons.	" " "	No.
Delaware	51,000	Tim. and clov. mixed.	Timothy and red top.	Bottom lands.	1½ tons.	When seed is formed, but not ripe to fall.	No.
Kelly's Island.	1,000	Timothy.	Clover.	"1 bu. of salt per acre after mowing."		Just out of bloom.	No.
Erie	51,000	Tim.,red top,red clov.	Timothy, red clover.	Rich; timothy; thorough cultivation.	2 tons.	Just out of the blow.	No.
Fairfield	20,000	Timothy and clover.	Timothy.		2 tons.		No.
Fayette	62,000	Tim. or herd grass.*	Timothy and clover.		1½ tons.	When the grass has dropped the bloom.	
Franklin	64,000	Timothy.	Timothy.	Black soil; timothy; land never broken; seed harrowed in.	1½ tons.	When out of blow and seed matured.	No.
Gallia	31,000	Tim. or herd grass.*	Timothy.	Bot. clay; tim.; manure on soil in winter.	1½ tons.	Seed in "dough state."	No.
Geauga	180,000	Timothy.	Timothy and red top.	Timothy and clover on uplands; red top on low lands.	1½ tons.	Seed formed, before commence to ripen.	Yes.
Greene.......	40,000	Timothy and clover.	Timothy.		1¾ tons.	Seed matured sufficiently to grow.	No.

Guernsey	39,000	Timothy.	Timothy.		1½ tons.	Blossom dropped—seed good to grow.	No.
Hamilton .. .	46,000	Timothy.	Orchard grass.	Upland; well drained and manured.	1 ton.	Seed in milk; clover when ½ heads ripe.	No.
Hancock	24,300	Timothy and clover.	Timothy and clover.		1½ tons.	When blos-om is off.	No.
Hardin	15,000	Timothy.	Timothy.	Low black land; timothy.		When seed begins to rip'n	No.
Highland	100,000	Timothy and clover.	Timothy and clover.	Good bottom land.	1½ tons.	Some, when bloom falls; some (both right) when seed is ripe.	No.
Hocking	13,500	Timothy.	Timothy.	Damp clay.	2½ tons.	Shedding bloom	No.
Huron	100,000	Timothy.	Tim. and clov. mixed.	Bottom; red top and timothy; 1 bu. seed per acre.	1 ton.	When top of head begins to ripen.	No.
Jackson	50,000	Timothy.	Timothy.	Break sandy soil; sow timothy, and harrow.	1½ tons.		No.
Jefferson	52,000	Timothy and clover.	Timothy and clover.	Bottom lands; frequent rotation of crops.	2 tons.	When blossom shows well in dew.	No.
Knox	50,000	Tim. or herd grass.*	Timothy.	Deep soil; well plowed; well manured and irrigated.	1½ tons.	When the blossom has passed off.	No.
Lake	61,000	Timothy and clover.	Red top.	Red top; low, moist, clay soil.	1¼ tons.	Seed full in milk.	No.
Lawrence	5,000	Timothy.	Timothy.	Clay loam, free from surface water; timothy; liq. manure; roll in spring.	1¼ tons.	Second blossom.	No.
Licking	52,000	Timothy.	Timothy.	Timothy; rich soil.	2 tons.		
Logan	40,000	Tim. and clov. mixed.	Tim. and clov. mixed.	Timothy on bottom lands.	2 tons.	When two thirds of bloom has fallen.	No.
Lorain	130,000	Tim., red clov., r. top.	Red clov. and orch'd.	Deep loam, recently tilled.	1½ tons.	Seeds begin to ripen.	Yes.
Lucas	13,000	Timothy and red top.	Timothy and red top.		1½ tons.	Soon after it is in full bloom.	
Madison	136,000	Timothy and clover.	Timothy and clover.		1 ton.		
Mahoning .. .	100,000	Timothy and clover.	Timothy and clover.	Sandy loam; timothy and clover; rich soil.	1½ tons.	When fully out of blow, and begin to ripen.	No.
Marion	72,000	Timothy.	Timothy.	New low lands; hill sides with eastern exposure.	2 tons.	Partly ripe.	No.
Medina	140,000	Timothy and clover.	Timothy.	Timothy and clover; top dressing of manure.	1½ tons.	Just before seed sheds.	No.
Meigs	10,000	Timothy and red top.	Timothy and red top.	Timothy on bottom land.	1½ tons.	Just going out of bloom.	No.
Miami	12,000	Timothy.			2½ tons.		
Morgan	26,000	Timothy.	Timothy.	Black loam.	1½ tons.	As blossom falls.	
Morrow	40,000	Red clover and tim.	Clover and timothy.	Black loam; third crop.		" "	No.
Muskingum ..	15,000	Timothy.	Timothy.	Heavy, moist; rich top dressing.	2 tons.	Grass in blossom.	No.
Noble	52,000	Timothy and clover.	Timothy.	Timothy; bottom land.	2½ tons.	After bloom has fallen, before seed is hard.	No.
Ottawa	3,000	Timothy.	Timothy.			When seed is ripe.	

GRASS AND HAY—*Continued.*

COUNTIES.	NO. OF ACRES DEVOTED TO MEADOW AND PASTURE.	KIND OF GRASS BEST FOR HAY.	KINDS YIELD MOST.	BEST CROP—SOIL, KIND OF GRASS, MANAGEMENT.	AVERAGE PRODUCTION, 1857, PER ACRE.	BEST TIME TO CUT TIMOTHY.	ERGOT OR SMUT IN GRASSES.
Pickaway . . .	100,000	Tim. and clov. mixed	Timothy.	Rich loamy soil.	1½ tons.	From 1st to 20th July.	No.
Pike	24,000	Timothy.	Timothy and clover.	Wet marshy lands.	1½ tons.		
Portage	135,551	Tim. or herd grass.	Timothy.	Gravelly loam; timothy.	1¼ tons.	When yellow blossom falls, and blue blossom hangs.	Yes.
Putnam	10,000	Timothy.	Timothy.	Virgin soil.	1½ tons.	Seed matured.	
Richland	40,000	Timothy.*	Red top.	Alluvial bottom; annual dressing manure.	1½ tons.	Just after blossom falls, and seed in milk.	No.
Sandusky . . .	29 000	Timothy.	Tim. and clov. mixed.		2 tons.	Seed formed but soft.	No.
Shelby	12,000	Timothy.	Timothy.		1½ tons.	Bloom begins to fall.	No.
Stark	27,000						
Summit	63,000	Timothy.	Tim. and r. top mixed.		1½ tons.	Seed begins to ripen.	Yes.
Trumbull	183,000	Timothy.	Timothy.		1½ tons.	Blossom falls.	Yes.
Tuscarawas . .	21,000	Timothy.	Timothy.	Clay loam bottoms.	1½ tons.	In bloom.	No.
Union	44,000	Timothy.	Timothy.	Low lands.	3 tons.	Soon as bloom gone; first joint turned yellow.	No.
Van Wert. . . .	5,000	Timothy.	Timothy and red top.	Black sandy loam.	2 tons.	Full bloom.	No.
Vinton	28,200	Tim. and Blue Grass.	Timothy.	Clay; plenty of manure.	1½ tons.	Blossom.	No.
Warren	30,000	Timothy.	Clover and timothy.		1½ tons.	Partially ripe.	No.
Washington . .	61,400	Timothy and red top.					
Wayne	22 000	Timothy.	Timothy and clover.	Bottom land; timothy.	2 tons.	Just going out of bloom.	No.
Williams	20,000	Timothy.	Timothy.	Loamy; timothy.	1½ tons.	Last of June or 1st July.	
Wood	9,000	Timothy.	Timothy.		2 tons.	Just as blossom falling.	No.
Wyandotte . . .	49,000	Timothy and clover.	Timothy.		1 ton.	Seed in the milk.	No.

NOTE.—Kelley's Island is a portion of Erie county, though situated 18 miles from the main land.

* Timothy and Herds Grass are synonomous.

SORGHUM SACCHARATUM.

Among the products which have been recently brought prominently into notice in Ohio and other Northern and Western States, is the Sorghum Saccharatum or Chinese Sugar Cane. This plant seems destined to have a very great influence upon the agricultural and manufacturing capacities of Ohio particularly. It is by some supposed to have been cultivated to a limited extent in western Pennsylvania, eastern Ohio, and perhaps in other localities, twenty-five or thirty years since, for the seed or grain, which was then used, in some instances, as an article of food by farmers who experimented in its cultivation. There were at the time mentioned two varieties cultivated, one having black panicles under the name of "*chocolate*," and the other having white panicles was called "*rice*."

The "chocolate" or black variety was prepared for use by browning the seeds, still contained in the panicles in the manner of coffee, and then making a coffee, which, with the addition of cream and sugar, resembled chocolate in appearance and somewhat also in taste, and was quite palatable. The white or "rice" variety was freed from the panicle and boiled thoroughly, and prepared as rice is prepared for the table, and was not inferior to it as an article of palatable food.

This plant is however so nearly allied to common broom corn that it hybridizes with it, and by means of this hybridization both the broom corn on the one hand, and the sorghum on the other, deteriorated to such an extent that the cultivation of the latter was abandoned, broom corn being then a more important product. The deterioration of the broom corn consisted in a shortening of the panicle or whisk, upon the length of which its value mainly depends, while the whisk of the sorghum was lengthened and the seeds diminished in size, thus injuring its qualities for its then use, as food for the table and feed for poultry. The manufacture of sugar from the stalk was not then known generally, if indeed at all.

Within a few years past, however, the cultivation of this plant has been recommended, mainly through the influences of information upon the subject disseminated, by the patent office at Washington, by which office large quantities of the seed of the plant have been distributed, and many parties in different portions of the country, more particularly in Ohio, have experimented upon its qualities as a sugar producing plant, with very gratifying and satisfactory results.

In the month of November 1854, Mr. D. J. Browne, chief of the agricultural department of the patent office, returned to America from Europe, bringing with him a quantity of these seeds, which he had procured from Mons. M. Vilmorin, of Paris, France. In the agricultural portion of the patent office report for 1854, we find the following:

A new gramineous plant, which seems to be destined to take an important position among our economical products, was sent some four years since from the north of China, by M. de Montigny, to the Geographical Society of Paris. From the cursory examination of a small field of it growing at Verrieres, in France, in autumn last, I was led to infer that, from the peculiarity of the climate and its resemblance in appearance and habit to Indian corn, it would flourish in any region wherever that plant would thrive. But how far it will subserve the purposes ascribed to it in France, should it even succeed in any part of the United States, can only be determined by extended experiments.

There appears to be a doubt among the scientific cultivators in Europe as to the true botanical name of this plant. *Holcus saccharatus*, which is evidently an error, has been provisionally adopted by M. Louis Vilmorin, of Paris; but as the term is already applied to our common broom corn, if not to other species, this name cannot with propriety be retained. *Sorghum vulgare*, (Andropogon sorghum, of others,) M. Vilmorin thinks, in all probability, would comprehend it as a variety as well as Andropogon cafra, bicolor, etc., of Kunth. Mr. Leonard Wray, of London, who has devoted much time and attention to the cultivation of this plant, with a view of extracting sugar from its juice, at Cape Natal and other places, informed me that in the southeast part of Caffraria there are at least fifteen varieties of it, some of them growing to a height of 12 or 15 feet, with stems as thick as those of the sugar-cane. M. Vilmorin also says that, in a collection of seeds sent to the Museum at Paris, in 1840, by M. d'Abadie, there were thirty kinds of sorghum, among the growth of which he particularly recognized several plants having stems of a saccharine flavor. Thus it will be seen that there is much cause of confusion and a necessity for a critical examination of the subject. I would state, however, that Messrs. Vilmorin and Groenland are engaged conjointly in the cultivation and in determining the properties of this and the allied species, and we have every reason to hope that their researches will enable us soon to know their botanical types.

The plant which was experimented upon at Florence, in 1766, by Pietro Arduino for the extraction of sugar, very likely belonged to this or some allied species; yet it must have been of a different variety, since he describes its seeds as being of a clear brown color, while those of the plant in question are quite black, and in appearance identical with the black sorghum of the old collections.

The sorgho sucre is a plant which, on rich land, grows to a height of from 2 to 3 or more yards. Its stems are straight and smooth, having leaves somewhat flexuous and falling over, greatly resembling Indian corn in appearance, but is more elegant in form. It is generally cultivated in hills containing eight or ten stalks each, which bear at their tops a conical panicle of dense flowers, green at first, but changing into violet shades, and finally into dark purple at maturity. In France, it is an annual, where its cultivation and period of growth correspond with those of Indian corn; but from observations made by M. Vilmorin, it is conjectured that, from the vigor and fullness of the lower part of the stalks, in autumn, by protecting them during the winter, they would produce new plants the following spring. If cultivated in our Southern States, it is probable that the roots would send forth new shoots in spring, without protection, in the same manner as its supposed congener, the Dourah corn. At the North, the maturity of the seed probably would be more certain if planted in some sheltered situation; but if the object of cultivating for the extracting of sugar, or for fodder for animals, an open culture would be sufficient where the soil is rich, light, and somewhat warm. According to the experiments of M. Ponsart, the seeds vegetate better when but slightly covered with earth. M. Ledocte proposes to associate with the plant another of more rapid growth, such as lettuce or rape, in order that the laborers may distinguish the young sorgho from grass, which it greatly resembles in the early stage of its growth. Any suckers, or superfluous shoots, which may spring up in the course of the season, should be removed.

The great object sought in France in the cultivation of this plant is the juice contained in its stalks, which furnished three important products, namely, sugar, which is identical with that of cane, alcohol, and a fermented drink analogous to cider. This juice, when obtained with care and in small quantities, by depriving the stalk of its outer coating or woody fibre and bark, is nearly colorless and consists merely of sugar and water. Its density varies from 1.050 to 1.075 and the proportion of sugar contained in it from 10 to 16 per cent., a third part of which is sometimes uncrystallizable. To this quantity of uncrystallizable sugar, this juice owes its facility of readily fermenting, and consequently the large amount of alchohol it produces, compared with the saccharine matter, observed directly by the saccharometer. In so far as the manufacture of sugar is concerned, this plant appears to have but little chance of success in a northern climate, as a large proportion of that which is uncrystallizable is not only a loss in the manufacture, but an obstacle to the extraction of what is crystallizable. It must not be understood, however, that the produce of this plant is unprolific or difficult to obtain, but that all things being equal, its nature renders it more abundant in alcohol than in sugar. Yet it would be very different in the warmer climate at the South, where sugar-cane is difficult to be obtained, in requiring protection from frost. From experiments made by M. Vilmorin on some dried stalks of sorgho sent from Algeria, it proved that the product of sugar obtained from them was infinitely superior to that produced by the same plant which had been cultivated near Paris. I was also informed by Mr. Wray, who experimented upon the juice at Natal, that the proportion of crystallizable sugar quite predominates where the climate allows the plant fully to mature.

The chief advantage of the sorgho, as a sugar plant, is the facility of its cultivation and the easy treatment of the juice. It is thought that the rough product may surpass that of the sugar-cane in those countries where the latter is an annual, and like which, its stalks and leaves will furnish an abundance of nutritious forage for sustaining and fattening animals. As the molasses, too, is identical with that manufactured from the cane, it may be used in the distillation of rum, alcohol, and the liquor called "tafia," which resembles brandy. The greatest difficulty to be apprehended, probably, would be the preservation of the stalks from fermentating, owing to the short time left to the manufacture. This, however, might be obviated, as Mr. Wray informed me that, in the neighborhood of Natal, the Zoulous-Caffers preserved it for a long time by burying the stalks in the ground, notwithstanding the climate of their country is very warm and damp. It will also be observed that in the manufacture of brandy or alcohol, the uncrystallizable sugar can be turned to account, which, in a measure, would otherwise be lost. Another advantage consists in the pureness of the juice, which, when thus converted, from the superiority of its quality, can immediately be brought into consumption and use. The alcohol produced by only one distillation is nearly destitute of foreign flavor, having an agreeable taste, somewhat resembling noyau, being much less ardent, or fiery, than rum.

One of the points M. Vilmorin was desirous of establishing was, at what period of the growth the stalks began to contain sugar, and, consequently, when its manufacture should commence. He came to the conclusion that it coincided with the putting forth of the spikes; but the proportion of sugar in the stalk continued to increase until the seeds were in a milky state. In the plant in flower, he observed that the amount of sugar diminished in the merithalles (parts of the stalks between the nodes, or joints,) the nearer they were to the top; and, also, that the lower part of each merithalle contained less saccharine matter than the upper. In consequence of this, and owing to the smallness and hardness of the lower knots, the centre of the stalk is the richest portion. He was inclined to the opinion that, at a later period, the merithalles lower down the stalk are impoverished in the amount, if not in the quality, of the sugar they contain.

The ripeness of the seeds does not appear much to lessen the production of sugar, at least in the climate near Paris; but in other countries where it matures when the weather is still warm, the effect may be different. According to the report of M. de Beauregare, addressed to the "Comice de Toulon," the ripening of the sorgho, in that latitude, had no unfavorable effect; and he considers the seeds and the sugar as two products to be conjointly obtained. On the other hand, Mr. Wray says that the Zoulous-Caffers are in the habit of pulling off the panicles of the plant the moment they appear, in order to augment the quantity of saccharine matter in the stalks. This question may be of some importance in our Southern States, should this plant supersede in any manner the sugar-cane.

We will give, as the result of a careful investigation of the subject, and a comparison of reports from our numerous correspondents, as succinct an account of the different items of information upon this important subject as possible.

The first practical information which we will mention is the fact already alluded to, that the Sorghum will hybridize with broom corn, and should not, therefore, be so planted as to favor this hybridization, which would be injurious to one or both these important products.

The soil and climate which are suitable for the cultivation of corn or broom corn, are also well calculated for the growth of Sorghum; but the most favorable situation and the best soil for a good crop of the cane, possessing a very rich juice, seems to be a rich, sandy loam, with a southern exposure; yet wherever corn will succeed Sorghum will also grow; but in a moist soil or very wet season, the proportion of sugar contained in a given quantity of the juice, seems to be less than in a dryer season, or more porous soil, when strength of juice will compensate for any diminution of quantity.

The mode of cultivation is so nearly the same as that adapted to produce a good yield of maize, that a farmer who understands the cultivation of corn can raise Sorghum also. As is well understood, then, the land should be well worked, kept clean, and manured when too little productive to make a good corn crop.

The season for planting is also the same as for corn, and most of our correspondents advise early planting, as the cane grows slowly at first, and takes so much time to mature that late planting and early frosts have prevented the seed from ripening in several of our northern counties. Mr L. G. More, of Logan county, recommends soaking the seed before planting, so as to save time in bringing the crop forward. He informs us that the unsoaked seed will lie in the ground fifteen or twenty days before germinating, if it be not soaked, and he advises two weeks soaking and immediate planting afterwards, and that, too, at once after plowing, so as to give the cane an opportunity to outstrip the weeds which would otherwise choke and retard its growth. The general time of planting has been from the first of May until the first of June. It has been planted in different ways, as in hills, drills, and broadcast, and these at different distances, from $3\frac{1}{2}$ by $1\frac{1}{2}$ feet, to 4 by 4 feet, and with from four to fifteen stalks in a hill. The result of experiments instituted seem to justify the conclusion that hills planted about 4 by 3 feet, with from 4 to 6 or 7 stalks in the hill, will produce as much sugar as the same ground would if planted much closer, as the closely planted stalks are not so large, thrifty and rich, and cannot so well resist the winds, and are often thrown down, broken, and destroyed; and, too, if this be so, the fewer stalks it is necessary to handle for a given quantity of produce the better.

The uses of the Sorghum are, when sown broadcast, the production of a good late summer or early fall fodder; when in hill, it makes some fodder after the appropriation of the stalks to the main object of its cultivation—the production of molasses and sugar. The leaves, which should be removed some days before it is intended to cut the cane, and while they are yet green, make, as some say, as good fodder as the best of hay. The leaves should be thus removed to facilitate the action of the sun upon the nearly matured stalks, which increases the quantity of sugar these contain.

The seeds may be fed to any kind of stock, ground or otherwise prepared, as is best with any kind of grain, and the use to which it was formerly put as an article for table use, may be tried and found desirable.

The principal use of the Sorghum is, however, the production of syrup, sugar, and alcohol, and one of our correspondents, Mr. R. A. Sherrard, of Jefferson county, informs us that the stalks, after pressing, may be soaked in water in a large tank, and by fermentation produce vinegar, and that they may be converted into paper at a considerable profit.

Our correspondents from every part of the State agree that the cultivation of Sorghum may be made very profitable, and the different estimates based upon the product of syrup alone all indicate that it is destined to fill an important place among the articles of agricultural produce. The yield of syrup per acre is estimated by those who have had but little opportunity of learning the capabilities of the plant, at from 50 to 75 gallons of syrup per acre, while the great majority place the yield per acre at 200 to 350 gallons. The largest yield of syrup which has come to our knowledge was in Belmont county, where there was one piece produced at the rate of 420 gallons of syrup per acre. The average quantity we think may be safely estimated at 200 or 250 gallons per acre.

We have also received notices of the amount of fodder, which range from 3 tons refuse after cutting and grinding, to 25 tons per acre, when sown broadcast for the produce of fodder alone. As fodder for winter use it is hard to cure, having so much juice, and if allowed to mature, the stalks become so hard that cutting, grinding and steaming are required to make it profitable as feed.

The profit of raising this plant is equal to and perhaps exceeds that of corn or wheat, and some of our correspondents consider it worth the expense of cultivation when the price of the syrup is no more than 15 to 25 cents per gallon.

The manufacture of the sugar and syrup is not difficult when once the proper process is known, and we will here insert the generally successful modes of proceeding: There is a particular time in the life of the plant, when it is best suited to be ground and pressed, as at this time the juice is in the state which is best suited for the production of the sugar. This time is when the process of ripening the seeds is just completed so far as to ensure their growth, but before they are over ripe; the stalks should then be stripped of their blades by hand or by means of a small cane, and this can be done in the field very rapidly. In a few days the stalks should be cut near the ground, and the heads with one or two joints from the upper end should be removed, as the upper joints contain little or no sugar, and possess a vegetable bitter, which would impair the quality of the sugar, if ground with the rest of the stalk. It is asserted by some that the stalks, if protected from the weather, may be kept for a considerable time after cutting and before grinding without injury.

The cane may be cut very fast with a common cutter, such as is in use upon almost every farm, or a short heavy scythe may be found preferable.

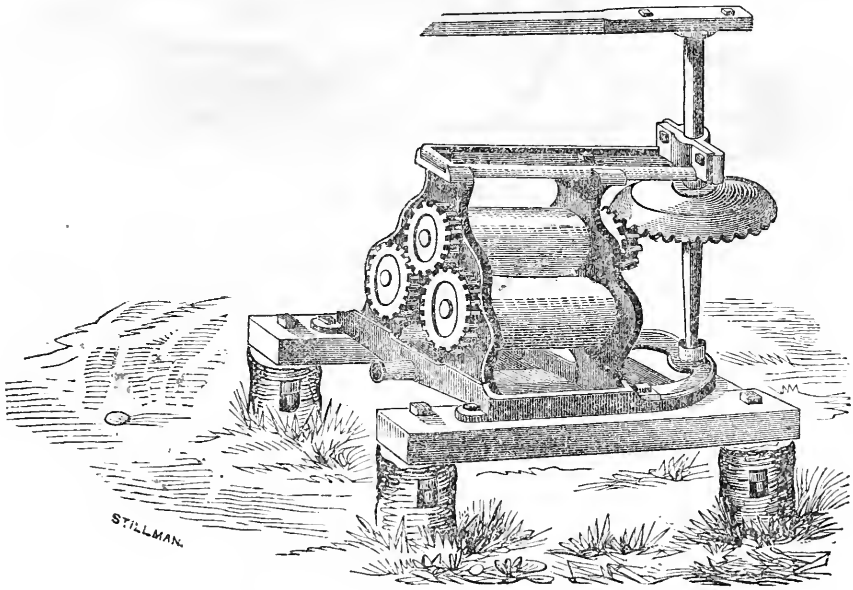
Frosts, and even freezing, do not appear to injure the quality of the plant, but rather improve it, unless followed by warm wet weather, which causes the juice to sour, even in the stalk.

About the 1st of October, earlier or later, according to the maturity of the plant, the stalks as already mentioned being stripped of their leaves should be cut and ground, and as soon as the juice is expressed no delay should occur in manufacturing it as it is liable to ferment and spoil, and the process of manufacture should go on steadily until completed.

The different implements and apparatus useful in the manufacture of sugar and syrup are various and numerous, although very simple machinery and boilers will answer the purpose for a small scale of sugar making. We will, however, before describing any of the needed apparatus, mention a plan which might be found very advantageous for all parties concerned in the Sorghum business, and one which was adopted by the Douglas Brothers, of Zanesville, Ohio, for the purpose of insuring a full experiment in the culture and manufacture of the plant. These gentlemen distributed seed among the farmers for raising, and they then erected a boiling furnace and grinding mill at their machine works, to which the farmers brought their cane already trimmed for grinding, and when the boiling was finished, the products of each man's cane was divided equally between himself and the manufacturers, and they state in their report that the quantities returned to different individuals after this division was from the smallest amount, 2½ gallons to one person, to the greatest amount, 228½ to another. They worked up cane for 46 different persons, and made in all 1073 gallons upon shares. Some of the cane was hauled 15 to 20 miles to their mill.

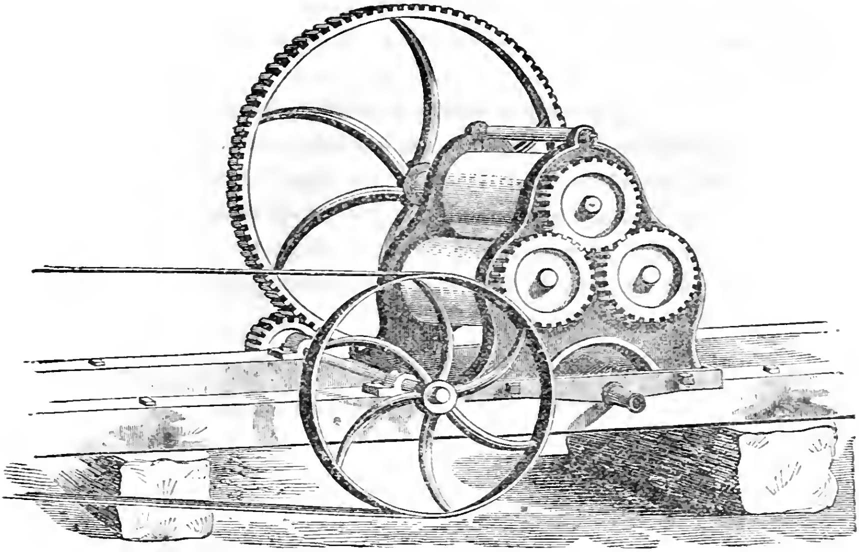
The hint suggested by this example is that farmers living in the same or contiguous townships, might make such arrangements with each other, or with a single individual, as would enable them to have their cane manufactured at a common sugar house, and thus save time, labor and expense, and in the end secure a better return than they could from private mills managed with less skill, perhaps, and less completely adapted to the business.

Common wooden cider mills have been used, driven by horse power, and may be resorted to in default of better. Mr. Dille, of Licking county, used a wooden mill, rigged with three rollers, for crushing, and a box for catching the juice. Others, at a small expense, have procured cast iron rollers, working together with or without flanges or ribs, working in the manner of cogs. Some of these rollers have been arranged horizontally, others perpendicularly. We are inclined to give our preference to a horizontal roller mill, made somewhat in the form of the annexed plate. This mill is to be arranged so that a cross-bar at the top, like a bark mill, may be arranged for the use of one or two horses, as the size of the mill and the quantities of labor to be performed demand. At one side, to facilitate feeding, a sloping box, like the box of a straw cutter, may be arranged, and a slide at the other, to carry away the pressed stalks. Beneath the rollers, and large enough to catch all the juice as it falls, may be placed a shallow trough, with a gutter and spout leading to a receptacle large enough for holding a conveniently large amount of juice.



HORIZONTAL MILL WITH VERTICAL SHAFT.

Another form of horizontal mill may be seen in the annexed cut, which is better suited to be moved by steam or water power than horse power. It may be driven very rapidly, and a large quantity of cane ground by it. These or similar and well adapted mills can be procured at almost any of our larger foundries, at a comparatively moderate expense.

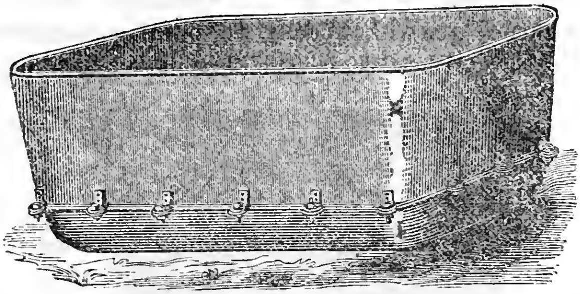


HORIZONTAL MILL.

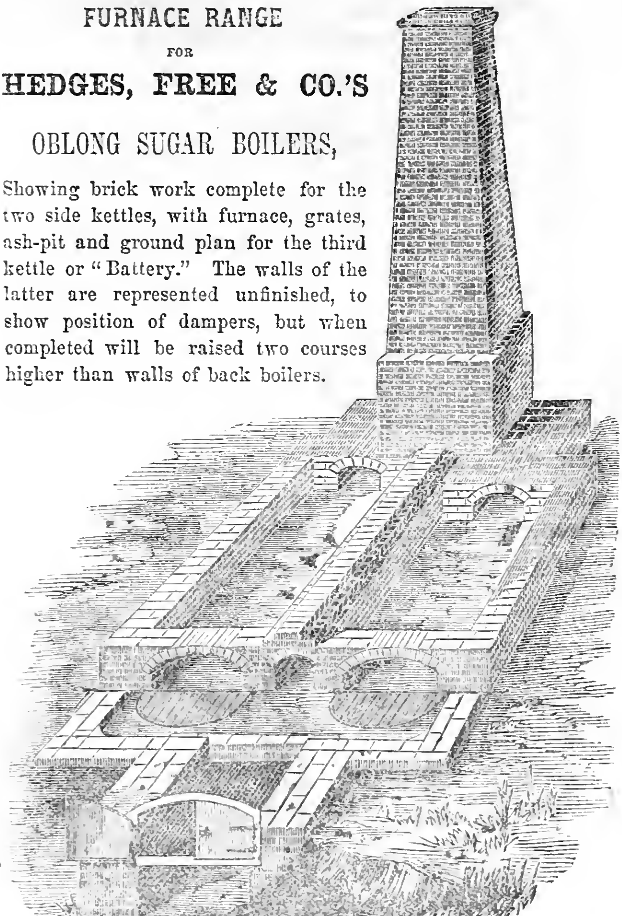
We can recommend, for a moderately large amount of work, the use of good and well adapted machinery, more expensive at first, perhaps, but far cheaper in the end than less perfect machinery, by which only imperfect results can be secured; and the losses from imperfect machinery, would soon pay the difference in original cost, and leave the owner greatly the gainer.

The cane need not be immediately ground when cut, as it may remain unground two or three weeks in favorable weather, but when once ground the juice should be manufactured as soon as possible, to prevent loss by fermentations; and for this reason sufficiently large boilers should be used to enable the manufacturer to dispose of all the juice his mill can press out, and this will vary, with the construction and size of his mill and the supply of cane, from fifty gallons per hour to half that many barrels.

As we have mentioned the necessity of speedily manufacturing the juice into syrup, we will give the figure of a form of kettle or boiler, which is well suited as to shape; and three or more of these, and of sizes to suit the quantity of juice to be manufactured, should be so fixed in a furnace of brick work that the fire may come in contact with the bottoms of the range of kettles, but not with the sides, which increases the danger of scorching, and this damages or destroys entirely the product. The kettles may range in size, then, from 50 to 200 gallons, and in numbers as may be desired. There is no difference in the result, whether copper or iron kettles be used, and for various reasons we would prefer the latter. A kettle of the annexed figure, made by Hedges, Free & Co., Cincinnati, can be separated into sections and damaged portions removed and new



pieces put in their places. Below we give a plate which sufficiently explains itself, of a mode of arranging the furnace, boilers, &c., for convenience and proper manufacture.



FURNACE RANGE

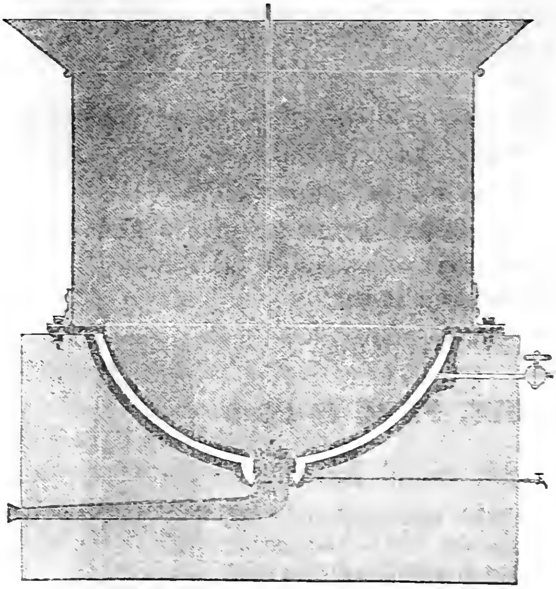
FOR

HEDGES, FREE & CO.'S

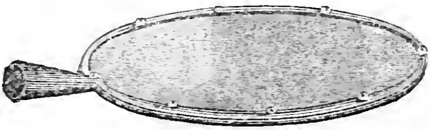
OBLONG SUGAR BOILERS,

Showing brick work complete for the two side kettles, with furnace, grates, ash-pit and ground plan for the third kettle or "Battery." The walls of the latter are represented unfinished, to show position of dampers, but when completed will be raised two courses higher than walls of back boilers.

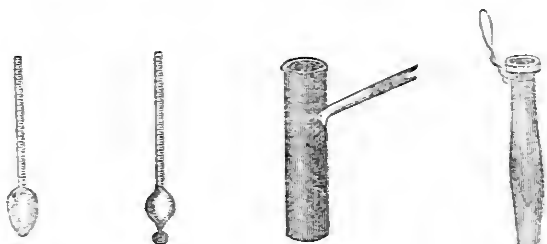
Below we give a sectional view of a steam-jacket sugar boiler, to be set in brick work, the object of which arrangement is to secure a large amount of heat without danger of burning the sugar or syrup. Moist heat can be applied to a higher degree without danger of burning than could dry heat; hence steam surrounded kettles are much less in danger of burning.



Skimmers for taking off the scum which rises during the process of boiling, are most conveniently made in the form of the annexed figure, which consists of a rim attached to a handle, and bottomed with fine brass wire cloth, which can be removed and replaced as needed.



Baume's saccharometers with a glass test tube in which to float them in the juice are useful to determine the quantity of sugar this contains, and a common proof glass will be found convenient for testing the progress of clarification.



1 2 3 4

The use of a saccharometer has been mentioned and a word of explanation may not be amiss as to the principle involved in its use. It is a small instrument having an air chamber, and scale of degrees marked upon a stem. It is weighted so as to sink in water at 60 deg. Fahrenheit, down, to the upper degree mark. Sugar added to water, makes the mixture capable of floating this instrument higher in proportion to the amount of sugar contained in a given quantity of water, and by a little practice with the instrument, the strength of mixtures of sugar and water are readily determined.

A thermometer having a range of about 250 deg. Fahrenheit, will be found a very convenient instrument for testing the quantity of sugar contained in a mixture of water. Water boils at 212 deg. Fahrenheit, at the sea shore, but falls below this point from one to two degrees in Ohio, at different elevations. When sugar is added to water the boiling point of the mixture rises in proportion to the strength of the mixture, and will thus afford a correct guage of the degree of concentration, reached in boiling syrup, and when this boiling point, as indicated by the thermometer, has reached 238 deg. to 240 deg., the concentration is so great that sugar will be crystalized upon cooling the syrup, because cold water will not hold in solution nearly so much sugar as warm or hot water, and thus the thermometric indication of strength will be a certain guide as to the crystalizing point.

We will give at the close of this notice, a list of the apparatus which may be found useful, and which varies in cost with the size of the articles.

From our information, gathered from all sources, we proceed to give the mode of boiling and clarifying which seems to be best. Place the juice in your kettles and bring it to a boil, then add a very small quantity of lime water, some bullock's blood, or white of egg, or of sweet milk to the boiling juice, stir it in and then give time for the scum to rise, and skim it off, and continue skimming until all the vegetable gluten and extractive matter is removed. Some persons allow the boiled juice to cool before skiming, and for the purpuse of making the clarifying process perfect the juice might be run off after mixing and skimming as directed, into a tall tank with a variety of stop cocks, and allowing about an hour for the fecula to settle, draw off first from the upper cock and then on down below to cause as little agitation as possible, and then placing in the boilers concentrate as rapidly as possible, and when the syrup has reached such a point of concentration that it will only boil at 238 deg., remove to the cooler, which may be a large shallow trough of pine boards, and gently stir from time to time and crystallization will go on without any more trouble. If crystallization o not proceed fast enough, a few ounces of sugar already crystallized added to the mass, will aid in hastening the process, which will also be carried on more rapidly by adding a number of successive portions of concentrated syrup to that already partially crystalized.

After crystallization, the whole mass should be put into drainers where the molasses may be allowed to flow or leach down into proper receptacles, leaving the crystals of sugar dry and free from admixture.

By reheating carefully to avoid burning, and then further concentrating the molasses, an additional quantity of sugar may be procured from the molasses which has dripped out of the sugar. Some of our correspondents, who have operated on a very small scale, merely for experiment, describe their process as the same as that with maple sugar, but cane juice is nearly 100 per cent. richer in sugar than maple sap, the former yielding 1 gallon of syrup from 6-7 of juice, the latter 1 gallon from 10-12 of sap.

The clarification should take place at 15 deg. concentration by Baume's saccharometer, and to insure discoloration the syrup, at this degree, should be filtered through animal charcoal, which must be reburned frequently to retain its purifying qualities. Wood charcoal will do, but not so well.

We have said, perhaps, sufficient to show the practicability of making sugar and syrup from sorghum a profitable business, and will only add that, from carefully conducted experiments, by Mr. Lovering, of Pennsylvania, it has been ascertained that an acre of ground in that State did actually yield 1221.85 lbs. of sugar, and 74.39 gallons of molasses, and that with proper apparatus for manufacturing the yield would probably have reached the sum of 1612 lbs. sugar, and 81.83 gallons of molasses, of a quality equal or superior to the best Louisiana products, which State yields on some plantations 1704 lbs. sugar, and 102 gallons of molasses per acre.

The following letter from Messrs. Hedges, Free & Co., enumerates the utensils necessary in the manufacture of syrup or sugar, together with the cost of each:

CINCINNATI, O., July 1, 1858.

John H. Klippart, Cor. Sec. Ohio State Board of Agriculture:

DEAR SIR:—We are in receipt of many letters asking what is required for an outfit for working the Chinese sugar cane, we hereunto append three complete invoices, such as we have furnished on various occasions, and which will prove serviceable, doubtless to such as purpose making syrup and sugar and have yet to procure their apparatus.

TEN TO TWENTY ACRE OUTFIT.		SIX TO TEN ACRE OUTFIT.		ONE TO SIX ACRE OUTFIT.	
1 four-horse mill....	$135 00	1 two-horse mill....	$100 00	1 one-horse mill.....	$56 00
2 clarifiers, 100 gal. $9	18 00	1 clarifier, 100 gals..	9 00	1 clarifier	9 00
3 kettles 1 each, 100, 150 and 200 gals. at $16, $18 and $20.	54 00	1 kettle, 100 gals...	16 00	1 kettle, 100 gals ...	16 00
1 furnace door.....	10 00	1 kettle, 150 gals...	18 00	1 kettle, 150 gals....	18 00
2 furnace doors for clarifier, $4......	8 00	1 fire door.........	6 00	1 fire door..........	4 00
1 set grates and bearing bars.........	6 60	1 set grates, bars, &c.	6 60	1 set grates, &c.....	6 60
2 set grates for clarifier range........	4 00	1 wire gauze skimmer	3 00	1 skimmer	3 00
2 wire gauze skimmers.............	6 00	1 saccharometer, cup, &c	1 00	1 saccharometer, proof glass, &c.........	1 00
1 saccharometer, test cup, &c..........	1 00	1 sugar thermometer	3 00	1 thermometer	3 00
3 fire dampers......	5 00	3 fire dampers......	5 00	3 dampers	5 00
1 thermometer......	3 00				
	$250 60		$167 60		$121 60

Of course these selections are subject to such additions or omissions as the purchaser may select, but their approval by practical operators increases the confidence we feel in their recommendation. Experience seems to indicate the necessity of rapid boiling of the clarified juice to insure favorable results, and equally forbids the use of kettles so set up as to leave the sides exposed to the fire. We feel the utmost confidence, therefore, in recommending those now made by us, they possessing a large amount of shallow fire surface with high curbs, wherein is ample room for the boiling syrup to foam and bubble in, even in very rapid ebulition. Hoping to be favored with your orders, we are,

Yours, &c.,

HEDGES, FREE & CO.

Mr. Jos. Lovering, of Philadelphia, wrote the following detailed account of a series of experiments to obtain sugar from the sorgho, which were crowned with success. I have in my office specimens of the samples of sugar referred to in Mr. Lovering's statement; these samples were examined by thousands of persons during the past several months, and are physical demonstrations of the truth, that excellent sugar can be manufactured from the sorgho:

The introduction of this plant into the United States, and the hope of producing sugar from it at the North, profitably, have excited such universal interest, that it has this year been planted in almost every State in the Union; and, as the season has advanced, the opinions early expressed by many intelligent and scientific experimentalists, that it contains no crysallizable sugar, have apparently been confirmed by later trials. A few crystals, it is true, have been obtained in one or two instances, but all hope of producing sugar from it profitably seems to have been abandoned.

My object in making the following experiments has been to throw what light I could upon this important question, and, in the event of the result proving favorable, to give such a formula as would enable the uninitiated to proceed with confidence of success. They have been pursued without any attempt at extraordinary production, either in the cultivation of the cane or the development of its properties; on the contrary, the experiments were made upon small quantities, under many disadvantages that would not occur in large operations, and consequently with results less favorable.

The series being completed, perhaps the best method of communicating the results and imparting the knowledge obtained, to the public, will be by giving the following extracts from my notes, made as the work proceeded. They will show the progress of the development of the sugar in the stalk, and its decline, with many other interesting facts:

EXTRACTS.

On the 10th of May, I planted about half an acre, on upland of good quality, such as would yield, in ordinary seasons, 50 to 60 bushels Indian corn to the acre. The rows 4 feet apart, and the plants intended to be 6 inches apart in the rows, but which, on taking off the crop, proved to be a little over 7 inches apart, When the canes were about 18 inches in height I had the suckers removed. During the month of June I passed the hoe-harrow through it twice, a man following with the hand-hoe, as in the case of Indian corn. It was then left to take care of itself. It grew rapidly and evenly, and attained the height of 12 to 14 feet.

My apparatus and utensils for conducting the experiments consisted of the following, viz.:

A pair of iron rollers, 7 inches diameter and 12 inches long, set in a frame, $\frac{1}{8}$ of an inch apart, with spout to catch and collect the juice, and a crank turned by hand; a few sugar moulds and pots, some ivory black or animal carbon; two filters, made of common bed-ticking, in the shape of an elongated pudding-bag; a thermometer, Beaume's Pese-Sirop or saccharometer, and a polariscope. All the other utensils I obtained from the kitchen, viz.: a copper kettle of 10 gallons capacity, a ladle; some tin pans, bowls, buckets, &c., to contain the juice.

FIRST POLARISCOPIC OBSERVATION.

September 28; temperature noon, 71° F.; wind S. W., clear.—Of two canes, took the first joints above the stay roots:

1st joint, 9 inches long, weighed	118.854	grammes.
2d " 8 " " "	93.742	"
Weight of 1st joints of two canes	212.596	"
After passing these three times through the rollers, the bagasse weighed	64.380	"
Leaving, as weight of juice, (69.7 per cent,)	148.216	"
Specific gravity of juice	1.063	"

After precipitation, by basic acetate of lead, of a voluminous green-colored flocculent substance, it filtered with difficulty; then completed the decolorization by passing it through animal carbon, and found by first observation in polariscope,

A deflection of the ray, right, 27° Add 10 per cent for dilution by precipitant, 2.7°		29.7 right.
After inversion by H Cl. left, 12.0° Add 10 per cent., as above, 1.2°	(temperature 27°,)	13.2 left.
Sum of inversion		42.9

This sum of inversion (42.9,) at temperature 27°, indicates 54.35 grammes of pure dry sugar to the litre of juice; and by reference to past results, it is found that 204.24 grammes of sugar per litre, equal 18.82 grammes per 100, or 18.82 per cent. Then, as 204.24 : 18.82 :: 54.35 : 5.008 per cent. of sugar in the juice; and as 100 : 5.008 :: 69.7 : 3.49 per cent. of sugar in the cane. A second observation in polariscope, of the juice from the two joints of the same canes next above these, indicated 5.57 per cent. of sugar in the juice, proving them to be richer than those nearer the ground.

FIRST PRACTICAL EXPERIMENT.

September 30.—The fact of the presence of crystallizable sugar in the cane being established, I proceeded to cut and grind 20 feet of a row, and passed the thirty canes which it produced three times through the rollers; about one fourth of the seed had changed to a dark glistening brown color, but was still milky; the remainder was quite green; ground 6 to 8 of the lower joints, which together yielded 3½ gallons of juice, weighing 9° Beaume; neutralized the free acid by adding milk of lime; clarified with eggs, and boiled it down to 240° F.

This first experiment looked discouraging and unpromising at every step. Its product was a very dark, thick, viscid mass, apparently a caput mortuum; it stood six days without the sign of a crystal, when it was placed over a flue and kept warm four days longer, when I found a pretty good crop of soft crystals, the whole very similar to the "Melada" obtained from Cuba, but of darker color.

SECOND EXPERIMENT.

Oct. 13.—About two weeks having elapsed since the first experiment, the weather in the interim having been quite warm, temperature at 8 A. M. 40° to 52°, and at noon 66° to 75° F., and about one half the seed being ripe, I determined to try it again, but not being very sanguine of success, no polariscopic observation was taken.

Cut and ground 50 feet of a row, which produced 88 canes, and yielded 8 gallons of juice, weighing 10° Beaume, (one degree more than the previous cutting) from the 6 and 7 lower joints; juice slightly acid. First clarification 4¾ gallons, neutralized with 3 table-spoonsful of milk of lime, stirred in 1 lb. fine bone black and 3 eggs, and placed it over a slow fire; at 215° F. took off a very dense, thick, green scum; when at 162° F. it marked 7½° Beaume.

A second parcel of juice from this grinding (3¼ gallons) was treated in the same manner, and set aside, both having been first boiled down to 22° Beaume.

October 14.—Cut and ground 50 feet; 81 canes produced 7½ gallons juice, 10° Beaume, which was treated as above, except that the eggs were omitted.

October 15.—Cut and ground 50 feet, produced 8¼ gallons juice, weighing 10° B.

October 16.—Cut and ground 50 feet, 86 canes, 8⅝ gallons, 10° B.

The whole of the foregoing four parcels were at this stage of the process concentrated to 22° Beaume, and set aside until I had completed the series on the 21st Oct.; they were then collected together, and again clarified with eggs, and a second scum taken off; they were then again placed over the fire, and when at the temperature of 225 F., clear lime-water in small quantities was added to coagulate the vegetable albumen, which is not disengaged at a lower temperature, but which is then observed as a whitish scum, very tenacious and glutinous, and is very detrimental to crystallization. After the various delays, heatings and reheatings consequent on my limited means of working, (the great disadvantage of which, those acquainted with the subject only can appreciate,) I commenced filtering the whole, but found it so ropy and glutinous that it would not pass through; diluted it to 10° B., when it came through tolerably bright; then passed it through 5 feet of animal black; it parted with its coloring matter very freely.

October 22.—Divided the product into three parts, and boiled it as follows:

1st part to 230° F.—This stood an hour without crystallizing—found it too low, although the thumb-and-finger proof indicated otherwise.

2d part to 246° F.—which was added to the first, and in a few minutes crystals began to appear.

3d part to 238°—being the mean of the other two. On finishing this, the two preceding had formed a thick, opaque mass of good crystals.

Filled one mould, wt	20 lbs.	
Weight of mould,	4¾	net weight 15¼ lbs.
Filled one mould,	14½ lbs.	
Mould,	4½	" " 10 lbs.
Total net weight,		25¼

and next morning set them on pots to drain. Also boiled down the juice from the tops, 4¾ gallons, which produced with the scums 13½ lbs. molasses.

Nov. 2.—Knocked out the proceeds of this experiment with the following results, viz:

			Sugar.	Molasses.
1 mould, gross weight, 20 lbs.				
tare,	4¾	" nt. wt. 15¼ lbs.		
weight of molasses,	8¼	nt. wt.	7 lbs.	8¼ lbs.
1 mould, gross weight, 14½ lbs.				
tare,	4½	nt. wt. 10 lbs.		
weight of molasses,	5½	nt. wt.	4½ lbs.	5½ lbs.
Add molasses made from the tops, as above,				13½
Total weight of product of 200 feet of a row, lbs.			11.50	27.25
Fifty rows, 4 feet apart and 218 feet long, constitute an acre, and 200 feet of a row is less than 1-50th part of an acre by 18 feet, therefore add pro rata			1.03	2.45
Product of 1-50th part of an acre in lbs			12.53	29.70
Multiply by........			50	50
Product of an acre in lbs........			625.50	1485.00

A gallon of molasses weighs 12 pounds; therefore divide 1485 by 12, and we have, gallons, 123.75.

For the acre, 625 1-2 lbs. sugar, and 123 3-4 gallons molasses, produced from 18,148 canes, yielding 1,737 gallons juice, weighing 9 lbs. per gallon, or 15,633 lbs., being 4 per cent. of sugar and 9.50 per cent. of molasses, or 13.50 per cent. together.

This sugar is of a yellowish-brown color, about as dry as, and about the color of second quality Cuba sugar, such as is used by refiners.

THIRD EXPERIMENT.

Oct. 23.—The foregoing favorable progress induced me to make another trial, on a larger scale. The weather looked threatening; and as a precaution, I cut 500 feet of canes and stored them in the barn, to be used in quantities conforming to my means of working.

Nearly a month having elapsed since the first polariscopic observation was taken, and two weeks since the second practical experiment—having had several heavy white frosts, and three nights of ice 1-8 to 3-16 of an inch in thickness—I concluded to have another examination by polarized light, to see the effect of these changes, when I was gratified to find the following results—juice weighing full 10 deg. Beaume:

First observation, right	55 deg.	....	60.5 deg. right.
Add 10 per cent. for dilution....	5.5 "		
After inversion	2 "	(temperature 25 deg.) ..	2 2 deg. left.
Add 10 per cent, as above	0.2 "		
Sum of inversion			62.7 deg.

This sum of inversion (62.7), at temperature 25 deg., indicated 79.06 grammes of sugar per litre of juice. Then:

As 204.24 : 18.82 :: 79.06 : 7.29 per cent. of sugar in the juice.

	Feet.	Canes.	Gals. juice.	
Oct. 24.—Ground	100	160	18 3-4	10 deg. B.
" 26.— "	100	159	18 1-2	10 "
" 27.— "	100	166	18 1-16	10 "
" 28.— "	100	149	16 3-4	10 "
" 29.— "	100	148	14 7-8	10 "

These several parcels were clarified like the second experiment, boiled to 15 deg. and 18 deg. B., and set aside till Nov. 2d, when I found all but the last day's work had changed to a thick, liver-like mass, resembling good soft soap—very acid, and totally ruined. The last parcel, having stood a much shorter time than the rest, was but partially affected. It was boiled to proof, and crystallized very well.

I regret this misfortune, less for the trouble it cost me than for the failure of the experiment, for it worked beautifully in the first stages, and the last grinding crystallized freely. The juice weighed heavier than previous or subsequent parcels, and would probably have produced better results. It taught me, however, the danger of delay; and also that no injury had been sustained by the juice so long as the canes remained unground, the last parcel having crystallized perfectly.

FOURTH EXPERIMENT.

Nov. 2.—Since the 28th October, the weather has been mild and foggy, with heavy rains; temp. varying from 48 deg. to 60 deg. A very decidedly increased development of sugar in the juice has been ascertained, viz: 7.29 per cent. instead of 5 per cent. And I have gained some experience; so, instead of allowing the syrup to remain from four to twelve days, still containing a great portion of its fermentable impurities, gradually undergoing decomposition and depreciation, I remedy this evil to some extent, as will be seen. I also dispense with the fine ivory black and the filtering, thus simplifying the process.

Nov. 2.—Cut and ground 58 feet of a row—100 canes—the upper portions of the stalks turning yellow—leaves dead and dry. Ground 6 and 7 of the lower joints; produced 10 gallons juice, weighing 10 deg. B.; much less acid than previous samples, and barely changing litmus paper; neutralized with milk of lime, and clarified at once perfectly with eggs; passed it immediately through 3 1-2 feet black, and boiled it to 234 deg. F.; after standing an hour, the crystals were large and sharp, but not very abundant till morning, it being boiled too low.

Nov. 4.—Cut and ground 58 feet—100 canes—9 15-16 gallons, 10 deg. Beaume; rather more acid than the last; clarified it fully as above; passed it through 5 feet black, and set it aside, as it is clear and bright, and contains no feculent matter.

Nov. 5.—Cut and ground 58 feet—94 canes—9 3-4 gallons, 10 deg. Beaume; treated as above, and set it aside.

Nov. 6.—Weather changing—cut and ground 58 feet—95 canes—9 5-8 gallons, 10 deg. B.; treated as above. Also ground the tops of all the above 232 feet, which produced 4 gallons, 2 quarts, and 3 half-pints of juice, weighing 12 deg. B.; more acid than the lower joints; treated it the same; boiled it to 238 deg. F., and set it aside. In the morning I found a good crop of crystals, but the mass thick and viscid; added 3 tablespoonfuls clear lime-water; heated it to enable me to pour it into a mould—gross weight 9 1-2 lbs., tare 4 1-2 lbs., net 5 lbs. On the 13th knocked it out, and had 3 lbs. good brown sugar, and 2 lbs. molasses.

Nov. 7.—Boiled one-half of the remainder of the proceeds of the above lower joints (one-third of the whole having been boiled on the 2d, as above stated) to 236 deg. F., and added it to that boiled on the 2d; boiled the other half to 237 F.; potted it at 176 deg. F., very handsomely crystallized, and very light colored.

Nov. 8.—Withdrew the stops, and set it on pots to drain.

Nov. 9.—The full mould (15 lbs. size) had run 1 1-8 gallons molasses, or syrup; if it had been boiled a little higher it would have produced more sugar and less molasses.

Nov. 14.—The whole having now stood 7 days, and being thoroughly drained, weighed as follows:

1 small mould, 10 lbs.			
Tare,	4½		
	nt. wt. sugar, 5½ lbs.		
1 larger "	18¼		
Tare,	7		
	" "	11¼	
Sugar from the tops		3	
Product of 232 feet canes..........		19.75 lbs.	
1 pot molasses, 17 lbs., tare 5 lbs			12 lbs. nt.
1 " " 9 " 5			4
1 " " 12¼ " 5			7.25
Molasses from the tops...........			2
Product of molasses from 232 feet canes			25.25
232 feet are more than 1-50th part of an acre by 14 feet, therefore deduct pro rata......................		1.19	1.52
Product of 1-50th part of an acre...		18.56	23 73
Multiply by		50	50
Product of an acre in lbs..........		928.00	1186.50
A gallon of molasses weighs 12 lbs., therefore divide by 12 for gallons....			98.87

and we have 928 lbs. sugar (first returns) and 98.87 gallons molasses, made from one acre (18,277) of canes, which produced 1847 gallons juice, weighing, at 9 lbs. per gallon, 16,623 lbs.; or, sugar, first crop, 5.58 per cent.; molasses, 7.14 per cent.; together, 12.72 per cent.*

This sugar is perfectly dry, as shown by sample No. 4. It worked perfectly, and without the slightest difficulty, at every stage.

Nov. 17.—Boiled all the molasses from the above (except the 2 lbs. from the tops, which was too poor for recrystallization), 23.25 lbs.; added clear lime-water until it marked 35 deg. B. when boiling; took off a thick,

* Neither the scales in which this juice was weighed, nor the quart measure in which it was measured, were sufficiently delicate or accurate to give precise results; and as they form the basis of these calculations, the per centages are probably not absolutely exact, but they are sufficiently so for all practical purposes.

glutinous scum, and boiled it down to 243 deg. F.; in two hours it produced a copious crop of very good crystals; allowed it to stand till morning, when it was quite solid.

Dec. 18.—Here an unfortunate accident occurred. Having placed the crystallized mass over a slow fire, to render it fluid enough to cast into a mould, I was called off to a case of illness, leaving it over the fire; and being detained much longer than I anticipated, on returning I found all the grain melted, and the molasses boiling vehemently, and badly burned. Much discouraged, I however proceeded. It crystallized the second time, and was put into a mould.

December 20.—Weighed the sugar from the 23.25 lbs. molasses boiled on the 17th Nov., as follows, viz:

Gross weight	11 lbs.	
Tare	4¾	
Second crop of crystals from the 23.25 lbs. molasses		6.25 lbs.
Deduct pro rata for the 14 ft. excess over 1-50 of an acre		3.73
Second returns from 1 50 of an acre		5.877
Multiplied by		50
Product of an acre from the molasses		293.85

Then we have, as the whole final result of an acre of canes,

	Sugar.	Molasses.
1st returns	928 lbs.	1186.50 lbs.
2d " (sample 4,)	293.85	
And deduct molasses converted		293.85
	1221.85	892.65

And 12 lbs. molasses per gallon gives 74.39 gallons.

Say sugar, per acre, 1221.85 lbs.; molasses, per acre, 74.39 gallons; sugar, per cent., 7.35;* molasses, per cent. 5.37; sugar and molasses, 12.72 per cent.

I will repeat here, that owing to the accident before stated, this sugar, (Sample No. IV.) second returns, is not nearly of so good quality as it otherwise would have been.

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* It may perhaps appear inconsistent to the casual observer, to find 7.35 per cent. of sugar obtained, when the juice only contained 7.29 per cent., as shown by the polariscope. This is readily explained. 1st. By the causes stated in a previous note; and, 2d, the polariscope indicates pure sugar; whereas the sugar produced contains about 4 per cent. free moisture and about 3 per cent. of molasses adhering to the crystals, also gum, &c., which will account for much more than the apparent excess.

FIFTH EXPERIMENT.

November 9.—I must now mention that the last experiment was intended to have been on a considerably larger scale than those previous. Each day's work was, however, kept distinct and separate from the others, thus enabling me to determine it at any point.

Having thus proceeded to and finished the clarification of the 4th parcel, (Nov. 8th,) and the weather becoming and continuing very warm, (thermometer as high as 74°,) I observed a very sudden and unfavorable change in the working of the juice. Instead of clarifying perfectly and with great facility, as at first, the defecation was difficult, and the color many shades darker; the juice gradually fell off in weight from full 10° B. to 9° B., and required 10 feet of granulated black to bring it to the same color as that made six days previously with 5 feet black. I however proceeded (keeping this separate) to the crystallization.

Boiled it to 242° F., when it produced good, hard, sharp crystals; but finding the quantity, by measurement, had decreased very considerably, I took no further note on that head, but gave it white liquor until it was neat, (about the usual quantity,) and produced the sugar, (sample No. 5,) being white sugar, directly from the cane, without refining or remelting.

SIXTH EXPERIMENT.

November 27.—Since the canes for the fourth and most successful experiment were cut, on the 6th inst., the weather has been very changeable. We have had warm Indian summer weather, with heavy rains, also very cold weather, making ice two inches in thickness—thermometer having varied from 16° to 60°. To try the effect of these changes, I cut 1-100 part of an acre, which produced 11 15-16 gallons of juice only, instead of 19 or 20 gallons, as before. It had, however, regained its former weight of full 10° B., but was much more acid, rank and dark-colored than previously. It clarified without difficulty, but raised a much thicker and denser scum; and, when concentrated, was very dark and molasses-like. It, however, produced good, hard, sharp crystals; but the quantity being much reduced, there was no inducement to pursue it further. This experiment proves, however, that this cane will withstand very great vicissitudes of weather without the entire destruction of its saccharine properties.

SEVENTH EXPERIMENT.

Took the proceeds of the experiments that were considered failures, viz., all the third and the poorest portion of the second, viz., 34 lbs. very indifferent sugar—refined it in the open kettle by the old process, and produced 15 lbs. loaf sugar, (sample No. 7,) which is a very full yield for the quality used.

The foregoing are all actual results, produced by myself, (the polariscopic observations having been taken on the spot, under the supervision of my partner, Mr. William Morris Davis,) with no object in view but the truth, and a desire to contribute whatever useful information I could toward the solution of this interesting and important question. They are, I think, sufficiently flattering in themselves to warrant renewed exertions on the part of our agriculturists of the Northern and Middle States especially, and perhaps those of the South also, in the pursuit of this promising branch of industry to the full and profitable development of which it is certainly capable, and which it is destined ultimately to attain. As before mentioned, they have been accomplished without the advantages of the powerful sugar-mill, the vacuum-pan, and the many other improved implements and apparatus now in general use in Louisiana and elsewhere. They are also important and interesting in many respects not apparent to those unacquainted with the subject; it may therefore not be superfluous to make some further explanatory remarks.

1st. The mill used and the power employed in these experiments were much less efficient than those in general use on sugar plantations, and the waste proportionally greater: the loss from which causes I estimate at not less than 10 per cent.

2d. It is well known to all who are acquainted with sugar and saccharine solutions, that by frequent heating and coolings, a considerable portion of the crystallizable is converted into uncrystallizable sugar, and is consequently lost *as* sugar. In these experiments, every parcel was from necessity heated and reheated from 8 to 12 different times.

3d. It is impossible to produce as good results, whether as regards quantity or quality, from small as from large quantities.

4th. This sugar (sample No. 4) is quite dry, and will lose comparatively nothing by drainage. The yield would be considerably greater, if it contained the usual quantity of footing that is contained in the hogshead when sold at the plantation—one of which being weighed there and reweighed in Philadelphia, in the month of July, will be found to have lost by drainage from 100 to 150 lbs., or from 10 to 15 per cent.

Assuming these propositions to be true, I make the following estimate of the probable yield of an acre of canes of ordinary growth, such as I have experimented upon, viz.:

Actual yield as per experiment No. 4,			1221.85 lbs. sugar 74.39 molasses.
Add for inefficiency of mill,	10 per cent.		
For heating and reheating, &c.,	5 "		
For footings, say but *	5 "		
	20 per cent.	244 37	
Probable yield per acre,			lbs., 1466.22 sug.; gals. 74.39 molasses.

Further, it will be observed that my acre produced but 1847 gallons of juice. I have, however, seen published accounts of far greater yield than this, one for instance in this county, apparently well authenticated, reaching 6,500 gallons per acre; which, according to my *actual* results, would produce 4499 lbs. of sugar, and 274 gallons molasses; and according to the foregoing *probable* results, would yield 5389 lbs. sugar, and 274 gallons to the acre. I do not pronounce such yield of juice impossible, but it will certainly be of rare occurrence. A mean between this and my yield would be a large return.

Another subject worthy of notice, is the nature of the season. My impression is, that owing to the lateness and coldness of the spring, and the continued wet weather, the last has been quite an unfavorable season for the ripening and development of the sugar in the juice, to which cause I think a deficiency in the yield of at least 10 per cent. may be attributed, which would further increase the quantity to 1,612 lbs. of sugar, and 81 8-10 gallons molasses, a yield very nearly corresponding with that of the best conducted plantations of Louisiana, as will be seen by the following figures, which I have collated from a minute statement furnished to me by the enterprising proprietor of one of the most complete and costly establishments in that region, (it being furnished with vacuum-pans, and all the most approved machinery of later times, and conducted under his own personal supervision,) of the actual product of one of his plantations of 266 acres, for eight consecutive years. These figures will also furnish useful data for the estimation of the cost of production here, viz.:

Aggregate yield of juice from 266 acres for 8 consecutive years...	4,757,700 gallons.
Aggregate yield of sugar....................................	3,626,425 lbs
" " molasses..................................	217,585 gallons.

* These two latter gains in sugar would be made at the expense of the molasses; taking from it the gain which would be realized by the use of a better mill, and therefore leaving the quantity of molasses unchanged.

COMPARISON.

	LOUISIANA.	PENNSYLVANIA.
Yield of juice per acre	2,236 gallons.	1,847 gals.
Density of juice, (Beaume)	8.44 °	10 °
Yield of sugar per gallon of juice	0.76 lbs.	0.66 lbs.
Yield of sugar per acre	1,704 lbs.	Actual 1,221.85 lbs. Probable 1,612 00 "
Yield of molasses per acre	102 gals.	Actual 74 39 gals. Probable 81.53 "

Wood consumed per acre, 3.87 cords, at $2.50 per cord.

Coal for engine, 0.41 tons, at $2.50 per ton.

Labor, per acre, 3.70 days.

These details have been extended to a much greater length than was at first intended, but perhaps not beyond a useful limit for those interested. To the working farmer they may appear formidable and prolix; but he may, nevertheless, gain some grains of useful knowledge from them to repay for their perusal. The conclusions to be drawn from them will be seen by the following

SYNOPSIS.

1st. That it is obvious that there is a culminating point in the development of the sugar in the cane, which is the best time for sugar making. This point or season I consider to be, when most if not all the seeds are ripe, and after several frosts: say when the temperature falls to 25 ° or 30 ° F.

2d. That frost, or even hard freezing, does not injure the juice nor the sugar; but that warm Indian-summer weather, after the frost and hard freezing, does injure them very materially, and reduces both quantity and quality.

3d. That if the cane is cut and housed, or shocked in the field when in its most favorable condition, it will probably keep unchanged for a long time.

4th. That when the juice is obtained, the process should proceed continuously and without delay.

5th. That the clarification should be as perfect as possible by the time the density reaches 15 ° Beaume, the syrup having the appearance of good brandy.

6th. That although eggs were used in these small experiments, on account of their convenience, bullock's blood, if to be had, is equally good; and the milk of lime alone will answer the purpose; in the latter case, however, more constant and prolonged skimming will be required to produce a perfect clarification, which is highly important.

7th. That the concentration, or boiling down, after clarification, should be as rapid as possible without scorching—shallow evaporators being the best.

With these conditions secured, it is about as easy to make good sugar from the Chinese sugar cane as to make a pot of good mush, and much easier than to make a kettle of good apple-butter.

POSTSCRIPT.

Having noticed in the newspaper reports of the proceedings of the United States Agricultural Society at Washington, a discusion in regard to the propriety of "removing the seed panicles from the canes as they appear, with the view of diverting the energies of the plant from the secretion of starch to that of sugar," I am induced to insert an additional experiment which (with many others,) was withheld from the first edition for the sake of brevity.

EXTRACTS FROM NOTES.

At the time my canes were in bloom, and before the seeds were all formed, I had the tassels of a part of the field removed, under the impression that a part of the sugar in the stalk might otherwise be attracted to the seeds, to form starch. Very soon after this decapitation, a second growth commenced; the latent buds began to shoot into leaf, and new panicles were soon formed. It will be seen that this activity of growth increased the density of the juice, while it diminished the yield of sugar, the per-centage of which indicated, was much less than was shown to be present in canes cut on the same day, whose panicles had *not* been removed:

By reference to page 425, Sept 28, it will be seen that the lower joints of two canes which had *not* been topped, weighed........	212 596	grammes.
That after passing 3 times through the rollers, the bagasses weighed	64 380	"
Leaving, as weight of juice (69.7 per ct.)........................	148.216	"
That the per-centage of sugar in the juice was..................	5.008	"
In the cane..	3.49	"

The density of this juice (though not there stated, through inadvertance,) was 9° Beaume.

On the same day, (Sept. 28,) the lower joints of two canes, whose panicles *had* been removed, were tested as follows, viz:

Lower joints of two canes weighed	215.268	grammes.
After passing three times through the mill, the bagasse weighed...	64.370	"
Leaving, as weight of juice (70.1 per cent.)................... .	150.898	"

The precipitate from the juice was more voluminous than that from the canes which had *not* been topped, and the per-centage of sugar indicated by polariscope was,

In the juice	3.49 per cent.
In the cane	2.45 "
Density of juice	10° Beaume.

COMPARISON.

	With tops and seeds.	Without tops and seeds.
Per centage of juice	69 7	70.1
" of sugar in juice	5.008	3.49
" " in cane	3 49	2.45
Density, Beaume	9°	10°

Statement of Robert A. Sherrard, of Jefferson County.

There have been a very great number of small patches of the Sorghum planted in this county, all as a matter of experiment, and, in every case, proved as successful as could be expected, considering the lateness of the season, together with so much wet, that planting could not be done much before the 20th or 25th of May, which was nearly a month too late for the full growth of the Sorghum, together with a cold wet summer and an early frost, which damaged, as was thought by many, the quality of the Sorghum juice; but by others, who crushed the frosted stalks and boiled the juice, and clarified with eggs and sweet milk, it was thought and expressed that the frosting the stalks had improved it in two ways—it made the syrup clearer and flavor better.

The tops were cut off and the stalks stripped of their blades and fed to the cattle and horses, which appeared to be very fond of it, and the stalks thrown to the hogs, which appear to be fond of extracting any remaining saccharine matter remaining in the stalk. But the farmer may turn the stalks to more profit and better account, by disposing of them, after the juice is crushed out, to the paper maker, to make paper of; or cut the stalks short and soak in the cider trough, and the extract will make excellent vinegar. The juice, when extracted, was boiled, skimmed and clarified, and made into syrup or molasses, of an exceedingly clear amber color and fine flavor, equal if not superior to Orleans syrup, and in no instance to be compared with common sugar-house or common Orleans molasses.

It was generally planted late; the mode, as it was a mere trial or experiment, was to leave out as many corn hills as was intended for the Sorghum. Some farmers planted three seeds in a hill; others put in ten seeds—down to three in a hill, leaving from three to eight stalks to the hill. It was cultivated with the corn. The soil on which the Sorghum grew in this county varied according to location. But the last season past, it grew and flourished best on a rich sandy soil, which being more warm and porous, gave more heat, and let the water off better, than a stiff clay soil. And experience has shown that on such a soil from three to eight stalks may be left to a hill, if planted early.

No man in this county, who raised and manufactured it into molasses or syrup, took time and pains to weigh the product of their small lot, previous to crushing out the juice. But suppose an acre of Sorghum to be planted three feet each way, there would be at least 2,800 hills, with an averge of three stalks to each hill; the number of stalks would be 8,400; allow each stalk to weigh two pounds, the number of pounds would be 16,800, or about 8 1-2 tons to the acre. And as to the number of gallons of syrup per acre, it is probable that the yield would be from 50 to 75 gallons per acre, were it planted early, and well attended by way of cultivation, on a rich warm soil. ROBERT A. SHERRARD.

SUGAR HILL FARM, Jefferson Co., O., Dec. 5, 1857.

Statement of J. Dille, of Licking County.

I planted about one-third of an acre, on the 8th, 10th, and 19th of May last, on a rich gravelly soil. I put it in in drills 3 1-2 feet apart. The unfavorable season, being cold and rather dry, checked its growth till about the middle of August, up to which time it was less than corn planted about the same time, but then it rapidly outstripped the corn, and threw out its seed panicles about the 25th of that month, and its growth was monstrous. The ground was covered so thickly with the crop that it fell down by the September winds, and I consequently lost two-thirds of my planting. Some 20 hills that I planted separately, 4 to 5 feet apart, among cabbages and vines, grew so strong and stoled out so vigorously that they withstood the winds, and gave the best and sweetest canes I grew. Owing to the difficulty of harvesting the fallen crop, I did not cut and work for syrup more than one-sixth of what I grew. The canes worked gave me six small cart loads of about 800 lbs. each, and produced 100 gallons of juice from the crushing mill, which was boiled down to 12 gallons of thick syrup. This syrup, from the want of sufficient experience in the process, as well as of proper apparatus for boiling, retained a slight taste of vegetable bitter, but was every way preferable to New Orleans molasses for the table. Mine was the first made in the county, as it was worked off on the 8th and 9th of September. My own results satisfied me that one acre of such Sorghum as I grew would produce 200 gallons of good thick syrup. The seed for feeding has no great value, as neither cattle or poultry manifest much fondness for it.

The blades and tops are about equal to corn blades and tops as a forage, and no better. In the manufacture of syrup, the canes should be so far matured that the seed will grow not over ripe; then so much cut off from top and bottom as is not decidedly sweet, for otherwise the joints near the ground will yield an insipid juice, without much saccharine matter, whilst two or three joints at the top abound in vegetable bitter, with no sweet.

Ours was ground in a mill, with three iron cylinders, made for the purpose, operated by a horse, with a sweep like a cider mill.

Many of our farmers brought in their canes to this mill, to be crushed and the juice expressed. Towards the latter part of the season, several improvements in the process of boiling and purifying the juice were adopted, which resulted in a very much improved product.

From my observation, the best apparatus for reducing the juice is to have large boilers, 75 to 90 gallons in capacity, sufficient in number for the work. As soon as the juice comes from the mill, it should be treated with a weak alkali, to arrest acidification, as well as to neutralize any acid that may be formed. The milk of lime, carbonate and super carbonate of soda, have been used. Nitric acid has been propossd to check acidification (but not tried so far as I know), before the application of the alkali, which should be applied in very small quantities, say 1 gill of the ley to 15 gallons of juice. It should be immediately put into a large boiler, when the heat should be gradually raised to the boiling point, and as the fecula arises to the top it should be skimmed off. When the feculent matter is pretty well removed, the juice should be poured into a tall tank, with several stop-cocks, where it should stand until the remaining fecula settles. To strain it into the tank would be well. Begin then to draw it off by first turning the upper cock, working down by degrees to near the bottom, as long as it flows off a clear liquor. This should be put into boilers, where it is hurried by a rapid heat until it is reduced to about one-fourth of the original quantity. It should be again put into another similar tank, either through a woolen strainer, or filtered through animal charcoal, when after subsiding it may be drawn off as before, and boiled down to the required consistency for syrup. Treated in this way the product will have the color of golden syrup, and the taste of nice strained honey.

With proper apparatus, I think on good land, and the crop well cultivated, and convenient to the apparatus, the syrup will cost to produce it about 25 to 30 cents per gallon, and a fair profit can be realized wherever it can be sold at 50 cents per gallon.

I have used it in my family, and we find it very acceptable on hot cakes, and for domestic ginger cakes. J. DILLE.

Statement of Douglas Brothers of Muskingum County.

TO V. BEST, ESQ., *President Muskingum County Agricultural Society:*

SIR:—At your request we now give you a brief statement of the results of our experiments in the manufacture of syrup from the Sorghum or Chinese sugar cane.

Last spring we ordered from Messrs. Emery Brothers, of Albany, a small lot of seed; they sent us a portion of seed raised by Colonel Peters, of Georgia, also a small lot of imported French seed. We also ordered a small lot from Messrs. Pascall, Morris & Co., of Philadelphia. A portion of these seeds we sold, the balance we gave away for the purpose of having the experiment thoroughly tested by experienced and practical agriculturists, with the promise that we would furnish the machinery and apparatus necessary to convert the juice of the cane into syrup. We will here state that a considerable amount of seed was sold in our city by dealers in garden seeds, and that a large amount was distributed through the Patent Office. Our firm being engaged in the foundry and machine business, we constructed for our own use two Horizontal Sugar Mills with three rolles, 7 inches diameter, 15 inches long, the two bottom rollers with flanges, the top roller without flange, working between the flanges of the lower rollers. We worked this mill by steam, driving it by a belt from the main shaft of our machine shop, and making about twenty-five revolutions per minute, crushing out about one hundred gallons of juice per hour; but after the cane was injured by standing in the field subject to a very heavy frost, the canes would break off at their joints, and we only then pressed out about thirty-five gallons of juice per hour. With one mill we were able to press out a large per cent. of the juice, say from 50 to 75 per cent.

We had two iron kettles of 75 gallons each, and one of 42 gallons, set in brick masonry, our flue being very imperfect and a large surface of the bottom and sides of the kettles exposed to the fire.

The second mill and range of kettles was not used, as we found we could work up all the crop at our works. With one mill and one range of kettles, we averaged about 40 gallons of syrup per day, and manufactured 1,073 gallons on shares, paying the farmer one-half. We worked up cane for 46 different persons. The smallest amount for one person being 2½ gallons, and the largest amount being 228 1-2 gallons. We sold our syrup at retail at from 50 to 75 cents per gallon, and a large portion of it was pronounced equal to the best New Orleans molasses—many pronounced it, to their taste, better and more pleasant.

Several lots were raised from 15 to 20 miles from this and brought in on wagons, stripped ready for the mill. One lot raised by Mr. Gardiner, near Pleasant Valley, about 8 miles from this city, excellent cane, raised on rich bottom land, averaged 600 gallons per acre.

We used lime and the white of eggs with skimmed milk, only using a small portion of lime in the first kettle to neutralize the acid, which we tested with the blue test paper, and about 2 dozen eggs and 1-2 gallon of milk to 75 gallons of juice.

On the 24th of October we boiled the juice as an experiment for the first time, without using anything to clarify the juice. We noticed that the juice was sweet, not affecting the test paper in the least, the frost seeming to have sweetened the cane juice. We succeeded well, the flavor of the syrup we thought more pleasant, and brighter in color, and we continued to boil the juice as it came from the mill.

On October 30th, the "saccharometer" stood in the juice at 9°. We will here mention that we procured a silver saccharometer and copper dipper from Messrs. Jones & Co., New York, an excellent article—boiled the juice to-day without using lime or eggs—made an excellent article of syrup.

November 2d. Juice 8 1-2°. Used to-day a small amount of lime water in the first kettle.

November 3d. Juice to-day stood at 7 1-2°. Cane had been cut several days and piled in bulk—was much mildewed—the cane therein was good, but when hauled in was damp from having been exposed to heavy frosts.

November 9th. Juice to-day showed by the saccharometer a density of 9°. The greatest density we noticed was 9°. We tried to make sugar, and although the syrup grained, we were unable to separate the molasses from the sugar.

We worked a force of 4 hands, 1 man and 1 boy at the mill, and 2 men at the kettles. We boiled about 15 hours in the 24. If our kettles had been properly set in the range, and had been increased by 2 clarifiers of 80 gallons each, we could easily with the same force have doubled the amount of syrup manufactured, and with the aid of another man to watch the kettles at night, and boil without stopping, except to clear out the kettles, could have easily made 100 gallons syrup per day, at an expense of $8 per day, viz: $5 for labor and $3 for power and fuel, or 8 cents per gallon for the expense of manufacturing, and as an acre of good cane will produce not less than 250 gallons, and would pay handsomely at $20 per acre or 8 cents per gallon, the farmer who is prepared to make molasses can realize the handsome profit of $10 per acre for manufacturing when the syrup is sold at 20 cents per gallon. The cost of mill, kettles, &c., will be from $200 to $300. If a more powerful mill and a range of kettles of large size be used so as to work up a crop of 20 to 30 acres of cane, the expense of manufacture will then be considerably reduced. We believe on a larger scale, where 25 or 30 acres of cane is planted and worked up, the syrup will prove profitable at 15 cents per gallon, when wheat is only worth 80 cents per bushel, and corn only 25 cents, which is the price of these articles with us, at this time.

We are satisfied, from our experience the present season, that the Chinese cane is destined to become one of the principal productions of our country—that it will prove as valuable a crop to the farmer as either wheat or corn. The cultivation being as easy and pleasant as that of a corn crop, and the manufacture of the syrup possessing a fascination that will make it a favorite occupation with the farmer.

We also believe it will be conducive to health, being highly beneficial to those of consumptive habits—the sugar house or syrup boiling will become a favorite place of resort during the boiling season, to those who labor under the destroying effects of that disease, and the use of the syrup more generally in our families will prove highly beneficial to health.

In conclusion we will state, that we have had the green scum off the kettles distilled in a copper still by a practical distiller, and that he has made an article of spirit pronounced by experienced distillers to be an excellent article; he is now experimenting with the scum from the last kettle and we are certain he will be able to produce an excellent article of rum from this scum. He is so well satisfied of the merits of the cane for alcohol purposes, that he intends to plant next year 20 acres in sorgho for the sole purpose of distillation.

Mr. Jones of Dresden, in this county, a large distiller, has made from 25 gallons of this juice, 6 gallons of spirit, 25 per cent. above proof, and pronounced to be equal to Catawba brandy.

We manufactured for A. Howard, 72 gallons syrup; J. B. Blair & Co., 101 1-2 do: Peabody, 143 do; Edward Ball, 228 1-2 do.

The largest amount made in one day being 58 gallons, and the next largest amount 57 gallons. We averaged about 40 gallons per day. We found it required about 6 gallons of juice to make one gallon of syrup of the density of 34° by Beaume's saccharometer.

One hundred stalks of cane raised by Edward Ball weighed 112 lbs. After being pressed, the stalks weighed 57 lbs.

Respectfully yours,

DOUGLAS BROTHERS.

Statement of Daniel J. Naeff, of Preble County.

MY PROCESS OF MAKING MOLASSES.

To ten gallons of juice add half a teaspoonful of the cream of lime, and half a pint of skimmed milk.

MY PROCESS OF MAKING SUGAR.

To the juice, as soon as placed in a kettle, add half a teaspoonful of cream of lime, one pound of finely ground and freshly burned bone black, the whites of four eggs and half a pint of skimmed milk; put it over a slow fire until the scum rises, then strain it, then boil it until a thermometer placed in it will indicate 220 degrees, then strain it and boil it to 240 degrees, then pour it in a drip and you will get sugar.

DANIEL J. NAEFF.

Statement of Henry Gardner, of Portage County.

FREEDOM, Portage County, O.,
November, 27, 1857.

P. B. Conant, Esq., Secretary Portage County Agricultural Society:

SIR:—In accordance with your request I herewith send you an account of our experience in cultivating and manufacturing sugar from the Sorghum. On the 28th of May last we planted one acre on sward ground turned over in the fall and exposed to the weather through the winter, and harrowed thoroughly in the spring, after which it was marked out into rows four feet apart. The seeds were also planted four feet apart with four to five seeds in a hill. It was cultivated the same as corn, being worked out three times with a cultivator, and hoed once. It grew remarkably slow for about two months, and about the middle of September it began to head out. The soil was a clay-loam, without manure. On the 18th of October, being fearful of frost we cut seven thousand canes, which was all that were ripe enough to make syrup. These canes were rolled and juice boiled, and the result was fifty gallons of thick syrup. Six gallons of juice yielded one gallon of syrup, but if the canes had been ripe five gallons of juice would have yielded the same. After this we cut and shocked up the unripe cane for fodder, and when cured there was three tons of it, a ton of which is equal to a ton of the best hay. The season was quite unfavorable for the growth of the cane, but in a favorable season I believe that it will do well in our climate, and with the same culture given to corn 200 gallons of syrup may be made on an acre. The best way to plant it is in drills four feet apart, the seeds one foot apart in the drills. In this way 25,000 or 30,000 canes may be grown on an acre, under favorable circumstances.

GRINDING AND BOILING.

The canes on being hauled to the mill are placed convenient thereto and are forced one by one between the rollers, care being taken to have the butts (which are very hard,) pass singly. Four or five canes are kept passing between the rollers, which are kept in as close proximity as the strength of the horses will admit. As soon as the juice is expressed it is conveyed to the boiler, which is a shallow pan, the bottom of which is of iron and the sides of wood, so arranged that the fire only comes to the bottom, which prevents all danger from scorching, which injures the flavor. The juice is at first heated slowly until the green scum ceases to rise; this is then removed and half a teacupful of refined saleratus, added to sixty gallons of juice. This causes the remaining impurities to rise to the top, and also neutralizes the phosphoric acid contained in the juice. The fire is then increased and the juice boiled down as soon as possible. When it hangs down in flakes half an inch from the edge of the ladle it is considered thick enough and is immediately taken from the fire.

THE MILL.

This was of wood, made somewhat like an apple mill, only the rollers are turned smooth, with cogs at the top. The rollers are two in number, each twenty inches in diameter, twenty-four inches long, one of which has a shaft run up, to the top of which is attached a crooked sweep about seven feet from the ground. A box is fixed underneath large enough to catch all of the juice. Such a mill may be built for about $25, and will do for a small business, but for larger operations an iron mill with three rollers would be necessary.

The Sorghum, though but recently introduced is, I believe, destined to become an important product in the Northern States, not only as regards syrup, alcohol, and perhaps sugar, but as a fodder plant. We have fed it to milk cows several weeks in succession, and the effect was an increased flow of richer milk. Horses and sheep also devour it with the greatest avidity, both stalk, leaf and seed. The story going through the papers that the tops and seed of the Sorghum is poisonous is undoubtedly false, for I have seen cattle eating it, day after day, without any bad effects.

Respectfully yours,

HENRY GARDNER.

Statement of E. Carpenter, of Warren County.

Chinese Sugar Cane has been successfully grown on all kinds of soil in this county the past season. Broad-cast, in drills and hills, and when planted by the first of June has generally matured the seed.

Experiments have been numerous in the county in manufacturing molasses from the juice of the cane; many have failed to make a good article from a want of the proper knowledge in managing the juice and the want of suitable apparatus. Others have succeeded in making an article quite equal to good New Orleans molasses, and a few specimens have been exhibited equal to the golden syrup. All agree that with the requisite practical knowledge a superior syrup can be manufactured for twenty-five cents per gallon. There were several entries made for the premium of $20 offered by this society for the best conducted experiment of $\frac{1}{8}$ of an acre, but all failed to comply with the requisitions. The board awarded to Mr. McKever a discretionary premium of a silver cup worth $10, for his sample exhibited and the detailed statement attached.

From the experiments that have been tried as a fodder substance, we have many other plants that I think far superior to it. Stock are fond of it when the saccharine matter is formed, which is about the time it commences heading out and increases until the seed is perfected, and from experiments, some time after. The outside cuticle becomes too hard for mastication by any stock but hogs, and has to be cut fine in a cutting-box, which requires too much labor at a season of the year when most stock is doing well on pasture, a patch to be used in case of drouth and failure of pasture would be convenient. On account of the great amount of sap contained in the stalk it cannot be cured for winter feeding; if it could be dried the hardness of the outside covering would render it useless unless cut and steamed before using.

Yours, respectfully, E. CARPENTER.

Statement of M. Keever.

Thirty-five rods planted 8th and 10th of May; stalks 16 feet high, perfect seeds, sandy soil, southern exposure; commenced manufacturing in October; last crop best, not frosted. Boiled in iron kettles out doors; boiled fast; clarified with saleratus and lime; saleratus and milk best; made 10 gallons per day with two kettles and two men; feed to hogs, cattle, horses and all stock; made at the rate of 350 to 360 gallons to the acre.

[The illustrations in the foregoing article were kindly furnished us by Hedges, Free & Co., of Cincinnati, who have all the utensils for sale.]

THE DAIRY AND ITS PRODUCTS.

Although we have taken all the care possible to elicit information upon this important topic, yet our information is so limited that we are unable to present the subject in as prominent a position in our report, as the interests involved in it evidently demand.

The produce of the dairy in Ohio, although very large, is not nearly so great as it might be if the attention of our people was directed to this branch of agricultural economy. Some of our northern and eastern counties send large quantities of butter and cheese to market, as, for example, Columbiana, which sells 750,000 lbs. of butter; Portage 170,000 lbs. of butter, and 2,500 tons of cheese; and one township in Summit county reports 639,756 lbs. of butter, and 600,000 lbs. of cheese, as the produce bought by one firm. Another township in Summit county, owning 2,017 cows, reports their produce at $73,238 27, distributed as follows: Cheese, $43,768; butter, $21,603 07; pork, $4,840 80; calves, $3,025 50, which gives a yield of $36 31 for each cow per annum. Huron county reports, if we are not mistaken in the figures, 5,000,000 lbs. of butter as its product. The business of the dairy is so productive and profitable that it deserves attention in every county in the State, where the soil and other conditions are suited to it.

We are unable to present any new information in reference to the mode of manufacturing butter and cheese, other than is found in its appropriate place in the report of the judges, on page 157; but are satisfied, nevertheless, that great improvements might be introduced, to secure the largest yield, at a much smaller cost than is at present attendant upon the production of these articles. A few counties report patent churns for butter, and patent or improved vats, heaters, and presses for cheese making, which save time, labor, and money, consequently, and afford a larger yield of these articles.

The average yield of butter for a cow is variously estimated or stated upon a carefully made observation, at from the lowest, 125 lbs., to the highest yearly product stated, 300 lbs. Some reports show a yield of butter of 12 lbs. per week for a single cow during the better parts of the season, and we may safely place the average yield at 275 lbs. for ordinarily good cows, properly cared for, and fed, housed, and pastured in a suitable manner.

A single cow will, under like favorable circumstances, produce from 200 to 400 lbs. of cheese, and will average, in an ordinarily well stocked and conducted dairy, 300 lbs. or more.

Although the information we have been able to glean from our reports is much less than we should desire, yet we are glad to be able to state, that, in a large majority of the counties from which we have been able to gain any intelligence upon the subject, a steady increase in the produce of the dairy is noted, while in a few instances the number of cattle kept has reached its highest proper limit; and hence in such few isolated instances, nothing more can be done than to improve the mode of manufacture, to insure an increased yield, and we hope to see this take place.

The price of butter ranges from 10 cents to 30 cents per pound, varying with the season, the market, and the relations of supply and demand. The price in most parts of the State ranges from 12 cents per pound during the spring to 20 cents per pound during the winter, while the cost of producing it hardly exceeds 6 cents per pound as the average for the year. The cost of producing, however, is subject to many modifications, affected by the season, breed of cows, cost of feed, price of labor, &c., but can scarcely ever be so great as to make the manufacture of butter and cheese unprofitable to the economical farmer.

The price of cheese may be placed at 8 cents per pound as the average, with a range from 6 to 15 cents, while the cost of producing it will, with economy, seldom rise above 5 1-2 cents per pound, and is generally below that price, so as to insure an average profit to the maker, which will make the business remunerative.

The breeds of cows which are preferred by almost all our correspondents, for dairy purposes, are the so-called native stock, or these crossed with the Devonshire breed. The Durhams and their crosses, although large and fine animals for the butcher market, are pronounced inferior to our old-fashioned native breed for all dairy purposes.

The native breed is small, reaches maturity early, is hardy, and an excellent milker, both as to quality and length of time it continues in milking condition, and crossed with the Devonshires produces a larger animal, but one still possessing these good qualities in a great degree. But at the same time these larger grades seem to require more feed and greater care in proportion to their yield of milk; and if the additional care given to improved stock were bestowed upon our native breeds, an improvement would be brought about in them scarcely now thought practicable by our farming and stock growing public.

It is, we believe, an error to attribute all the superior qualities possessed by the breeds termed improved, to the blood or race of the animal, because these breeds being in repute and often obtained at a great expense, much more care is bestowed upon them, and they are thus in a manner, perfected by extra care, which if devoted to our own, less expensive breeds, would effect very advantageous results. Within certain limits the power to improve and modify all the objects placed within the hands of man is indefinite, and we have probably not reached the ultimatum of improvement in regard to any single object which has engaged his attention and called forth the energies of his mind, and we believe that very much indeed, is still attainable in the whole range of the dairy business, raising stock, feeding, caring for, and improving the animals, and obtaining the largest produce at the smallest cost of time and labor.

The following excellent article on butter making is by

SARA FARQUHAR.

Come with me to the *locale* of one of the fairest pictures within the halls of memory—the surroundings of a dairy on the Juniata, placed there by the hands of woman. In their early life, Mr. and Mrs. S. were poor. With what would now be expended in a bridal tour, they purchased a wild piece of land on the Juniata. That she might be a help meet for her husband, Mrs. S. designed establishing a dairy, and the first step taken was to induce him to sow a large meadow with clover. Some good cows were purchased, and at the base of a knoll near the dwelling round which a branch of the river went dancing and singing all through the long summer, a good substantial spring-house of blue limestone was built, both convenient and extensive, being divided into three departments: that on the upper side for an ice house, the middle one for milk, the third to perform the labor in during inclement weather. In this room there was a stove for winter; in the inner room a thermometer was hung, that she might see that the air there was always unvaried in temperature, as near 40 deg. as it could be kept. Through the milk room stone troughs were placed, one end being in the ice room for the water in dripping from the ice, to flow through. On three sides of the room just over the trough, broad white shelves were placed for the milk in winter, and on the fourth were others for butter; the walls and ceiling were as smooth and white as plaster and lime could make them, and the stone floor clean as a lady's parlor. Opposite there were windows of wire gauze and glass, both sliding to use as needed, and shutters outside. A large willow standing near the spring, threw its sloping branches over the milk house, and a clump of fine cherry trees rained white blossoms on the roof in spring. Under the former, white tables and benches were placed for the bright tin pans and buckets in summer, and here all through the long summer days they were seen, giving bright evidence of their owner's cleanliness.

Mrs. S. was a quiet woman, and made no parade of what she was doing; but she dropped a few seeds here, planted a sprig there, till her dairy grew into a thing of beauty. The back yard was a broad flat, terminating in a rolling bank, descending to the run of water, over which was thrown a neat foot-bridge joining the spring-house yard. Around the whole enclosure ran a tall privet hedge, before which gleamed hollyhocks and four-o-clocks, like banners of crimson. Flowers of every hue bloomed in the foreground, like bright-eyed children, they even clambered over the stiles leading to the barn and meadows. Broad stone steps descended from the yard to the bridge, and from the back piazza to the dairy porch roof, a covered grape vine arbor was thrown for shelter in going to and from the milk house. Within this on each side were beds of violets, and all along the water and the banks rolling up to the dairy walls, a carpet of the same fair flowers were spread. Climbing up the trees, twining round the arbor trellis work, twisting in and out through the railing of the bridge, festooning the windows and doors of the dairy, there were roses of all hues that roses wear, honey-suckles, sweet-scented and coral, beds of myrtle and forget-me-nots, and the "ivy-green," creeping all through the crevices of walls and pavement. Johnny-jump-ups laughed at us from under the shadows of hedge rows, mignonette, heliotrope and thyme sent up their reviving odor. Walking or sitting, we had flowers for company. The dairy was cradled in flowers.

"But," says the homely disposed matron,—"*Where is the butter?* Don't tell me any body wasting her time planting and tending all such things, ever made good butter, or enough of it to sell, if she had fifty cows, unless she hired a girl to do it for her."

But I tell you she did, though, and such butter too that she was famed for its making all through that region of country. And what is better, she never failed. The result of many experiments, was the following system, which she adopted, invariably following it with success. I can say nothing better or more to the purpose, than give her directions as they were given to me, when I asked for advice on the subject.

THE COWS AND THE FEEDING.

After your meadows are well set in clover,—for you must stipulate with the men for good pasture, or you cannot be sure of premium butter,—first, from a good stock, select quiet, kindly disposed cows, with no vicious propensities, and then treat them well. To beat, shackle, chase or worry a cow, is to ruin her. She will not be forced to do anything; if kindness does not cure her of a bad habit, compulsion will not. As both the quantity and quality of milk is influenced by the cow's condition, her well-being is of the greatest importance. And as *different kinds of food* affect the quality of butter, attention to her feeding is the next consideration.

For making sweet yellow butter, nothing is better than clover grass. During the season for pasture, let her roam and feed at will, in rich pastures, with running water, and trees for shelter. Every farm should be well supplied with this fragrant grass, and none, however productive or well ordered, are complete without ample fields of clover. Any kind of feed that makes a cow thrive and milk well, will not insure sweet yellow butter. In winter, cows should have clover hay and a good rich slop twice a day, made of bran, with shorts, salt and potatoes cut up for one-half, the other half must be corn-meal scalded, as it is the *corn meal* and *clover hay* that give to butter its sweetness and golden color. Regularly, morning and evening, she should be thus fed, with access to sheaf oats, corn fodder or wheat straw during the day. Potatoes increase the quantity of milk, corn meal improves its quality.

Cows must be sheltered during inclement weather. None need say they cannot afford to build stables for all their cattle. A space enclosed with rough boards and roofed, with plenty of straw for bedding, and a rack of hay to eat at, will make a cow comfortable, where she will lie and chew her cud contentedly, while others with less careful or feeling owners, are shivering in their rough coats out on the bleak snowy hill-side.

THE DAIRY HOUSE AND UTENSILS.

Before commencing to make butter, a cool place for the milk must be provided: but any cool place, where it can stand undisturbed, will not do. A cool cellar where vegetables are kept, or a cold spring-house illy ventilated, will not do. Butter and milk readily absorb foreign substances floating in the air, and are easily tainted in this manner. No butter can be sweet kept in an impure atmosphere: I have known the effluvia rising from vegetables or a lid of some kind of wood, and confined air, to ruin butter. One good butter-maker had her butter rendered unfit for market, by its being placed in a cool, but illy ventilated spring-house, the musty air impregnating it to such a degree that it was unfit for use. A syphon is the best means to ventilate apartments with, from its easy application and thoroughness. In a cellar, the chimney will do for the long arm, and a tin tube four or five inches in diameter, and as many feet in length, will do for the short arm. In a spring-house, make one of tin, the long arm projecting through the roof, the short arm within the apartment. Gases or impure air will rush into the short arm and ascend through the other, thus establishing a current in the room. Purity in all things connected with milk or butter, is of great importance, for the reason that both are so readily tainted. The walls and ceiling of a milk-house must be kept perfectly clean and pure with lime, that the milk may stand uncovered, the lid or confined air under it, being almost sure to taste the milk. And for this reason the least porous bodies are best for pans, buckets, churns, etc.; tin is best for the former, and cedar wood for the latter, also for the butter bowls and ladles. All utensils, after being used, must be washed immediately with soap suds, then scalded, and afterwards cooled by being rinsed in cold clear water, wiped and placed in the sun or air to dry. *Purity* must be the handmaid in butter making.

TEMPERATURE AND CONDITION.

But these directions thus far may be followed without success at all times, if the temperature of the milk and cream is not equable, and of the right degree.

Temperature is of the greatest importance to insure success. If the milk is too cold, or down to the freezing point, the cream cannot rise, nor will it separate from the milk, if too warm. If the cream is too cold, it will froth and swell in churning; if too warm, the butter will be scalded—in both cases, it will be white, crumbly or spongy.

The milk and cream must not be suffered to pass through extremes of heat or cold: if it has been too cold, then raised to the right temperature, the butter will betray it in its pale color and texture. For this reason, an ice house in summer, on one side of the milk room, and a stove on the other, in winter, I find necessary, to regulate the temperature of the atmosphere. When butter-making is followed as a business, and prime butter must be made regularly, a thermometer is necessary.

Many persons think the cream must be sour before churning, or the butter will not separate. I have experimented with both, and find this is an error. When cream is soured by placing near a fire, in cold weather, the butter will be bitter. It is better to churn it sweet from the pans, than to thicken it by artificial heat. In no case must the cream either before or after skimming, be permitted to stand till it acquires an old taste, or the butter will not be fresh. Frequent churnings are best in a dairy of several cows; daily, is better than to risk tainting the cream by letting it stand too long.

CHURNING AND HANDLING.

First, scald the churn, then cool it well with cold water. Test the cream with a thermometer; have it cool, but not as cool as it was when standing in the ice water. The floor, if stone, in a good spring house, is generally cool enough for the cream-pot, and taken from there, it can be churned in summer without raising its temperature. As near as possible, have the cream for churning about fifty degrees the year round. Churn, neither too fast nor too slow, but with a regular, brisk motion. When done, either scald and cool the butter bowl and ladle, or wet them well with butter-milk, to prevent the butter from sticking. Do not put any water on it while working, but press every particle of buttermilk out of the butter, as it is this that sours and renders butter rancid. When all the milk is pressed out, add fine white salt, and work it well through the butter. If for immediate use, either make it into rolls or prints, to suit the taste; place on a dish, or in a sweet vessel, and let it stand on the shelf, or in the ice water trough, according to the season. That for keeping, must be carefully packed down firmly in small sized jars—stone is preferable—one churning in each jar. The harder it is pressed down the better, to exclude the air, filling each to the top, and then cover by first tying a silk oiled cloth or prepared bladder over the mouth, drawing the string as tightly as possible; then just below the rim, draw a strip of the same material round the neck of the jar quickly, after running a line of warm sealing wax the whole length. This will hold the cover down securely, and exclude the air. Or, if preferred, fill each jar within an inch or two of the top, then fill up with a pickle made of fine pure salt and loaf sugar, and tie a cover over securely. To carry a distance, I prefer the former.

But, after all, it is the quality of the butter *when it is put in the jar*, and not on any other method of packing, on which its keeping sweet depends.

CARRYING TO MARKET.

Butter designed for market, may be conveyed in various ways, but I have never seen any arrive in better condition than by having it carried in a safe. Mrs. S. has one of cedar wood, five feet square, with shelves extending from side to side, about six inches apart. On each, a clean white linen cloth is spread, on which prints of butter are placed, each enveloped in a white linen cloth, wet in summer, but dry in winter. The closer the rolls are packed, the better they will carry; in warm weather, ice among them at intervals, aids in keeping the prints firm. The safe has side lids with falling hinges, each one serving for a table on which the butter may be drawn for customers to inspect. The box may be made with or without feet, and of any solid wood devoid of odor; pine wood will ruin the butter; cedar is preferable, though I have seen them made of well seasoned oak, walnut and cherry. The prime order in which butter always arrives at market carried thus, causes it to bring a higher price than other lots as good, but in bad order, thus well rewarding the owner for all his trouble.

CONCLUSIONS.

To make butter then that will *keep sweet*, all these directions must be followed; if any are neglected, we cannot insure success. *Food*, *purity* and *temperature* are the three great requisites in making sweet yellow butter; pressing all the buttermilk from the butter, is as necessary for that designed for keeping.

WHY MR. B. FAILED.

The management of the dairy, though a woman's business, requires the co-operation of men, if they have the feeding of the cows. Those giving milk, *must* be fed on what the women know will produce yellow butter. The husband must do his part by providing proper food, by attending to the cow's condition, though not as Mr. B. a neighbor of Mr. S. does. He thinks all well-fed cows *ought* to make yellow butter, and if they do not, why "of course it must be the women's fault."

"How is it, my dear," he one day said in my presence, "that we always have white butter in winter, when at the same time our neighbors have sweet yellow butter?"

While speaking, a bit of the butter was held up on the point of his knife, an ugly smile curling his lips into something like scorn.

"As I have often said, I think the difference in our butter is caused by the different method of feeding." Mrs. B. said this with an effort, but firmly.

"Pshaw! stuff!" was the elegant rejoinder; "I'll leave it to Miss —— here, if my cows ain't in as good order as any belonging to Mr. S."

And so they were. In summer they had "plenty of grass," as he said, and in winter were "kept fat on oats, rich slop, with as much fodder as they would eat."

"No," as he again said, "the fault must be in Mrs. B. She had lost her art—she didn't manage right, *somehow*."

Nor did she, in attempting to do that which could not be performed with the means she was forced to use. Mr. B. had established a dairy, intending to furnish city customers with the best article, his wife being an experienced butter-maker, having successfully carried on the business during her first husband's life-time.

His failure in supplying the market with premium butter, was a great mortification to Mr. B., but he would not be convinced of his error; he went on, fattening his cows by feeding them on oats, or if corn meal was given, it was fed raw, until the business was given up in disgust; for he could not succeed while feeding on his own plan, nor would he try any other.

PRIZE ESSAY ON DITCHING.

BY J. BRADY, OF OXFORD, O.

Much of the land in the North-Western Territory, when first visited by white men, was wet and marshy. The early settlers were, most of them, from hilly or mountainous regions of country. The wetness of these lands was, to them, a very weighty objection, being so unlike the hills and dales, rocks and ravines, to which they had been accustomed. It was, indeed, a serious objection. Though the natural fertility of the soil was much lessened by the excess of moisture upon it, and sickness was produced to a very great extent thereby, yet there were many evident advantages, not possessed then, and that could never be possessed, by the States and countries whence they had emigrated. Many allowed a few objections to outweigh numerous advantages, and, therefore, remained in their "upland homes," living and dying where their fathers had lived and died. It was found, however, that when the dense forests, with their almost impenetrable undergrowth, had been removed, thus allowing evaporation to take place; and when the logs, some of which had laid in their beds for scores of years, and the brush, so abundant, had also been removed, thus opening the natural channels for surface drainage; and when plowing loosened the soil, allowing absorption, much land, which had before been esteemed quite wet, became sufficiently dry. But, with all that had been done in this way, much land still remained, and even yet remains, either too wet to be cultivated at all, or so wet as to materially injure the crops upon it. What can be done to remedy this evil? Drainage, by means of open or covered ditches, is the only sufficient remedy that has been proposed.

It is but recently that ditching has received any attention in the West. Even now, it by no means receives that earnest attention to which, from its importance to the agriculturist, it is so eminently entitled. In England, Scotland, Holland, and other countries of Europe, its value has been known for many years, having been tested by many and most successful experiments. In our older States its worth was sooner proven; but in Ohio and Indiana, and the Great West generally, land was too abundant and cheap to justify the labor and expense necessary to ditch it. Lands that were considered permanently wet were long passed by. Others, less wet, were purchased by those who hoped that, when the country was opened to the wind and the sunshine, they would become dry enough for pasture lands. These, however, long commanded but low prices. Those who had wealth in store purchased some of them, in the expectation that, as population became more dense, and adjacent lands increased in value, their value must ultimately increase; and some purchased them who had not the means to purchase higher priced lands: but the idea of draining them, so as to make them dry enough for all the ordinary crops of the climate, and even dryer in a wet season than the rolling lands, had scarcely been conceived by a single Western man, twenty-five years ago. Open drains were used by a few, as far back as the period named; but covered ones, which, in all practicable localities, have now the preference, had seldom then been thought of.

An excess of water on and near the surface is the grand cause of the evils to be remedied—evils which I will specify with more particularity hereafter. The extremes of too much moisture and severe drouth are both caused by this excess. This may, to many, seem a contradiction, or even an impossibility; but the facts in the case, as will be seen, place my assertion beyond controversy. An observing writer, a few years ago, remarked as follows: "Perhaps the greatest evil the farmers of Ohio have to contend with is the tendency of our climate to extremes of drouth and moisture." This is not less true of other Western States than of Ohio.

In the Old World, so far as remedies for these extremes have been sought and employed, irrigation has been used to prevent the former, and drainage the latter. Except for gardens, irrigation has not been used in this country at all. The labor and expense necessary in employing it are too great, to allow it to be extensively used in a country in which lands are so cheap, and the prices of the products of the soil so low. Irrigation has been chiefly used in tropical climates, where the causes of drouth are very different from that which I have mentioned. In such countries it often becomes a necessity, but such can never be the case here. Drouth, as usually produced in our country, is best remedied by drainage. The same writer mentioned above, says: "The best means of guarding against both these extremes are deep culture and thorough drainage." Again: "Well-drained lands, and those worked to an extra depth, do not suffer from excess of wet, nor of drouth, to near the extent that other lands do." Another says: "Drained land is much dryer in a wet time, and more humid in a dry time." If this is correct, as experience will prove, then irrigation becomes useless to us, because in drainage we find a remedy for both the evils sought to be remedied.

If drainage is so beneficial, two questions naturally present themselves: 1st. When is it necessary to employ this remedial agent? and, 2d. What classes of lands are especially improved thereby? In answer to the first, I will say (using the language of another), "whenever and wherever so much moisture exists in or on a soil as to saturate it, it should be removed." It has been said, also, that whenever water can be seen on the surface for three hours after the harvest rain, drains are needed. I will not vouch for the latter as a standard that can be implicitly adopted; yet, on valuable lands of most varieties of soil, it will, perhaps, be a sufficient guide. To the second, I answer that the most general classes are: 1st, the swamp lands, still so abundant in Ohio and Indiana, including those covered with small ponds or lakes; 2d, all that class of lands, more extensive than generally supposed, known to farmers as *cold* and *sour* lands.

In these two classes, the evils, though produced by stagnant water in each case, are yet very different in their effects, and in the labor and perseverance necessary to remedy them—the former class being much more readily made dry than the latter.

In swamp lands, the water is generally kept upon them by higher surrounding lands. This higher land is often a mere narrow ridge, sometimes but little higher than the land to be drained. Drainage, in such cases, is usually effected by cutting a passage through this higher ridge to such a depth as to draw off the water from the surface and beneath it, thus leaving the soil dry. This being chiefly made up of sediment, whose lightness and porosity have not yet been destroyed, is at once productive. To merely cut a single drain, to serve as an outlet for the excess of water, is, in some cases, quite sufficient. In other cases, besides the main drain, a few sub-drains leading into it are necessary: but, from the natural looseness of the soil, a small number will generally suffice.

In the *cold, sour* lands, the evil arises from two causes: 1st, the land is too level to allow a sufficient surface drainage; 2d, the subsoil consists of a tough clay, or other material, of such close texture as to permit the surface water to pass through it very slowly, if at all. Consequently, when heavy rains have fallen, too much water remains on the surface, or in the adjacent soil. It becomes stagnant, and in this condition, instead of furnishing *food* to the plant, as it should do, it becomes a *poison* to it. It prevents the decomposition of *vegetable* matter, and the appropriation by plants of this and the surrounding *mineral* matter, which, together, form so large a portion of their food. It causes land to bake in summer, and heave in winter, thus injuring, if not wholly destroying, the crop. To the roots of plants, it prevents the access of air, with its enriching properties, so essential to their vigorous growth and early maturity. Evaporation takes place, causing the *coldness* complained of, and vegetable acids are formed, causing the *sourness*, so that these lands are truly *cold* and *sour*. In proper proportion, these vegetable acids are really useful, but it is the *excess* of them that is productive of so much harm. The soil being cold, and the crops, consequently, late, they are much more subject to rust, blight, mildews, and frost, than those on warm lands. Many of the most profitable crops of the latitude cannot be produced on such lands, because of their coldness, and consequent delay in ripening vegetation. Instead of loose, enriching earth, the plow turns up clods; instead of heavy, abundant crops, much of it for market as profit on his labor, the husbandman gathers in a scanty return for his toil, and, with all his prudence, is barely enabled to make "ends meet." Much of the sickness of new countries is produced by these stagnant waters. They produce also many insects that become a pest to the farmer, and some of them to the whole community. For all these and other such results of this great evil, thorough drainage is an effectual remedy. The soil when drained only retains so much moisture as is necessary to the best growth and development of the crops. The causes of coldness and sourness are removed, and, in their stead, are placed sources of fertility, making that productive which was once almost barren, and that valuable which was once quite worthless. The change is much more gradual than in case of the swamp lands. Time is required to complete this great change, which, though gradual, is nevertheless certain. The evil has long existed, so that no one need expect that it can be removed, in all cases, instantaneously, or in a single year. The first year will always exhibit much change, sometimes quite a complete one, but succeeding years will add to its efficacy. Some undervalue the effect of drainage on such lands, because they do not at once see the full fruits of their labor. Though ample returns are usually given immediately, yet in this, as in many other improvements, if we would see the full fruits of our toil, we must

"Learn to labor and to wait."

Sub-soil plowing is a species of drainage very valuable and quite efficient for some lands, but insufficient in cases of abundant moisture. Its effect in deepening the soil, and thus, by absorption, aiding the escape of the surplus water, renders its value truly great; yet, in very wet lands, nothing but ditching will yield us all the benefits sought.

I have already said that covered ditches are preferred to open ones. Such is the case in all localities, except where the amount of water to be discharged is very considerable. The reasons for this difference are, that covered ditches drain the ground better; when properly made, they seldom fill up, and, consequently, involve little expense in cleaning them; they occupy no surface ground, and are in the way of nothing else; and, though the original cost may be more, they are cheaper in the end. They admit side ditches better than the open ones do. One who professes to speak experimentally, says: "An under-drain will drain three times as much ground as an open one." At the latter the plowman must turn, leaving on each side, for a turning-row, from 1-4 to a whole acre, or even more; but over the former he may drive without the slightest inconvenience. Instead of giving up one or two acres of his richest land to the production of weeds and bushes, as is but too often done, he raises upon that very part the best grain in his whole field. When numerous drains are required, these reasons grow into additional importance.

We should never lose sight of the fact, that the importance and advantage of draining result not only from *letting the water out of*, but also from *letting the air into*, the soil. (See Essay of R. J. Gatling, Esq., in Indiana Ag. Report for 1854–5.) Both objects are effected, whenever land is thoroughly drained. "*Roots* as well as *leaves* require air," says another. Though the atmosphere contains its portion, yet the food of vegetables is chiefly deposited in the soil. The access of air and heat to their roots is necessary for preparing this food, and for the perfect development of the plant. When the earth is saturated with water, the air is excluded. Heat also, so essential to the perfecting of vegetation, is, by means of evaporation, as will be more fully explained hereafter, drawn off, leaving the soil cold, heavy, and lifeless. On the other hand, if this surplus water is withdrawn, the air takes its place. The cavities then, instead of being filled with cold, stagnant water, acting as a poison to vegetation, are filled with warm air, invigorating and giving life thereto. Since air is not so good a conductor of heat as water, the heat received by the earth from various sources is not so readily given off, and consequently, the temperature of the soil is higher. For the same reason, when once warmed, it long retains its heat. The temperature is thus regular, which is much better for vegetation than extremes of cold and heat.

As already intimated, all cold soils contain much vegetable matter not decomposed, which, if fermented and decomposed, would furnish to them a most valuable manure. Heat and access of air are necessary to produce this decomposition. In the withdrawal of the superfluous moisture, and the consequent admission of air and increase of temperature, these requisites are furnished. Decomposition then takes place, and new sources of fertility are developed. Though heat is necessary to develop this chemical action; yet on the other hand decomposition produces much additional heat. Every farmer can observe a precisely similar process in his stable manure. Without heat and access of air, it will not ferment at all; but with these in proper proportion, fermentation is produced, and a great amount of heat is given out, while decomposition is going on. Heat and air being present in the soil, decomposition becomes rapid, and the growth of plants is proportionately rapid. These chemical changes, and consequent addition of enriching properties, give a darker color to the soil; and we are taught by chemistry, that the sun's rays, or heat in any form, will penetrate a black soil to a much greater depth, than a yellow or white one. Such soils are warmer even in winter, so that they freeze to a less depth. The winter rains and melting snows find more ready access to the drains, because there is less ice and frozen earth; and, in turn, there is less water at the surface to become ice. Water in freezing loses 140° of heat. If the water frozen is on the surface, all this large amount of heat is given oft into the atmosphere; if beneath the surface, the atmosphere still receives a large portion. The winds and other atmospheric currents carry much of this away. When spring has arrived, before this ice can be dissolved, an equal amount of heat must be drawn from some source. While that soil which is free from ice, is warming up by the genial influence of the early sunshine, and already causing hardy vegetation to peep out, the ice-covered portion is absorbing all the heat from above and beneath and around, in the almost vain endeavor to remove from its surface its *chilly blanket*. It will be seen, then, that the greater the amount of water that is frozen on or beneath the surface, the colder must the earth be, and the later must vegetation be in the spring. Drainage, as I have shown, gives, at least, partial relief from this cause of coldness.

In consequence of the increased warmth of drained land, vegetation starts earlier in the spring; it also grows later in the fall, and is less subject to be cut down by early frosts; and, more than all, the warm, porous, enriched soil causes a rapid growth in summer, the combined effect of which is to greatly increase the crop. It gives the farmer a longer period for cultivation, for he can plow not only earlier and later in the season, but he can also plow sooner after a shower. I have seen farmers on drained lands, which had once been swamps, plowing when the underdrained, rolling lands adjacent were too wet to admit of it.

Drainage, because of the facts enumerated, becomes to the farmer a curative or preventive agent. Rust, blight, mildews, &c., have become to him most destructive enemies, especially in the destruction of wheat. Late wheat rarely fails to be injured by rust, while early wheat is seldom affected thereby. Wheat, being earlier on drained land, has generally ripened before the time for rust to appear. There is much reason, also, to believe, that wheat, on drained land, even if no earlier, is less subject to those diseases, which so often blast the fond hopes of the wheat grower, than that grown on cold, wet, clammy soils. Mr. Johnston, of New York, probably the most experienced drainer in America, claims that he saved his wheat from the fly by means of drainage, which secured an early crop.

The winter-killing of wheat and other fall grains by heaving, is also prevented. Every observing person will notice, that it is always on wet lands—such as the heads of ravines and heavy clay soils—that this takes place. The reason is of easy explanation. Water expands in freezing. If much of it stands about the roots of the grain, in freezing it expands, and the roots are torn loose and often broken. In our climate, several thaws and freezes usually occur during a winter. The roots in this way are often thrown almost out of the earth, and perish altogether, or maintain only a sickly existence. Good drainage is an effectual remedy.

In all lands having an excess of moisture, if ditches are not provided to remove it, we must then depend upon evaporation. This can never produce heat and a loose soil, but will produce cold and a heavy soil instead. Again I must refer to chemistry. By this science, we are taught, that a great amount of heat is abstracted from the earth, whenever evaporation from its surface takes place. Coldness of the soil, one of the evils to be remedied, is thus increased. The greatest cold ever produced, artificially, was produced by means of evaporation. This was 168° below the freezing point, Fahrenheit. At this temperature even alcohol is frozen. "In the vaporization of water, nearly 1000° of caloric are absorbed." (See Gray's Chemistry.) Water, or other liquid, is quickly frozen, when speedy evaporation is made to take place from the surface of the vessel containing it. If evaporation could even be depended on to ultimately remove the excess, the operation would be a long one, and the soil much injured before it was completed.

From estimates—not absolute, of course, but approximative—we have reason to believe, that, with the present drainage, not more than 1-10 of the water which falls in the Mississippi Valley, is discharged into the Gulf of Mexico and the Mississippi River. The remainder is chiefly taken up by evaporation. Now, if every gallon evaporatad, takes off enough heat to lower 5 1-2 gallons from the boiling to the freezing point, as we are told, what an immense amount of heat is absorbed from the adjacent soil, that would, if retained, furnish a life-giving property to early as well as late vegetation! In a system of complete drainage, we find a method by which we can save to each drained farm a large portion of its share—all, perhaps, that is necessary.

An element still additional in warming the earth is found in the warm rains and dews which fall upon the surface and filter through into the ditches, imparting their heat to the particles with which they come in contact. In the summer the atmosphere is warmer than the earth. The difference is equal to several degrees, producing a very considerable result. So much in reference to increased warmth!

But the soil is not only made warm by drainage. but porous likewise, so that the roots of plants penetrate the earth to a great distance in every direction, seeking that food, necessary, not to their well-being merely, but to their very existence. In the undrained wet land, they can obtain but an insufficient supply, and, with their sickly leaves and stems, present as unsightly an appearance as a half-starved animal. The importance of the admission of air, both as a result and a means in the production of lightness to the soil, may be judged from a most forcible and appropriate comparison of Mr. Gatling. He says, "The presence and influence of the air in and to the soil, *is as yeast to a loaf of bread.*" It must be remembered, that, when the soil has become more light, the labor required in cultivation, both to man and beast, is much less, and the consequent expense is less. This, in many cases, makes a marked difference.

Draining is essential to the proper action of manures on wet lands. Though plants cannot live without a supply of *fresh* water, I have already mentioned that *stagnant* water about their roots is very injurious. In this condition the vegetable and mineral manures in the soil are almost lost, and even *applied* manures will not make them thrive. The effect has been very fitly compared to that of food on the human stomach. One writer says, "It is as useless to manure a field that does not drain, as to feed a stomach that does not digest." If the stomach is diseased, that which should be nutrition, will be poison; so in this case; that which should be nutritious, lies there, a mere dead weight. Any one can test the accuracy of this conclusion by experiments on flowers in the common flower pots, having each an orifice in the bottom for the escape of stagnant water. While the orifice is kept open, they flourish; but, when closed, they soon become unhealthy, languish, and, unless very hardy, eventually die. For reasons presented on the last two or three pages, drained lands, even though of inferior quality naturally, require less manure to fertilize them. One writer says, that "*one* load of manure on drained land is worth *three* on undrained land," and many confirm it. Another says, that "to spread manure on a surface that is covered with water four months in the year, is but to throw it away." Manures are usually thrown upon the surface, in piles or scattered, and remain, until dissolved by rains, and carried off into the small streams, and thence into the large ones; or; if not carried off thus, they remain, until their virtues are carried away by evaporation. In either case, a large portion is lost. But, if these fields have been loosened by drainage, the falling rains soon sink into the earth, and, in passing to the drains, deposit the rich particles which they have absorbed from the manure, so that nothing is lost. Let me not be understood as recommending this system of manuring; but, if practiced, such will be the result. The numerous and long roots, which plants produce in porous earth, not only bring in nourishment for the present crop, but most of them remain in the earth, to furnish, in their decomposition, rich manures for succeeding crops.

While discussing the subject of manures, and the beneficial effects of ditching upon them, I must not omit to mention rain-water, as one of the most important sources of fertility—one which, on wet lands, cannot be developed without ditching. Rain-water, as it falls upon the earth, contains large amounts of ammonia, carbonic acid, &c. I have spoken of the injurious effects produced, when the water remains long on the surface, or is evaporated; but, when it filters through the soil, the ammonia, and other enriching elements, are absorbed, affording to crops an abundant manure. It is estimated that the rain which falls on a single acre in a year contains 100 lbs. of ammonia, a most valuable manure to wheat, corn and other grains—more valuable than even guano, of late so much prized by agriculturists. Ammonia is contained in the atmosphere, also, and absorbed from it by the earth by contact. The more of the atmosphere, then, that can be brought into contact with the soil, the more ammonia will be absorbed. This desired result is most effectually secured in drained lands, in which the air penetrates the earth to so great an extent, that much of it must come in contact. Carbonic acid, also, is drawn from the atmosphere, and from rains and dews. This gas, though so destructive to *animal* life, is necessary to the sustenance of *vegetable* life.

The question may suggest itself to some one, "Will not so much water be drawn off as to leave an insufficient supply?" So far from such a result occurring, drained lands actually suffer less from drouth than any others. The reason, on reflection, will be apparent. Drains only remove the superabundant moisture, leaving enough for all the ordinary wants of vegetation. In seasons of unusual drouth, especially one following a wet spring, the undrained soil, having been soaked and run together like mortar, acquires its nature. As it dries, it bakes and hardens, like sun-burned brick, or like our mud roads in summer. The roots of vegetables, though ready to perish for want of food and moisture, can scarcely penetrate this stony soil to obtain them, and, consequently, both grains and grasses make a poor return to the husbandman for his expenditure of money and labor. On the contrary, when drained, no stagnant water stands upon this, during winter or spring, to destroy its porosity. Being loose, it remains moist to the very surface, while hard ground soon dries out. If any one doubts this, let him, in the dry, hot weather of mid-summer, compare the middle of the road with the road-side, and both with the loose soil in a well-tilled field. The first will be hard and very dry, the second looser and moister, the last much looser than either, and proportionally moist. The want of attention to this fact has led many to believe that corn is injured by plowing it in dry weather. Such is not the case, unless it has been so much neglected in the early part of the season, that the soil will turn up only in clods, by which the roots are torn loose and broken. Neither plowing nor letting it alone will save corn on such ground, if the drouth continues; but, if the early cultivation has been good, every plowing will improve the crop, no matter how great the drouth. In loose soils, whether produced by drainage or otherwise, whenever there is a want of moisture at or near the surface, it is drawn from beneath, where a sufficiency usually exists. Even in a dry season, plants upon these soils suffer little, comparatively. This is the result of capillary attraction, a principle in Natural Philosophy, which causes water and other fluids to rise, through small tubes or pores, above their fountain. A few examples: a sponge or lump of sugar is filled with small cavities or pores. If either be barely touched to water, the water will rise through its pores, until the whole has become moist. Oil will rise several inches through a lamp-wick to supply the flame. Take a candle-wick, and immerse one end in a vessel of water or oil; let the other end hang over the side of the vessel to a point lower than the surface of the fluid; it will all be drawn out by means of the wick. The syphon is a long, narrow tube, so curved as to occupy a similar position. It will produce a similar result. These are experiments that most persons have seen, and that all may test. When the earth is drained, or pulverized in any way, it becomes light and full of pores, like the sponge or sugar or candle-wick. If, then, there is a deficiency at the surface, that beneath will be drawn up by means of capillary attraction, and, great must be the destitution, if this does not pretty well supply the need.

The atmosphere has been considered as a source of heat, and of fertilizing matter. To a mellow soil, it is, also, a source of moisture. (Of course, I do not refer to that portion, which falls to the earth in the form of rain.) In warm, dry weather, the atmosphere contains more moisture than many are apt to think. For instance, on some hot day in July or August, in a very dry season, if you please, let a pitcher be filled with cold water. How soon large drops of water are seen standing upon the surface, or even running down the sides? All this is drawn from the surrounding atmosphere; and, not merely so, but it is all drawn from that portion which comes into actual contact with the pitcher. The air by penetrating mellow soils, imparts to them, not only much warmth, but much moisture also. Observation will verify the truth of the conclusion to which I come, that *a rich, deep, mellow soil will produce a pretty good crop any year.*

There is a class of lands much benefited by ditching, which has not been mentioned in this discussion; I mean those lands generally dry, but which contain numerous little ravines or branches, leading to some larger stream—some of them fed by springs, and some of them only wet for a few days after rains. It becomes necessary for the plowman to turn at many of these. A turn-row must be left on each side, thus involving a loss of both time and land. This waste ground is often permitted to grow up with weeds and bushes, from which the whole farm is annually seeded, if any part has failed to produce its own seed. Because of the excess of stagnant water, at the heads and alongside these ravines, grain is frozen out during the winter, or drowned by the fall and spring rains. Drainage is the grand remedy here, also. Fields may be made square, instead of being cut into two or three or more angling parts, as so many are now. Much time and labor in cultivating them is thus saved. The rich, alluvial soil, that aforetime was carried away, more or less, by every considerable rain, is now almost entirely preserved. The water settles into the ditches, and the sediment, instead of being carried away, is left upon or near the surface. This is proven by the fact, that, when the water in open drains and little streams is muddy, as is the case after a rain, that from a covered drain is always clear. It would astonish many, to know the amount of sediment washed away. Some idea may be formed, though an imperfect one, by noticing the amount deposited in canals and mill ponds and mill races. Enough to enrich every poor field in Ohio is carried every year into the Gulf of Mexico by the Mississippi River.

A very important advantage to this class of lands, is the furnishing of stock-water. There is usually a spring, and sometimes more than one, at the head of each ravine, besides others at intervals along them. The sources of these springs being opened, and a steady outlet provided, an unfailing stream of water flows from most of them during the whole year. Before, a supply could not be obtained when most needed, because a constant outlet was not provided. A trough or reservoir to receive it, so constructed and placed as to be accessible but not easily destroyed, is all that is needed.

In draining wet lands, the cause of much disease is removed. That stagnant water, and the noxious gasses arising from its evaporation, are prolific sources of fevers, and chills and fevers, there can be no doubt. In its early settlement, the north-western territory was very unhealthy. Wherever lands generally remain wet, sickness still prevails; but, wherever lands from any cause have been made dry, good health has followed as a natural consequence. Many, very many of the adventurous and hardy pioneers were struck down by these deadly miasmas, arising from level streams, swamps, and other standing water, whose possessions are now in the hands of those enjoying health, happiness and content.

It is not meet that I should dwell separately on each advantage which might be mentioned;—the advantages to meadow, to fruit trees, to strawberries and berries of all kinds, except cranberries, to gate and fence posts, in causing them, when planted over or near ditches, to last twice as long, to barn-yards, hedges, cellars, &c. In view of the principles which have been demonstrated, a mere mention must suffice.

In draining, the increase of the crop is generally very great. The increase is variously estimated, and varies very much, no doubt, under different circumstances. Some say that their next crops after ditching have been increased one-third, some one-half, and some doubled. Succeeding crops are usually still more increased. This increase to the crop will generally, in two years, pay the expense of draining. Besides this increase, the increased value of the land is generally equal to the cost, and often several times as great. In view of all these reasons, no farmer having wet land, should delay a single year or month to commence its drainage. If he cannot drain all at once, let him drain a portion, and that will soon bring a return that will enable him to drain the whole. Most of the work of construction can be done by his own labor, and in no way will he sooner see "the work of his hand returned to him seven-fold."

I have not enumerated the several reasons for ditching, and considered each separately, because they depend to so great an extent on similar principles, that it would have caused much repetition. It is, at best, very difficult to consider such a subject fully, and avoid repetition. For convenience in reference, I will now enumerate, very briefly, the principal advantages that have been considered in the foregoing pages:

1st. Draining prevents water from standing on the surface to become stagnant, and drown or poison vegetation.

2d. By the removal of the excess of water and the admission of the air, the soil is made porous and light.

3d. The temperature of the soil is increased by the admission of air instead of water into its cavities.

4th. This is also increased by additions of heat, absorbed from rains, dews, and the atmosphere.

5th. It is still farther increased by heat, derived from the decomposition of vegetable matter.

6th. The temperature of the soil being thus increased, longer seasons are given to the husbandman, and more time for plowing and working his crops.

7th. The temperature is also more regular than before draining.

8th. The access of heat and air hastens the decomposition of vegetable matter, which, in turn, increases the warmth and fertility of the soil.

9th. Drainage leaves less water to be evaporated, and less heat is, consequently, lost.

10th. It causes the earth to be warmer in winter, as well as summer.

11th. It causes the soil to be blacker, and thus attract and absorb a greater number of the sun's rays.

12th. It prepares the soil to receive a large amount of fertilizing matter from the air, rains and dews.

13th. It causes manures to yield more nutrition.

14th. It causes plants to root deeper, and consequently, be more luxuriant.

15th. It prevents a large amount of sediment being carried away by heavy rains into the water courses, and lost to the land.

16th. It prevents fall grains, clover, &c., from being winter-killed.

17th. It lessens the severity of labor to man and beast.

18th. It lessens the injuries, which rust, destructive insects, &c., often cause.

19th. It is a means of securing stock-water in dry seasons.

20th. Drained soils do not suffer from drouth as others.

21st. Drainage improves meadows, orchards, hedges, &c.

22d. By removing stagnant water, it lessens or prevents disease.

23d. It enables us to make our fields square, making them much more convenient for cultivation.

24th. It saves to the farmer much productive land, that had not before been tillable.

25th. By lengthening the season, it enables him to raise crops, profitably, which before would not mature.

26th. It increases almost all kinds of crops, to such an extent, as speedily to pay the expense of draining, in the increase of the crop alone.

27th. It also very much increases the value of the lands drained.

I have now considered quite fully, yet with all the brevity that was practicable, the advantages of drainage, together with the reasons that make it necessary. This was, I suppose, the principal object had in view by those who called forth this essay. Though this was the *principal* object yet it is proper that I should consider, briefly, the method of constructing ditches to make them most useful and cheap.

In discussing this part of the subject, I shall consider the *depth* of the drains, their distance apart, the manner of laying them off, mode of digging them, materials used for making the ducts for the passage of the water along them, and mode of filling them.

First, the *depth*. As to the depth best suited to secure the greatest advantages from draining, there is variety of opinion, even among practical drainers—some preferring two feet for the depth, and some four or five, or even six feet. The proper depth will depend very much upon the character of the soil, amount of fall, &c. The general preference is for deep ditches, especially in black soils—the deeper the better, within reasonable limits. Care should be taken to ascertain the amount of fall, for success or failure will often depend upon this. Let the main outlet be deep enough to allow sufficient fall to the branches. In clay soils, if the fall is sufficient, ditches may be safely dug from three to four feet; in black soils, from three and a half to five, or even six feet. The principal argument urged in favor of shallow ditches, is that they would be more readily removed. On the other side 'tis said that deep ditches would be less liable to *need* repairs, than the shallow ones, because they would be more perfectly free from the effects of the atmosphere and the freezes of winter. A strong reason in favor of deep ditches, is that they will drain farther on each side, so that, on a given space, fewer of them will be needed. Each ditch will cost more for digging, but this will be more than balanced by the above consideration. Drains must, at all events, be put deep enough to be out of reach of the plow, whether subsoil or any other. This direction *must never be neglected.* In black soils, there is very little danger that they will be put too deep; in tough clay soils, they may be put so deep, that water will not readily find its way from the surface into them.

Second, *how close together should they be?* No general answer can be given to this question. To answer definitely, we must know, in each case, the character of the surface soil and the subsoil, the amount of water to be discharged, the fall, and many minor things that will readily suggest themselves to the intelligent reader. Much controversy has existed on this point, arising from the fact just named. Some have maintained that thorough drainage requires that the drains should be no more than from two to five rods apart; others assert that, in all ordinary cases, four or five drains are sufficient for a ten acre field. We can safely say this, at least: wet clay soils require more ditches, in a given space, than alluvial soils, equally wet. To make a very general estimate, in the former they may vary from three to twelve rods, according to the circumstances of the case; in the latter, from six to twenty. It often happens that a single ditch, constructed through a field, or along the side of it, may be of immense advantage to it, or, perhaps, drain sufficiently all the part that greatly needs it; but, to make the work thorough, when the land is very wet, numerous drains will be required. Let it not be forgotten that the number of drains will depend very much upon their depth.

Third, *the manner of laying off the drains.* Ditches are generally constructed on lands quite level, but not absolutely so. Each field is composed of one plane or more. To notice and take advantage of this is important. The first thing to be done, then, in preparing to lay out drains, is to ascertain the general tendency of the natural drainage. The next thing is to get a proper and sufficient *outlet.* This, to make the work effectual, must at all times afford a complete and ready outlet to all the drains connected with it. For that purpose, the lowest point, or one sufficiently low, must be sought. From this, along the principal depression, the main drain should be laid. Several main branches may be laid into one of these, and as many small drains as necessary into them, thus forming a system, connected like a river and its tributaries, or the veins in the human body. If the field to be drained is very level, and the outlet deep enough to allow it, increased fall may be obtained by making the main drain deeper than the sub-main or side drains. If the outlet to an adjoining creek or ravine does not give sufficient fall, or is liable to be injured by back-water, more fall and security from the water may be obtained by leading the drain along it for some distance. Sometimes a better outlet can be obtained by cutting across an adjoining ridge into some other water channel. An insufficient outlet may render worthless all the drains discharging their waters through it. Side drains should enter the main drains at an angle less than a right angle. Drains thus constructed are thought to be less liable to get clogged.

Fourth, *the method of digging or opening the drains* next demands our attention. Common shovels or spades are often used in digging them. Plows may be used to throw out the surface earth, and they have even been made to loosen the earth to the depth of 1 1-2 or 2 feet. Spades with narrow points are used in finishing them. Many tools have been invented to expedite and lessen the labor. The ditches are usually made as narrow as will possibly allow room for the workmen. The sides slope gradually to the bottom. Machines have been constructed which are said to work admirably, insomuch that a great saving of labor and cost has been effected thereby. I have seen commendations of Pratt's and Cotgreave's, but they have not, so far as I know, been used in the West. It is of the utmost consequence that the bottom of the drain should be regular and of uniform descent, especially when there is very little fall. This is best secured by the use of one of the many instruments for leveling. If some portions of the drain are on a dead level, stoppages will be more likely to occur at these points; on the other hand, if some portions have too great descent, they are liable to be injured by the violence of the water. The descent, then, should be uniform, if possible. Much less fall is requisite for drains than many suppose. Even one inch in 150 feet, or three feet in a mile will answer, but twice or three times this descent would be desirable. On level land, the descent is not likely to be too great; on hilly land, if the fall is too great, a remedy may be found in leading the drain around the hill, and not directly down it.

Fifth, *the manner of constructing the conduits, or ducts, for the passage of the water, and the materials for their construction.* A great variety of methods have been devised for their construction, and stone, tile, brick, wood, sod, &c., employed as materials. Of these, stone and tile are most valuable, and are most used where drains are most extensively employed. I will speak of the several materials specified, reserving tile to the last. In selecting materials, cost, durability, and efficiency of operation are to be considered.

In the West, stones are used generally, wherever they can be obtained.

When quarries or beds of them are near, so that they can be obtained cheap, they combine the three requisites named, better than any other material. For upland drains they can usually be had, but for drains in swamp lands they often cannot. In the use of stone, greater width is necessary than with most other materials, so that a wall may be built on each side, and a space left between them. This space may be four, six, or ten inches wide, and the walls six, nine, or fifteen inches high, according to the choice of the builder, or the volume of water to be discharged. Broad stones are placed over these openings—their ends or sides resting on the walls. The covering stones may be fitted to each other, or the joints may be covered with other stones. The walls are built without mortar, so that the water may filter through at any point into the open ditch. Where much water runs, or the fall is considerable, the bottom should be covered with large level stones. These serve for the water to run upon, and also for the walls to stand upon, so that they may not be undermined. Without this, in such cases, the earth, upon which the walls stand, is softened or washed out, so that they sink, and stop the drain. Instead of large flat stones for a foundation, some have thrown in broken stones to answer the same purpose. Another method is to leave, at the proper hight, a shoulder on each side, to serve instead of a wall; then cover with large stones as before. This lacks stability, and is, therefore, not to be recommended. The shoulders are apt to give way after a time—especially if the frost can reach them—and permit the covering stones and earth to fall in and fill the duct; yet they often last many years. Another method still, is to cast small boulders, or broken stones, into the ditch to the depth of a foot or eighteen inches. No open duct is made, but the water is expected to find its way through the interstices between the stones. Sometimes large stones are placed with one edge on the bottom and the other leaning against the side of the ditch, thus leaving a duct beneath them. Again, they are placed on each side of the ditch, and their upper edges placed together over the middle. Many methods have been devised for the use of this material. I have named the most important ones. Limestone is generally used for these purposes, but sand stone, and other kinds, are also used. Slate, where it abounds, has been used with advantage, especially as a material for covering the duct.

Bricks have been employed by some, and when hard-burned serve an excellent purpose. They may be had where stones cannot. They are not expensive, very convenient to handle, and last well. They should be protected, as far as possible, from freezing and the effects of the atmosphere. Those to cover the drain should be longer and thicker, and perhaps wider, than the ordinary size. They may be laid in the bottom also, if necessary. Two instances are recorded of brick drains in England, which were opened more than one hundred years after they had been laid down, and found to be in good condition. Bricks, pressed and dried instead of burned, have been used for the same purpose, but are less likely to be permanent.

In Ohio and Indiana, wood, in some of its forms, is commonly used, if stone cannot be conveniently obtained. One of the methods of using wood, is to cut oak, or some other lasting timber, 18 or 24 inches in length; split these into staves of the thickness of 2 or 3 inches, and as wide as the tree will make—the wider the better. One end of these staves is placed in the bottom of the ditch at one side, the other is placed against the opposite side. The joints may be covered with narrow pieces. Where good timber is abundant this is a cheap ditch, and will last longer than we could expect. Slabs are used in a similar manner, except that they stand on one edge, whilst the other leans against the opposite side. In the shouldered ditches, sometimes the staves or slabs are used to cover them, instead of stones. Drains have been made with boxes, formed of planks two or three inches in thickness, sawed from lasting timber. Instead of nails, wooden pins are used in fastening them together. Another method for the use of wood is the following: Take saplings from four to ten inches in diameter. Cut off three feet or more from the butt end. About six to twelve inches from the bottom, make an excavation in each side of the ditch, so as to allow the part cut off to lie across the same, the ends resting in these side openings. Put in as many such as may seem necessary. Then place the remainder of each sapling on these, lengthwise of the ditch, top to butt, so that they may fit together better. In the shouldered ditches, the cross pieces may lie on the shoulders.

Drains made of sods are of little value, not being sufficiently permanent. It adds, however, to the permanency of open ditches to line their banks with sods. They can be cut in the shape of bricks, though longer, and laid up in the same manner, breaking the joints, &c. As the sides of the ditches are sloping, the sods may rest against each side, thus strengthening the walls of grass. The inner edges of the sods will soon be covered with grass, and the sides of the ditches protected against frost, changes of weather, and surface water.

Peat, brush, &c., have been used for draining purposes, but should not be used, unless nothing better can be obtained.

The drainage tile seems to be preferred by those who have tried them to all other materials, except stone; and many do not even prefer stone. Tiles appear to be liked by all who have tried them. Mr. Johnston and others, in the State of New York, have used them considerably, and very highly commend them. They are made of tough clay and burned, much after the manner of making and burning brick. Tile resembles potters' ware, except that it is not glazed. Various patterns are used. That which came into earliest use was, from its shape, called the "*horse-shoe tile.*" It formed something over half a circle, and then spread out three or four inches on each side to form a flat surface to rest upon. They were often laid with no other foundation than the clay in the bottom of the ditch. In many cases, the clay would be softened by the water, and permit the tiles to sink in it and become disarranged, so as to partially or wholly obstruct the ditch. To remedy this, plates, an inch in thickness and eight or ten inches in width, were made from the same material, and burned in the same manner, as the tiles. These were termed "soles," and were made three or four inches wider, but of the same length, as the tiles to be placed on them. Both tiles and soles were placed end to end in laying them. In order to give them more permanence, the centre of the tiles was placed over the break in the soles. These were wedged on each side with stones or some firm material, and were then ready for the covering. Sometimes the wedging was omitted, but should not have been. A later improvement was to attach the tile and sole in making. This increased the permanence.

Pipe tiles are now generally preferred to these. They are made of various shapes,—round, oval, square, &c.,—and of various sizes from 1 to 6 inches in diameter. They are from 12 to 18 inches in length, and are laid end to end. To give them additional permanence "collars," as they are termed, are placed over the joints. These are short tiles, of the same shape, and large enough to pass over the others, and cover the joints. The collars are not generally used, as they would obstruct the entrance of the water. Soles are often used for the pipe tiles, and increase both utility and cost. Tiles may be made of any desired shape by merely changing the pattern. For side drains, tiles with an opening of 2 to 3 inches, or even less, will answer; for sub-main, from 3 to 5 inches; and for main drains, 6 inches. If one such tile is not sufficient, two may be placed, side by side, and even a third one over them. Portions of the tiles in the main and sub-main drains must have openings for the reception of side drains. Care should be taken to have as many of these as the number of side drains to be admitted. In making these connections, especial care should be taken to make them permanent. Side drains should not enter opposite each other. It is the design of pipe tile to receive all the water at the joints. Some have feared that these entrances would be insufficient but experience dissipates this objection. Norton, in his prize essay on the "Elements of Scientific Agriculture," says,—"Many farmers have thought that water would not find its way *in*, but experience will soon show them that they *cannot keep it out*." Tiles are sometimes made porous, so as to admit water through the pores, but such are not likely to be strong or lasting. If tiles were glazed, it would, probably, add to their efficiency, without lessening, in any respect, their beneficial action; yet they cannot fail to last well without glazing. A tile drain, with broken stones or boulders thrown in over the tile to the depth of a foot or two, has been pronounced the best of all drains. Iron pipes might be used in the same manner as tiles, but they would cost more, and would, probably, give way sooner, unless they could be permanently protected from rust. All drains, and especially main tile drains, should be placed as far as possible from trees and hedges, because the roots are liable to grow into them and obstruct them.

Sixth, *the mode of filling ditches.* Leaves, straw, brush, or grass, are usually thrown in first, to prevent the fine earth from falling through into the duct. These soon decay, but not until the earth over the ditch has become settled, so that it afterwards remains firm. Filling is often done with the spade and shovel, but the process is too slow. Plows have been used with advantage. The one-horse plow, constructed especially for this business, is preferable. The beam is placed at an angle with the share, so that the horse may walk clear of the ditch. A two-horse plow may be used, constructed in a similar manner, so that both horses may walk on the same side. The common plow may be used, with one horse on each side of the ditch, attached to a long whippletree; but this method, in turning and some other respects, is inconvenient. A friend informs me that he has successfully used a one-horse scraper, with a gentle horse attached to it by means of a long chain. The scraper is placed upon one side of the ditch, the horse on the other. It is necessary to back the horse each time to fill the scraper, which is also inconvenient; yet he says that a half-grown youth may thus fill from 10 to 12 rods per hour, which is a great gain upon the use of shovels. Some of the ditching machines are used for filling, as well as for digging. Ditches should be filled above the level, so that when settled they will be level.

All open outlets to drains should be covered by iron grates, to prevent the entrance of little burrowing animals, which might injure them; or, it will generally answer the purpose as well, to fill the last three or four feet with broken stones, or to build a dry stone wall across, through which the water can find egress. There should be few open outlets. Let the side drains, as far as possible, open into the main or sub-main drains, instead of into the open ditches, so that there may be a few outlets to guard. The upper ends of the drains are usually sunk to the same depth as other parts of the drain, and covered entirely. If open, sticks, weeds, sand and mud would be likely to wash in and fill them. In a few cases, it becomes necessary to leave one open, or even to admit a stream of running water. In such cases, a close grate should be constructed, not only to keep out the animals named, but also to prevent the admission of straw, weeds, &c. To prevent the entrance of sand and loam, let a box be placed a little lower than the bottom of the ditch, over which all the water must pass to enter the drain. These heavy particles would chiefly fall to the bottom, and could be removed as often as necessary. In steep ravines, where the surface is likely to be washed by an accumulation of water, the stone over the duct may rise above the surface at regular intervals, checking the current, allowing the sediment to settle, and assisting the water to trickle through to the drain.

Where a sufficient fall could not be obtained to allow the construction of ditches, wells have been found to answer the same purpose. In digging wells, we seldom reach the depth of 12 or 15 feet without finding gravel, or some other porous stratum, that will absorb the water drained into them. At the bottom of the loose stratum, the digging should cease, so that water may not be drawn from the strata below. The ditches can then be directed into the well or wells, which may be left open, or filled above their entrance by small stones—the soil being replaced for 2 or 3 feet at the surface. Wells have been effectual in draining extensive marshes, and even ponds or bogs, where common ditches were impracticable for want of fall. In an extensive shallow marsh, four wells were sunk, which completely drained it. It was at once ready for cultivation, and proved to be the best quality of land. It is sometimes of advantage to bore holes in the bottom of ditches, so as to allow reservoirs of water to empty themselves therein.

Lakes, even of considerable extent, have been drained by means of large pumps and syphons. In Holland several thousand acres of most productive land, relieved of water by this means, instead of forming a part of the Haarlem Lake, now produces every year a bountiful harvest. The amount drained is, I think, 30,000 acres, but the statement is not now before me, and I may be mistaken as to the amount. Similar drainage has been effected in Scotland, and, I doubt not, will be often resorted to hereafter, in the drainage of bogs and marshes.

Tile has been little used in the West. One reason has been that other materials have been abundant and cheap, but a chief reason has been the want of machines to make them at home. Machines have now been introduced into Lake county, and perhaps other counties in Ohio. One of them was on exhibition at the late State Fair at Cincinnati. The proprietors propose selling machines, and imparting to the purchasers all necessary information in reference to the manufacture and use of them, so that we may soon expect them to be cheap all over the State or States.

As to the cost of drains, no absolute price can be named. It will depend on the cost of labor, of materials, difficulties of draining, &c. The cost of ditching will generally range with the value of the land when drained, and the selling prices of the various grains and grasses raised upon it. If labor and land command but a low price, the cost will be small; if a high price, the cost will be greater, but not quite proportional to the increase in the price of the land. The thoroughness with which a man will be likely to drain his land, will depend very much upon the increase of value which he can realize. In some localities, the land when drained would be worth \$50 or \$75 or \$100; in others, but \$15 or \$20. The ordinary cost of drains, allowing established rates for the owner's labor, ranges from 20 to 40 cents per rod. Good tile drains have been finished at 25 cents per rod.

There is one consideration, by no means unimportant, which I have thus far omitted, but which I would not willingly close this essay without naming;—I mean the increased beauty and neatness everywhere observable on drained lands. About a dwelling, we often expend a considerable amount, apart from the mere adornments of the building, in grading the yard, fencing it neatly, laying off and constructing walks, planting ornamental and fruit trees, cultivating flowers, &c. We regard this as demanded by good taste. And shall no attention be given to the *neat* and the *beautiful* on our *farms?* We may disregard this in theory, but we do not in fact. How soon do we form an opinion of a farmer by the appearance of his farm! The expenditure of a few hundred dollars in repairs and general improvements on a farm, has oft' times insured its sale at an advance of as many thousands.

The *facts* which I have presented in favor of draining would seem sufficient to convince any observing man. Nor have I neglected *argument.* Even the argument to the pocket, which is said to be the most effective of all arguments, has been given due prominence. Observing men will allow these their value, whatever it may be; but, when I speak of *observing men*, I must needs exclude many calling themselves farmers, but who are so much attached to old systems and methods of culture, that they will see no good in anything new. They reject all idea of progress, and, through their neighbors derive large benefits from the use of the improvements of the day, they plod on the beaten path, and refuse to profit by any of them. They seem to think that man came forth at the creation, like Minerva from the brain of Jupiter, as related in the fable, with all his powers of mind and body perfected, and so wise that observation and experience availeth him not. To convince such an one would be no less surprising, than are some of those wonders in the vegetable world produced by draining.

I will give, in the close, two extracts from agricultural writers. The first says, "*The atmosphere is to the farmer like the sea to the fisherman—he who spreads his nets the widest will catch the most.*" The other says, that those who would attain the highest degree of development for their crops, must "*drain more and plow deeper*," than has been customary. Let me urge all who have wet lands, that they effectually drain them. Each one will thus spread a net near the surface of the earth, that will gather in the rich particles from the atmosphere above, and from the depths beneath, and retain them as a fund of vegetable wealth, to be ultimately gathered into his storehouse, in the form of the full, ripe grain.

DITCHING AND DRAINING IN OHIO.

It might, at first glance, be supposed, that a country conditioned as Ohio is, consisting in a great measure of level or nearly level tracts, would early require the experiment of ditching to be made, and this supposition is correct when consideration of the requirements of the soil alone, is had in view, but in Ohio other causes than the propriety of draining and its effects have retarded the application of this branch of agricultural labor, to an extent scarcely credible by those who are unacquainted with the condition of agriculture in this respect in our State. That draining is not nearly so extensively employed as a fertilizing agent as it might or should be, is apparent to any one who will visit and observe any section of the State; and the reasons of this non-use of draining may be adduced in a few words:

Land in Ohio and other Western States, which may be cultivated with a fair prospect of a remunerative return for labor applied, is abundant and cheap, and most persons looking for a more direct compensation for their application of capital and labor than seems to them to be promised by draining, have sought in preference those tracts, which afforded the largest body of arable land not actually requiring ditching, to begin their farming operations upon, and in this way vast quantities of, yet to be, exceedingly prolific land now lie waste, and worse than useless, being not only unprofitable to the owners but an expense in the way of taxation, for which it yields no return, but miasmatic poisons, and the not very delightful music of frogs, toads, and their associates.

Moreover, a correct knowledge of the uses and influences of draining has but rarely been possessed by any of our farming population, which is made up principally of emigrants and descendants of emigrants from the more hilly and mountainous States, or from like rolling countries of Europe, where the nature of the soil, the form of the country, and the underlying geological formations have to a great extent obviated the necessity of man's labor to dessicate the soil sufficiently for the purposes of agriculture.

Man is very slow to depart from the usages, opinions, and supposed knowledge of his predecessors, and is generally much too prone to look back upon the wisdom of the past as unsurpassable, and indeed but rarely to be equalled, and to content himself if he can but approximate to, or imitate the example of those who have gone before, and to regard all that is new as mischievous innovations, and this he does, too, when a glance at the present or a comprehensive view of the future would lead him in a directly opposite path, and reveal to him the fact that the sum of all human wisdom yet lies in that "good time coming," when the relation of cause and effect will be far more correctly understood and appreciated than it is now, or ever has been by the wisest sages of the past.

It has always been the case that the masses of the population have been slow to adopt what was new to them, and the reason is perfectly obvious. The wants of the body and the means of supplying those wants, manual labor, have so much occupied the time of the laborer that his mind was not permitted to act freely in the accumulation of those ideas and items of information which would otherwise have led him to become himself an innovator. But, now, the comparative ease and comfort by which our farmers are surrounded, and the vastly increased dissemination of intelligence among all classes, making a less constant toil for the support of the individual and those depending upon him necessary, the more comprehensive views, engendered by means of the facilities thus afforded, are leading men to look for still larger returns for a given outlay of capital and labor than were heretofore attainable; and therefore all the innovations of the day are more carefully studied than formerly, and if utility stamps their character they will be much more speedily adopted than they could have been a few years since.

Draining, and particularly underdraining, was but recently a new thing to the vast body of our agriculturists, and while, fettered by too great a prejudice in favor of past systems, and under the necessity of too great and constant an application of the powers of body and mind to the toilsome drudgery of a less productive labor, they were unable to make such experiments even when their attention was called to the subject of draining, as would make them practically acquainted with its advantages. But the work of experiment and demonstration is now begun in many counties of the State where the necessity of draining is more plainly apparent and imperative, and these demonstrations of the utility of draining will before long cause experiments in this matter to become quite general, and then lands which would at present be considered ruined, perhaps, if ditched or underdrained, will be found greatly improved by the application of this means of fertilization, which has been heretofore so little understood and beneficially applied.

In the whole north-western portion of the State, draining will become much more generally applied than in the other portions of the State, which are rolling and hilly, and where, consequently, much smaller tracts are so much filled with water as to make the utility of draining at once apparent. But even here much land that at present would seem not at all to require but would rather be injured by any process of draining with great advantage.

In many of our north-western counties, open ditching has been extensively employed, and all who have reported to us upon the subject concur in the statement that the productiveness of the drained land has been increased from 25 to 100 per cent.; and lands, as our Fayette county correspondent says, which before draining would bear nothing, have been made equal to the best grain land. Our Lawrence county correspondent remarks, that even open ditches, the kind of drains mostly in use, have so modified the productiveness of land in that county, that one ton and a half of hay per acre, is produced where, formerly, the only yield was bull-frogs and ague.

In most of the counties where draining has been put in practice, open ditches are principally used, but where comparisons have been instituted, underdrains have altogether the preference, as they save arable ground, are neat and conducive to health, and have a much better effect upon the land and, consequently, the crops, and being far more durable and not very greatly more expensive at the outset they are far cheaper and far more profitable in the end. An underdrain constructed of suitable materials as of tube, horse-shoe, or right-angle tiles, or hard burnt-bricks or flat stones, put down so low as not to be affected by frosts and in such a manner as not to be washed out of place, or filled up with dirt and sand will last one hundred years or more; long enough to pay a thousand fold for their construction, which is indeed paid for and over paid in the increased value they give to land as soon as they are constructed.

Our correspondents, who have had an opportunity to judge, all concur in reporting an increase of crops, less winter-killing of grain, less injury from excesses of moisture or of drouth, and greater mellowness of soil, and salubrity of the neighborhoods where draining, particularly underdraining has been practiced.

The principles involved in the subject of draining and the general corroboration by our correspondents, of the correctness of the opinions and observations adduced in the preceding essay, in which these principles are discussed, render a more extended series of remarks upon this interesting department of agriculture unnecessary, as sufficient has already been said to call the attention of the intelligent reader forcibly to the necessity and advantage of draining all soils where it is at all required, without delay.

A variety of machines are now in use, to a limited extent, to make the construction of drains less laborious and expensive, and we may hope to find that as the use of drains becomes more general, the inventive minds of the State will be stimulated to improve the machines now in use or invent others, until all that can be desired in that direction may be obtained.

COAL OILS.

To John H. Klippart, Esq., Sec. Ohio State Board of Agriculture:

At your request I present the following remarks and statistics on the subject of the manufacture of Coal Oils and other products from Cannel Coal, and of the beds of Cannel Coal and shales in central Ohio, for the forthcoming report of the Ohio State Board of Agriculture. The statistics I present are confined to the counties of Licking, Coshocton, Muskingum, and Perry. Other counties may have equally valuable deposits of coal, and facilities for development, but they are out of the range of my own examinations.

The manufacture of oils for *illumination* and for *lubricating*, from coals, as commercial products, is of recent origin, and limited to the last five years, and mainly to the last two years; but though yet in its infancy, and but partially understood by very few, if fully by any, enough has been learned and developed to place it in high rank among the valuable gratuities prepared in Nature's great laboratory for the wants and comforts of our race.

In common terms and in common processes, Cannel Coal yields us: Benzole, a light and highly inflammable substance used largely in the arts and in the portable processes of manufacturing gas; next in order we get the burning or illuminating oil, being a mixture of the Benzole and the unctuous or fatty portions of the oil; next an oil admirably adapted for wool in the picking and carding processes, its properties tending to dissolve the grease and dirt so intermixed with all our fine wools; next the heavy or lubricating oil for machinery, which as it runs from the stills is mixed with paraphene, a substance in its nature and appearance corresponding with the best sperm and white wax. These products occur, in varying proportions, in different coals, and no general standard either of general product, or the specific results, could be made, the coals from the same vein frequently changing materially in their quality in a few feet. Most coals yield a large quantity of strong ammonia water, a product that will be sought for with earnestness by every farmer who fully understands his true interests, and the value of this fertilizer in connection with spent lime or ashes and barn-yard manure. This, with the coke, ends the chapter of products, and like the cow or ox, in life or at the shambles, everything is available for use.

We probably have in central Ohio as rich varieties of the Cannel Coal, and as fine deposits, as exist anywhere in the world; and I feel safe in estimating that within the counties named there is an area equal to ten miles square underlaid by Cannel Coal and shale, to the average of three feet thick.

This would give about 4,500 tons to the acre, and 307,200,000 tons to the land alluded to, and if we estimate the average value at five cents per ton in the bank, it makes the large sum of $15,360,000, and if manufactured into oil and made to yield (as it may) thirty gallons to the ton, we have 9,360,000,000 of gallons, which at sixty cents per gallon equals the enormous sum of $5,616,000,000.

These figures will look extravagant and visionary to most readers, and will prove practical illusion to those who act upon them as affecting the value of their real estate in this day and generation, except in favored localities, where the facilities of transportation and manufacture are very good, and then it must be limited, as a few acres of good coal will last an extensive manufactory many years.

I am no Millerite, looking yearly for the destruction of the earth and its inhabitants, but fully believe that centuries of ages hence will find this mother of us all blooming in pristine freshness, cultivated and enjoyed by a happy and more highly intellectual people. In those years and ages will these grand deposits be used and appreciated; chemistry and practical science will develop more fully the various properties contained in them, and an ultimate amount of wealth be drawn from them that shall fully justify the figures I have made in contemplating their extent and value. But in those years and ages the interest on lands now estimated at but a few dollars per acre, advanced on account of the coal, will swell the sum to thousands of dollars before some of those lands shall have yielded up their treasure. It may not be thought legitimate in a paper of this character to follow in detail the subject of the true cash value of the coal lands of this region, but there are so many wild and inconsiderate notions by both sellers and buyers, that I propose to those interested that they look at these figures. Suppose one man has a farm fronting on, or cut through by a canal or railroad, giving him direct access to market for a good three-foot vein of cannel coal, and for which he can readily get ten to thirty dollars per acre for the mining rights, and that another man owning the adjoining land has a vein equally good, but the entrance to which is a mile from the means of transportation or shipment, it should be evident to owner and purchaser that the one bank is really worth from six to ten cents per ton more than the other, or two hundred and forty to four hundred dollars per acre difference.

So would I caution buyers, that money expended in coal lands that will not be brought to market for many, many years to come, will do better at interest, or invested in many other ways. Suppose, for instance, an owner refuses $12 per acre for a coal bed, and keeps it in his own hands for ten years, it should then sell for $21,50 per acre, to realize simple interest annually on the money offered; and if he holds it twenty years it should sell for $38,50 per acre. As money is always likely to be worth at least six per cent., it is easy to see that property costing large sums, lying idle for years, must realize a large advance to make the investment at all profitable. Many valuable coal deposits will lie hidden for ages, and then suddenly enrich their owner, while others now known will be *held* at high prices, or be *sold* at high prices, and in either case the interest absorbs al the profits of the speculation. I have been thus explicit in detail in hopes to suggest a healthy trade in cannel lands.

Many individuals and companies are engaged or engaging in the manufacture of the products of Cannel Coal, and some expect the business will be overdone and shorn of all the advantages it now offers as a speculation. To many this expectation will be realized, while to others who best understand the processes for refining and deodorizing the oils, and who skillfully manage their financial matters, there is a fruitful field to harvest before them. No substance has ever been used for lubrication that more fully realizes the wants of the mechanical world, *when properly prepared for that purpose*, and it can be afforded at a much less price than any of the good oils heretofore used.

For illumination there is nothing but gas that can vie with it for brilliancy, and on the score of economy it takes precedence even of gas.

These excellencies will surely be proved to the whole public, in spite of the errors and failures of some manufacturers to supply a *good* article, and a consequent temporary prejudice, and it requires but ordinary foresight to comprehend the magnitude of the demand. Many millions of gallons will be needed annually, though the *hog* shall multiply and thrive, and the monsters of the deep shall continue to yield to the hardy whalemen the wonted treasure they seek, for our wants are rapidly running beyond the natural supply from those sources, and coal must furnish them.

As a manufacturer I do not regret that new investments are being made to increase the supply, if those who engage in them shall produce and furnish to the public a good article, so that the consumer shall realize what many now know for a certainty, that coal oils are *the best and most economical substances* for the various uses for which they are prepared, by any possibility within their reach.

Messrs. Dille & Robinson, under the firm of John R. Robinson & Co., were the pioneers in the business in Central Ohio, and they have struggled up against prejudice, and against the difficulties that beset a new and truly *mysterious* business, till they are now preparing for market weekly from 2,000 to 2,500 gallons of the various oils. Their manufactory is near Wolf Station, in Perry county.

The Great Western Coal and Oil Company, of this place, are just now completing their works on a large scale, and in a few days will be able to furnish from 3,000 to 4,000 gallons per week.

The Newark Coal Oil Company, (Holmes, Hull & Harris,) also at this place, are preparing to make from 1,500 to 2,000 gallons per week, making an aggregate for these three establishments of 6,000 to 8,000 gallons per week, or from 300,000 to 400,000 gallons per annum.

This seems like a large amount, and as if it would overstock the country, yet the statistics show that Cincinnati alone manufactures more than five times that amount of lard oil annually.

Respectfully,

NEWARK, O., June 9, 1858. JOSEPH E. HOLMES.

MACHINERY.

The use of machinery, as applied to the purposes of agriculture, and its influence upon the progress of mental culture, among the people, and the effect it has upon the productiveness of labor and capital, and, consequently, upon the physical and moral well-being of society, justly calls for a careful consideration upon the part of every intelligent citizen, whether farmer, artisan, merchant or professor; for, there is no rank in the social scale, no single individual, indeed, who is not affected by the application of machinery to the purposes of producing what the natural or acquired wants of mankind, considered individually or in the aggregate, demand for subsistence, comfort, health, spread of knowledge and happiness.

The application of machinery to the purposes of production, has such a direct relation to the spread of knowledge, and the increase of the happiness of the race, that it has become one of the most important subjects of investigation, and so great is its influence in carrying forward the grand work of civilization and the advancement of mankind, in every matter of social and moral amelioration, that machinery may be said, almost, to have transformed the savage and barbarian into the polished, useful, and happy benefactor of mankind; to be, in fact, the great agent of human progress in every department of knowledge and morals.

To obtain a clear conception of the vast importance of machinery in any one department of human industry, it will be necessary to consider, with more or less comprehensivess, its application in other departments and from a knowledge of the combined influences it exerts upon the general productive forces of a country, deduce conclusions as to its results in a special application to a particular department of labor, and, not only so, but it is equally necessary to consider and compare different periods in the history of machinery and the coexistent conditions of society and observe the bearing, which improvements in mechanism, from time to time, have had upon the progress of social and individual advancement, in the essentials of civilization and their conjoined advantages, as evidenced in the greater security of life, liberty, possessions and happiness, now enjoyed, than was formerly within the reach of the wealthiest or wisest, and the far greater accessibility of those means of intellectual enjoyment, which distinguish the pleasures of the cultivated mind from those of the ignorant and uncultivated savage, or his from those of the brute creation.

And, besides, a full understanding of this important subject cannot be attained without some reference being had to the nature of the human constitution, and the condition of man without any implements whatever, and his situation as modified by his acquisition of a few implements, and noting the progressive steps by which he passes from the savage to the civilized state, in exact proportion to the skill he acquires, of constructing implements of defence, offense, and manual labor. In fact, to be able to estimate, in its totality, the mighty influence exerted by machinery, simple and complicated, upon the progress and destiny of the human race, requires an acquaintance with the principles of man's being, his mentality, his social and individual character and requirements, his morals, government, religion, and in fine, the whole of his intellectual endowments and their multifarious manifestations.

This would require, for a clear exposition, vastly more space than the limits assigned to this subject, in the present report, would permit, and we can, therefore, only glance at a few of the more prominent principles involved in it, but hope, at the same time, to be able to place these in so plain a point of view, that a more careful investigation of the relations of machinery to the progress and happiness of man, will be awakened in every lover of his kind, who shall read the following remarks, designed to attract attention to the subject, and, as far as practicable, elucidate it, without a too prolix dissertation thereupon.

Any man, even the most intelligent, who might suddenly find himself cast upon an uninhabited island, naked and destitute of all implements of labor, would be, no matter how great the possessions of which he might find himself the sole master, a most forlorn and destitute being. Imagination can scarcely picture forth his wretched situation,—without the means of appropriating to himself the wealth by which he might be surrounded, and he could only subsist by the most unremitting and arduous toil, and would soon sink into utter barbarism. Yet in a genial climate, and upon a productive soil, a very few implements would enable him to gain from the earth and forest a livelihood, at far less cost of labor.

If, instead of being solitary, he have a few companions, and each have a few implements, the combined energies of the community would vastly diminish the labor of the individual in procuring a subsistence, and permit some accumulation to serve as a resource in case of accidental inability or other cause of neglect to labor, constantly, to supply the pressing wants of the body.

Again, this community, supposed, when swelled in number and impelled to produce more and more, would set up divisions of labor and a system of exchanges, and thus favor individual developments, in particular kinds of productive labor, and we would see the different occupations of builder, smith, shoemaker, tanner, farmer, and all other special occupations, become gradually established, as independent branches of industry, and thus, a much greater development of skill and productiveness would characterize the labor in a special department, than could be attained by any one who must give an imperfect attention to many different occupations, as is done by the savage or semi-civilized, skilless laborer.

Still farther, in the condition of society characterized by all the refinements and enjoyments of civilized life, the number and variety of implements and machinery which are designed either to increase the productiveness of the labor of the individual, or to render the product more perfect, have kept pace with or rather preceded and caused this more universal spread of comfort and ease, and thus favored, by affording more leisure, a greater diffusion of knowledge, in the aggregate, among the people, and this knowledge, reacting upon the source whence it has been nurtured, multiplies and improves the productive machinery, by the use of which the mass had gained time to acquire that increased stock of information and mental power, which, properly applied, make up the sum total of human pre-eminence.

Thus, gradually emerging from barbarism to civilization, and from mere civilization to refinement and intellectual elevation, society and the individuals composing it, have been constantly indebted to the implements and machines for increasing the productiveness of labor, or for making its products more perfect, which the skill, acquired slowly and painfully at first, and more readily at each successive step of progress, has made and applied to the purposes of production, and in a no less degree are they indebted to the system of division of labor, and of exchanges growing out of it, for a powerful incentive to still greater improvements in the means and products of labor, and the diffusion of knowledge, and the consequent increase of material and mental enjoyment.

Man subsists upon the products of the earth, either spontaneously called forth by nature, or, increased in quantity and modified in quality by his labor, either in the very mode of their evolvement from the earth, or in the subsequent changes wrought upon them by his skill, for the purpose of making them more conducive to his comfort and the proper sustenance and protection of his body, or the gratification of his senses and intellect.

All that the labor of man, applied directly or indirectly, can do, then, is to effect changes in the materials which have been supplied him by Nature, and these changes are reduced to three kinds, which are: *change of form*, *change of place*, and *change of ownership*,—and all these changes are vastly, almost inconceivably, facilitated by means of machinery appropriate for each kind of change.

A cursory review of some of the mechanisms by which these changes are effected now, and by which they were partially effected formerly, will be not only interesting but instructive, and will serve, better than any other means, to exhibit the importance of the subject in a clear light.

The change of form has reference to the conversion of the products of the earth into food, raiment, houses, implements of labor, defense, offense, and pleasure, and begins by increasing the quantity of these natural products in a given space, and then improves their quality, and, afterwards, changes their form to a greater or less extent, to subserve the purposes of life. Thus, by the skill acquired slowly and gradually, the form of nearly every vegetable, which serves as the food of man, has been changed, as the peach from an unwholesome, inedible, bitter wild fruit to one of the most delicious and palatable luxuries, the apple from a sour and disgusting to a most desirable and healthful delicacy, the wheat from an insignificant grass, the aegilops, to our now indispensable staff of life, and so, of almost every plant cultivated by man, the form, even of growth, has been so changed that it is often difficult or impossible to define the original form of the improved vegetable product. And this change of form and relative quantity of a given vegetable reaches back to a change of form of the inorganic elements themselves, and man is thus enabled to mould, indirectly, as yet, it is true, but none the less certainly, those elements, useles or injurious to him in their unmodified condition, into the very essentials of physical comfort and well-being. Consider, for one moment, the amount of carbonic acid which has been converted from a positively deleterious to a decidedly useful form in the cultivation of a single acre of wheat, corn, sugar, cotton, or any other plant, and not this one material alone, but all others, which enter into the constitution of vegetable productions, are changed into such form by man's labor operating directly, or circuitously, as to add to the means for the preservation of his life or the increase of his enjoyments.

Change of form is effected in the products of the earth, after their growth has been perfected, by man's labor, as the wheat in the straw is cleansed, separated, ground, and otherwise prepared for consumption in a variety of ultimate shapes,—the juice of the cane is converted into sugar, the fibre of the cotton, flax, and hemp into cloth and other textures, to subserve the purposes of life, in a great variety of ways, and so on indefinitely.

The mineral wealth of the earth is also the subject of change of form, at man's will, and the useless pebble at his command becomes the axe, the sword, or even the pen, which exceeds them both in power,—the plowshare and pruning hook, and the warrior's spear and coat of mail are all fashioned by his hand for their several uses. This conversion of the various minerals into forms, useful to man, increases in direct ratio with his increase of knowledge and intelligence, and is at once the means and exponent of his intellectual power. Without knowledge and skill the ores of the metals lie useless upon or beneath the surface of the earth, but when man, no matter how, has learned to fashion them into new forms and combinations, they at once become the most efficient auxilliaries in his efforts to subdue and guide any and all of the productive forces of nature, and to effect all the changes which may be necessary for his safety or happiness.

Fire effects a change of form, and reduces the metals from their ores, and renders them more easily moulded or beaten into shape. Then comes forth the hammer and the axe, and by the aid of these the plowshare and the beam are fashioned and fitted, and by this the bosom of the earth is wounded and gives forth to her children the nourishment and covering for their bodies.

But, constant toil is slavery—and man longs to be the master of more servants to do his labor, and the glowing fire and the ringing hammer mould and fashion, arrange and dispose, under his guiding skill, until all the complicated mechanisms of to-day, which perform the labor which would require more than the united effort of ten such worlds as ours, unassisted by them to perform, have been evolved from the fertile brain of the sage and philosopher, to relieve man of his thralldom, and open to him the storehouses of intellectual enjoyment.

Let us consider, for a moment, the effect of some changes of form, and a few of the labor-saving mechanisms of the present, and observe their effect upon the well-being of mankind; and, first among these, we will consider gunpowder and its appliances, designating it as one of those most conducive to man's happiness and longevity, which have ever been called into existence. And, that it has been a means of spreading civilization and preserving human life, to an almost incalculable degree, may be inferred from the following considerations, which might be lengthened to many pages, but which render the truth of the proposition sufficiently evident to the intelligent mind, without entering into as lengthy details and illustrations as the magnitude of the subject would permit, and even render proper, if time and space justified.

Before invention and application of the fearfully destructive agent, known as fire-arms, the world had been progressing so slowly, and, in so few and isolated regions, towards civilization, that by far the greater part was sunk in utter barbarism. With the few, inefficient means of offense and defense then possessed, mankind was, in many places, merely able to maintain their position against the ravages of the beasts of prey, but were unable to reclaim the forests and transform them into safely habitable fields and cities. The savage life of the vast majority of the world's population led to continual wars and devastations, and even among the most civilized of the nations, existing prior to the discovery of gunpowder, personal prowess in the field of battle offered the only road to distinction and honor, and war, with all its horrors, was the business of the world. The energies, talents and skill of the ambitious and mentally great were almost exclusively occupied in the arts of war, and thus, almost all the efficient minds of the age were attracted away from the business of producing to that of destroying. The constant exposure and dangers of camp-life, in addition to the wholesale murders of the battle-fields, thinned out of every community the strong and efficient labor-power, to waste it in the vain pursuit of glory. Famine and pestilence were the attendants and coadjutors of war, and, in their united devastations, age and sex, were disregarded—the husbands and fathers, perished by war, and the women and children by want and disease, while cruelty and bloodshed, rapine and debauchery, stamped the nations with their fearful seals of degradation. Ignorance and vice, the companions of warlike life, obstructed the way by which the gentle arts of peace lead their votaries to wisdom and goodness.

But the face and fortunes of war have been changed by the discovery of the engines of death, and that which rendered the battle more murderous and terrible, the sooner terminated the struggle. The destruction of life being more certain and speedy, shortens the duration of the conflict, and, the survivors are enabled the sooner to return to the useful and productive vocations of peace, and, in the aggregate, even supposing the number of slain in battle to be equal now to what it was formerly, yet there is a vast saving of labor-force in the much speedier return of the living to the work-shop and the plow. By this means there is a great saving of time and lives which may be made valuable to the community;

but there are other advantages flowing from the diminution of the duration of the evil influences of war, such as the lessened liability to dearth and famine, the shorter time during which the soldier is exposed to vicious influences, and the removal of those influences, while existing, from among the whole people, and limiting them, as by a moral cordon of safety, to the immediate vicinity of the more closely circumscribed sphere of action, to which armies are now confined.

If war be at all necessary, which it will not be when the humanizing influences of peace and intellectual and moral culture have become more universally known and acknowledged, the use of fire-arms has incalulably lessened the labor of carrying on the business of human butchery, and the more and more perfect the means of destruction, the less and less frequently will their use be thought necessary until the nations of the earth "shall not learn war any more."

Besides the great labor-saving properties mentioned in the foregoing paragraphs, the uses of gunpowder in the arts of peace are scarcely less important. The blasting of rocks, in the construction of those mighty works of the civilized world, the canal and railroad, has often, in a few seconds of time, performed the labor which would otherwise have been performed only by the outlay of the labor-force of hundreds of men, for days or weeks of time.

One more illustration of the effect of the use of gunpowder before we pass to the consideration of any other subject. Its effects as an agent in civilization may be further inferred from the fact that, when warfare was carried on by brute force, it was the rude and barbarous nations whose only occupation was war, who were but too often the conquerers and enslavers of the more peaceful and refined, the more civilized nations, and by this means the blighting influences of barbarism, kept in check and often drove backwards the slowly advancing civilization of the world. But the use of gunpowder equalized at once the physical force of the contending parties and gave to intellectual power that preponderance, which has enabled civilization steadily to encroach upon barbarism, and will continue to do so until not a savage will be left upon the face of the earth,—until all will have yielded to the genial influences of intellectual development, or perished in a vain attempt to oppose its progress.

The mariner's compass, a little thing, and simple in its use, was unknown to the ancients, and the dangers of navigation and the vast amount of time required to perform voyages, which are of short duration now, kept the nations of the earth so much estranged that those living upon one side of the globe knew nothing of those upon the other, not even of their existence. The vastly greater length of time required to perform a given voyage, and the much greater exposure to the dangers of the deep, made the life of the sailor one of the most hazardous. But the compass, and, afterwards, the sextant and the chronometer, in the hands of science, have lessened these dangers and delays inconceivably. In the time of Henry II, of England, his son, William Longsword, was tossed about in a voyage from France to England, for the space of three months, when a week now, even without the aid of steam, and during very unfavorable weather, would be considered a very long voyage.

The compass has made all parts of the earth accessible to civilized nations—it has made navigation more secure—it has vastly lessened the time required to perform a voyage—it has thus saved time and life, and brought knowledge and its ameliorating influences to bear upon many spots of this green earth, which were formerly the abode of degradation and utter barbarity.

Who can for a moment conceive what our world would suffer in loss of time and waste of labor, if the watch had never been invented to mark the progress of the hours, or if it even now ceased to tick the knell of the departing seconds? Let any man, in a civilized and busy community, disregard, for a few days, all reference to an observance of "set times and seasons," and in his intercourse with an active world, he will find himself too late or too early to apply his labor at the moment when it would be most productive of results, and he would soon discover by painful experience, that, to perform his part well in life's dramma, a constant reference to the labor adjusting qualities of the watch is unavoidably necessary.

The whole world lay in the impenetrable darkness of the long night of ignorance, with but here and there a gleam of light emanating from the pen of some writer, as from the wand of a magician, to light up the obscurity and make it visible for a moment. The interchange of thought, the commerce of intelligence, had no labor-saving machinery, and but few indeed of all mankind ever found access to the temple of science, and even those few were unable to explore its store-houses of knowledge—the keys required to open the fane of learning, were wanting, and, even the most aspiring, could but enter the outer courts of the temple.

All the books, in which were recorded the researches of investigators of truth and observers of passing events, were but slowly and painfully multiplied by the labor of the scribe, and few, indeed, were fortunate enough to possess such a treasure as even one volume. "The Royal Library of Paris in 1378 consisted of nine hundred and nine volumes—an extraordinary number" for the age. "The same library now comprises upwards of six hundred thousand volumes," and from all the data upon which to form an estimate, it may be safely concluded that where one volume could be obtained by the laboring classes, in the fourteenth century, they can as easily procure four hundred thousand at the present time. "Even as late as 1539, in England, the bible, now distributed gratuitously, was placed in churches and often chained to the desk for the use of the common people; and the multitude assembled to hear it read from the few who possessed sufficient education for this purpose."

But, as heaven's best gift to man, the means of bringing the treasures of knowledge, science and wisdom within the reach of every mind, the art of printing was discovered. Is it saying too much to declare it revealed to its inventors? And, with the least appropriate mechanical aids now in use for the purpose, one man is at once able to perform, in the multiplication of copies of any volume, the labor, which, before, would have required the conjoined efforts of ten thousand scribes or copyists, and with a perfection of execution which not one of the ten thousand could equal.

But, aided by the machinery in use and by the proper division of labor into special departments, a single printing establishment in London or New York, can produce more books, or single copies of books, in a year, than could all the people of the world, working as scribes, produce in five centuries.

The consequence of this almost inconceivably rapid multiplication of works of art, science, literature and all the useful incentives to thought, have changed the ratio of exceptions in all civilized nations. Formerly, the man who could read was the rare exception, while now, it is the child of ten years, who cannot do so, who is separated by distinction from his fellows.

At the present day, a thought, which contains aught of utility, aught that tends to elevate and ennoble the race, or, direct mankind to a new and beautiful path towards moral or intellectual development, is heralded forth by the press and may find its entrance, by a rapid course, to every fireside, and we might say almost every mind in the civilized world, so that there is no longer any plea or excuse for gross ignorance, in Christendom, and the time is rapidly approaching when the press, the mightiest engine which ever wrought for progress, for civilization, for freedom of body and liberty of mind, for humanity, will forever rend the chains of thralldom and mental, moral and physical slavery, which ignorance and superstition have riveted upon man, whose god-given inheritance is freedom of thought.

The object and the sole aim of every human being is happiness, and to obtain this all men's efforts and energies are applied, but, unfortunately with so little acquaintance with the laws of cause and effect, operating, in the moral and intellectual, as well as the physical sphere of human existence, that the object is but rarely gained, except very partially and imperfectly. Ignorant of the laws of health and life both are needlessly exposed to danger of destruction, in ten thousand modes, and the one being injured or the other lost all past efforts for mundane happiness are rendered futile. And the question arises, "What doth it profit a man if he gain the whole world, and lose his own soul?" But a correct knowledge of the laws of health and the relations existing between physical comfort and mental ease, properly appreciated and applied, would lessen the evils of disease and increase the longevity of the race, and thus afford more time and opportunity for prosecuting the search after happiness, and multiply the means of discovering its true nature and the elements of which it is constituted.

By the wide spread and constantly increasing influence, which the intelligence disseminated by means of the art of printing is exerting upon the minds of the whole race, directly or indirectly, all the avenues to a correct appreciation of the relations of cause and effect, both physical and moral, are becoming more and more accessible, and, consequently, the true path to happiness, a strict conformity to the laws of mental, moral and physical being, is becoming daily plainer and more easily trodden, and the well-being of mankind is better and better secured, by this, the most directly beneficial of all labor-saving inventions,—most directly beneficial because wielding its influence upon the very centre and origin of all human greatness and worth, upon the mind of man itself.

The human race can never be happy until they become wise, that is, until they have made themselves acquainted with the laws of their whole being and well-being, spiritual and material, and in accordance with those laws, have learned to apply the appropriate means, in a suitable manner, to obtain the grand object of their existence—happiness. And, in bringing about this desirable state of things, every step that has been taken to facilitate the spread of knowledge, every additional facility which has been afforded for the acquisition of truth, and every new incentive to research has directly tended to elevate man, and lessen his sorrows, which are the offspring of ignorance alone, either of himself or of his fellows, and add to his means of enjoyment by adding to his stock of material and intellectual resources, and increasing his capacity to be happy, and thus leading him by the path of wisdom to the abode of peace.

No other means of facilitating the increase of man's knowledge has ever equaled the art of printing, which does the labor of a whole world of scribes, and to its beneficent influence may be justly attributed nearly all the other improvements in the arts and sciences, which promote, so greatly, the civilization of the world.

He whom the world has chosen, in the post to honor, as the practical man, that is, the man who toils from morn till night for his subsistence, or for the accumulation of riches, without troubling himself with the sciences, by him and them, in their ignorance, deemed useless, is wont to be looked upon as the model, which every one, aiming at usefulness, should imitate. But while we are glad to yield a tribute of merited praise to him, who has not been an idler in the human hive, we cannot but honor the laborer who has achieved greater results, by the efforts of the mind, than he who has applied less of thought and more of muscle to the business of production. Among those who have most aided in the world's progress, Watts, who invented the steam engine, stands a worthy peer. Besides the inventors of gunpowder, of printing, and of nautical instruments, none have performed a better work for humanity than he, as his invention gives an increase of power to effect changes of form and place, almost incalculable in extent and variety.

Watts, alone, has, as the result of what his less actively thinking fellows denominated "lazy dreaming," performed more labor for the good of mankind than all the mere practical manual laborers who have ever used their muscles and permitted their minds to lie dormant and unproductive of any thought, which was of sufficient importance to give a remembrance to their names, now stricken from the rolls of fame or disgrace, and consigned to as utter oblivion as though they had never been.

Steam, in its applications to the change of form, has been the means of multiplying the productive forces under the control of man, to such a degree, that the engines now employed in the different branches of the arts, exclusive of those used for transportation on the rivers, oceans, and railroads, will represent a labor-force, which, probably, exceeds ten times the united strength of all the laboring classes of the entire world, and the additional equivalent of two or three times the effective force of the whole human race is found in the transportation power of the locomotives and steamers which so intimately unite the distant in space together. Let the skeptic convince himself by estimating the amount of human labor which would be required to drive the machinery of a single rolling mill, cotton manufactory, or machine-shop, and then glance at the number of steam-engines driving forward the productive energies of the whole world, and he will not be surprised at the estimate we put upon the effective force of steam in use when we assess it at an equivalent of fifteen times the population of the whole earth. This estimate may seem large at the first view, but when it is known that the profit upon articles manufactured almost exclusively by the application of steam, in the State of Ohio, exceeds $60,000,000 per year, exclusive of the application of steam to farming and transport purposes, a faint idea may be formed of the mighty force, called into being by one man's thought leading the way, and others, bodily idlers, but mentally laborers, following in the path, and applying the power by him discovered, to new purposes. We will recur to this subject again when speaking of the means of transport in relation to machinery, and can easily demonstrate that very many times the actual population of the world, unaided by steam, would be required to perform the labor, done by one man's thought embodied in the engine.

The appliances of machinery to effect changes of form are almost endless in variety of construction, and specific purpose, and we can, therefore, not even mention all of them, but a few are so prominently useful, that we are constrained to call attention to them, and thus awaken an interest in, and investigation of, the subject, which will lead to the adaptation of labor-saving contrivances to a variety of purposes, in which they are now wholly or almost wholly neglected.

Not a century since, nearly or quite all the cotton cloth consumed in the world, was furnished by the Hindoos, but at so great a cost that the consumption was very limited, and the price was very great, but now the invention and perfection of the spinning machines enables a single intelligent Yankee girl to represent the labor of three thousand Hindoo spinners, and by such means the price of cotton yarn has been wonderfully diminished, but its use has become proportionally wide spread, and calculations based upon carefully collated statistics demonstrate that more cloth is produced by the power looms of England, alone, in one week, than could be made by all the people of the globe in twice that length of time. This perfection of machinery has vastly diminished the price of cloth, and made the luxury of comfortable clothing attainable by all, where but a generation or two since, it was only the very rich who could enjoy the comfort of good and suitable clothing. More cloth is produced, more consumed, more physical comfort secured, and greater immunity from the necessity of labor enjoyed.

The manufacture of paper has been made cheap, in like ratio, and its consumption has increased and favored the reduction of the price of books, by the application of machinery, thus increasing the means of happiness of mankind, by aiding in the reduction of the labor and cost of procuring the food necessary for the healthy growth of the mind.

The saw-mill, the grist-mill, the forge, the glass-house, the foundry, the tannery, all, besides many other branches of manufacture having man's comfort, health, life, and happiness for their ultimate objects, are supplied with mechanical auxilliaries, lessening the amount of labor required in the production of the several articles they are designed to make, and rendering their products more perfect, and thus each aids to give man more means of enjoyment and more time to profit by the means so liberally provided.

The forces at work to produce changes of form are, as hinted at, multifarious and great, and as they have been evolved from the minds of thinkers, furnish strong arguments in favor of mental, as the stronger over mere physical, as the infinitely more inefficient mode of labor, and point out clearly the propriety of applying thought to the evolution of still other mechanical contrivances for the purpose of lessening the effort necessary to procure the means of a comfortable, bodily subsistence, and giving greater scope and time for the development of man's mental and moral nature, and supplying to these the resources of the happiness which exceeds in intensity mere physical pleasure, as the mind has been clearly shown to exceed the body in the productiveness of its labor.

But, with all the increased facilities for change of form, if the means of transport, or, the machinery to produce change of place, remained unimproved, the increased power of production would almost fail in its grand object, the multiplication of the means of human comfort and civilization, and the expanding intellects of the present and preceding ages have labored to increase these demanded improvements. The improved wagon and the improved road took the place of the pack-horse, or porter, and bridle-path,—navigation was reduced to a fixed science, and the transit by sea became speedier and more certain. But production went on increasing, and Fulton, laboring upon a new application of Watt's motive power, the steam engine solved the problem of steam navigation. Following in his footsteps, other thinkers improved, remodeled, and labored until the rivers were made the highways of the huge steamboat—but, the ocean still kept the nations apart, and, the ocean steamer became a necessity, which mind, the ruler of all things, obviated, and rendered an ocean voyage a mere pleasure trip compared to what it was a few years past.

There are, yet, three men living who accompanied Fulton on his experimental, first voyage on the first steamboat, and who are therefore, still living witnesses of the birth of this mighty creature of the brain, which has been nurtured and developed by its parent, mind, until it encircles the globe in its arms and binds the nations of the earth together in the bonds of neighborly love and sympathy. Who would not rather be a Fulton than an Alexander the Great?

But, while the river and ocean were teeming with busy commerce, land export could not lag behind, and, Clinton, with his canaling genius, increased the capacity of the means of transport, wherever the ditch could be dug, a thousand fold, but time, being the great wealth of man, was in a manner wasted, and although the transport-power was greatly increased, yet, speed was needed to make it perfect, and the scientific mind constructed the railroad, and all went on smoothly for a little while, as, by the lessened labor of moving a given weight, one horse could sooner perform the labor, which, before, required on a common, good road, the force of twenty horses. But the mind cannot rest in the path of progress until the limit of possibility is reached, and the brain conceived and brought forth the iron horse, whose muscles never tire, whose food is the mineral from the coal mine, or tree from the forest, and whose breath of life, supplied to lungs of metal, is the scalding steam, and who represents in his speed, strength, and power of endurance more than a thousand horses or more than ten thousand men.

In the State of Ohio alone, in the year 1857, there were 600 locomotives, and the combined distance of transit which these could perform, allowing 500 miles each, in 24 hours, would amount to the enormous distance of 300,000 miles, for a single locomotive equaling 30 miles of travel each for 10,-000 men, and carrying burdens which would require more than three times that number to move them one mile, and, in accordance with this process of simple reasoning, from known data, we have, in Ohio, in our railroads and locomotives, a man force equivalent to 300,000,000 of men. Now, Ohio is but one small spot, and when we view the enormous distance traversed, and the quantity of freight transmitted throughout the world, by railroad, by steamboat, and by canal, greater than could be effected by the old modes of conveyance, and reflect upon the almost incalculable number of men required to effect the same amount of change of place, the value of machinery as a labor-saving, comfort-spreading agent, will begin faintly to appear. Watts has performed more labor by the offspring of his brain than all the merely manual laborers who have ever lived.

In the year 1790, there were in the U. States, 1,875 miles of post routes, and the mail was often a week reaching Philadelphia from New England, and two weeks in arriving at Savannah, from Boston. In 1810 there were

2,300 post offices, receiving $500,000, at the rate of at least 50 per cent. more than is paid for the same matter now, when the receipts of the P. O. department amount to $6,000,000 for transportation mail of matter over 217,743 miles of post routes, equaling an annual transportation of 61,892,-542 miles, but these increased and seemingly adequate means for affecting a change of place of the mental commodities produced by the age, were found insufficient for the growing demands of the mind, and Morse harnessed the lightnings of heaven which had been rendered obedient to man by Franklin, to the car of thought, and we are now in familiar, neighborhood relations, with every important city of our vast country, and now, a still further extension of our intimacy, even to the remotest lands of earth, has been demonstrated as practicable by Field, in his Atlantic telegraph, and the triumphs of mind over the forces of nature, rendering them subservient to the wants and the desires of man, begin to seem illimitable.

Verily the progressive character of the human race is a demonstrated fact, it is the law of its being, and yet, in the face of all the evidences of the utility of the mechanical appliances thus patent to every one who looks upon the world with open eyes, the masses do yet oppose their use in each new field.

We have demonstrated, it will be admitted, in the preceding remarks, the very great increased power of rendering labor productive, conferred upon man by the machinery and implements, which his brain has conceived and his hands have fashioned, to facilitate the effectuation of changes of *form* and changes of *place*, the objects of which changes are the increase of the physical means of comfort and intellectual development, and their more universal dissemination over the earth. And this increase of effectual productive force by the substitution of machine labor for hand labor, has, as a natural result, diminished vastly the amount of time and application necessary, upon the part of the individuals composing the world of mankind, for securing their support, and supplying all the real wants of the body, and this permits a much greater portion of time to be devoted to the acquisition of knowledge than could formerly be done. This diminution of necessity to labor is so great that, proper economy being used in the consumption of its products, one person can supply the wants of eight or ten others, who can thus be enabled to devote their time exclusively to the business of intellectual culture and the pursuit of happiness, or, what is more nearly the correct presentation of the case, the individuals of society need not, and many of them do not labor, taking the whole duration of their lives into consideration, more than one-sixth or one-eighth of the time which would have been required even half a century since, to secure an equal amount of physical comfort and opportunity and means for recreation and enjoyment.

Freedom from necessity to labor is followed, necessarily, by greater mental activity and proportionate development of the powers of the mind for the law of man's being is *activity*, and, if no longer necessitated to exert himself physically, the mind *must act*, and human progress is accelerated. The philosopher and intelligent philanthropist, hail with pleasure, consequently, each new avenue, by which the searching mind may be enabled to explore the realms of thought, less embarassed by the toils and cares of external and physical life, but, not until the use of machinery shall have replaced, to a much greater extent than at the present time, and made far less necessary, the use of manual labor, for securing subsistence, can the advice of the great teacher's "Take no thought for the morrow," (lest it prevent proper freedom from corroding cares, and interfere with spiritual improvement,) be followed by the masses of mankind. So long as men, women and children are over-worked they have not enough time to devote to that mental culture which is destructive of vice, ignorance and degradation. The leisure of a prison life gave to the world Bunyan's Pilgrim's Progress, which would never have delighted its millions of readers, had Bunyan been compelled to work instead of being compelled to think.

Having given, at some length, the principles involved in a change of *form* and *place* by the aid of machinery, we will now consider, in a very cursory manner, the machinery applied to the change of ownership, and, by a few familiar illustrations endeavor to make this part of the subject easily intelligible.

In a rude state of society, exchanges occur, but they are limited, necessarily, by the difficulties which surround the commerce of the barbarians. The hunter exchanges his venison and undressed skins and peltries with his trafficking fellows for ready made clothing, perhaps, or the construction of his lodge; or, he deals with the renegade, or wandering civilized merchant for the guns, powder, lead and blankets, which he has brought a long distance, with great inconvenience, for the purpose of trade. The nomadic shepherd tribes trade cattle, sheep, horses, and other live stock, for what they can obtain for them, and, in some countries slaves are made use of as a kind of circulating medium, as they were by our Anglo-Saxon ancestors. Formerly, in the earlier colonial condition of New England, codfish and tobacco were used as a currency; but, no amount of contrivance could make either of them desirable for money purposes for the lady portion of the N. E. aristocracy, which had its foundation in the current value attached to these articles of trade.

Direct exchanges of products of all kinds would be very laborious, indeed, and this labor would be so great that, without machinery for facilitating a change of ownership, all the advantages flowing out of the application of machinery to the business of production would fail to effect that degree of labor-saving, which is the origin of so many of the advantages of the civilized over the barbarous conditions of the human family.

Change of ownership is a matter of such vast importance that it has in all progressing nations, and particularly in those most advanced in the arts of peace and prosperity, become a special department of labor, like the trades of the carpenter and the smith, and a perfection of execution has, consequently, been reached by those who make the change of ownership their trade or occupation, which never could be attained if each individual were himself required to effect all, or even a greater part, of the changes necessary to be effected before a product passes from the hands of the producer to those of the consumer, and hence the merchant, undertaking to devote himself entirely to the effectuation of these changes, becomes a necessity in a civilized world, like other laborers for man's good, who do not directly produce by their own labor, yet, do, in the end, assume the rank and deserve the honor due to producers, because they lessen the labor of the producer in reaching the consumer, in such a way as actually, although indirectly, to be producers through the greater facilities they afford for making productive of results the labor-force directly applied, and preventing it from being expended in unproductive and wastefully misapplied efforts. The merchant, then, has a special branch of industry to which he devotes his attention, and the per cent. he gains, from his capital and labor invested, are the measure really of the estimation in which the utility of his labors are held.

Those who have given themselves but too little time for reflection upon the subject of the different professions, considered in view of their relative value as productive directly in themselves, or, indirectly, by their labor-saving influence upon others, are prone to undervalue, not only the mercantile, but other equally useful and highly indispensable branches of special occupation in a civilized community, and often unwisely attempt to array the working men against other classes who are no less useful in the way of promoting the general good, because the results of the labors of these are affected by circuitous and hence less plainly apparent routes, when at the same time a proper investigation of the connection, existing intimately between every member of society and all other members, would make the unity of interests of the whole so plain, that each laborer in a special department would have the respect due him, and, which is never wanting, except as a result of an imperfect acquaintance with the fact, that the true interests of every man are the proper subjects of general, nay, universal solicitude, because the labors of the hand or the brain, which favor the multiplication of human resources of enjoyment are unavoidably performed for the good of all, no matter what the motive of the individual performing such labor, no matter whether performed with a view to his own advantage alone, or directly for general good.

Division of labor has been found advantageous in all occupations, as, for example, the exclusive attention of individuals to the business of iron manufacturing, tanning, building, or other vocation, and the advantage consists in the greater perfection acquired in the quality and quantity of the product, and the same principle of division of labor, operating first upon the whole mass of laborers, separated those whose business it is to effect changes of ownership from the producers, and afterwards still operating upon the exchanging class, this was subdivided very extensively, in proportion as the wants of civilization demanded, until we have, in flourishing communities, the so-called dry-goods merchants, grocers, hardware dealers, wood, iron, coal, sugar, cotton, and other traders, who have selected distinct branches of merchandise, to the greater or less complete exclusion of other articles of trade, and all this has, as a legitimate consequence, an increase of the facilities for change of ownership.

Again some deal in the raw materials, others alone in manufactured articles, some import and export, or attend to change of place as well as ownership—others, fixing themselves upon one spot, trade and exchange there, some deal for dealers alone, as the wholesale trader, while others deal with the consumer exclusively, in the way of retail trade, all of which divisions and modifications of the application of the principle which underlies the division of labor, have as their result a greater ease and certainty of effecting changes of ownership than could ever be attained, if each consumer were compelled to effect these changes for himself, in which case the loss of time and increase of labor would counterbalance, in a multiplied degree, all the per centage now expended for the effectuation of those changes as a branch of special occupation.

But, with all the facilities which a division of the labor of merchandizing affords, there is wanting, to complete and perfect the change of ownership, some machinery, holding, in this branch of labor, a position of usefulness and productive force comparable to the steam engine in the mechanical arts. Without such machinery all the steps required to effect changes of ownership, would be slow, toilsome, and, in many instances entirely impracticable. If merchandizing were reduced to simple bartering of one product for another, many of the operations of change of ownership could not be performed at all, and the wheels of progress would stop. These wheels of progress are driven by steam, water, wind and horse-power, in the millions of workshops, farms, and cars and vessels, which are carrying on the work of civilization and of refinement. But behind these there is another machine, so peculiar in its vast power as to give an impetus and continuous movement to them all. One, too, which operates in such a variety of modes as to be universally applicable in effecting changes of ownership, and in so doing brings the consumer and producer into such intimate relations, that the labor saved by its influence is fully equal to, if not greater than that of all other labor-saving machines combined. This labor-saving machine is *money*, which does more work than could be effected by any amount of other machinery unaided by its use.

In reference to money, its uses and utilities, most persons entertain imperfect or erroneous ideas, and a few remarks upon its character and the relation it sustains to the work of civilization, may serve to suggest views in regard to it, which will lead to a knowledge of the proper position which should be assigned it as one of the motive forces of the world, having as a result of its application a great increase of the faculties for acquiring the means of physical and intellectual happiness.

Certain characteristics are required to give money its value as a medium of exchange, or machine for trade, which are possessed pre-eminently by the metals, gold and silver. No other known substance could so well perform the offices of a circulating medium as these, and their value for this purpose depends upon the fact that they have an intrinsic worth in themselves, which is the same in all quantities or masses. Thus a piece of gold or silver of a given purity, is valuable in exact proportion to its weight. One hundred dollars weight of gold or silver being the same in value, whether it be cut into small pieces or form but one mass.

Considered as a mechanical contrivance it must have the character of representing great value in a small compass. Diamonds and other precious stones have this characteristic, but, they are not valuable in proportion relatively to the mass as are gold and silver. Two diamonds of smaller size, exactly equalling one larger one, are *not* nearly so valuable as is the *larger*, while the two pieces of gold or silver *are of equal value* to one other of like weight, and so on indefinitely in the way of division and subdivision.

These metals, too, possesss a degree of indestructibility which gives a permanence to their value not possessed by other materials which might, for the time being, replace them as a currency. There are some products as the otto of roses, musk, silken textures, &c., which possess great value in a small compass, but are so perishable as to make them unfit for currency purposes. Iron is too abundant, as is, also, copper to be used, extensively, for the purpose as a man would be compelled to take a wagon load of either of these useful metals to purchase products for which the silver or gold he may carry upon his person can be readily exchanged. In Russia platinum is coined into money, but this metal has a very flunctuating value, being difficult to work into the metallic products of the arts, and cannot, therefore, be used so readily in another form, as can gold and silver.

Current coin must, to answer all the purposes of convenience, have a nearly equal value in all places, and gold and silver, stamped by governments, which are simply the authorized exponents of the will and pleasure of the governed community, have such nearly equal value, that the rate of exchange of the coins of one country for those of another are very low. The coining or stamping of the pieces is merely a guaranty of the purity of the metal at fixed standards, with a statement of the value of the piece according to its weight at that standard.

The amount of utility of a given quantity of money, as a labor-saving means, may be inferred from the nature of the uses to which it is put. Suppose that one dollar be the representative of a given amount of labor, say one day's work, or the amount of produce which a man may obtain in exchange for a given outlay of labor-force, then the possessor of one hundred dollars, has at command one hundred days' work, or, their produce, and can readily exchange these hundred dollars for any article produced by labor, because, that which gives value to any product—its utility or the labor required to produce it—may be again exchanged for the instrumentality which can be made to reproduce a similar amount of the same or other products of like value. Now, the products of one hundred days' labor may be desired all in one article, or, it may be that twenty or more different kinds of labor products may be wanted and the possessor of their representative applies to the shoemaker, tailor, grocer, butcher, baker, hatter, and, so on, as his needs require, and from each procures the products of their labor, giving of his hundred dollars to each, in proportion to the value received, and having obtained his money, perhaps by exchanging for it one particular product, wheat for instance, he effects, by means of money, a change of ownership, first of his wheat into a divisible everywhere acknowledged, easily transportable representative of the value of his wheat, and this he converts, by an easy process, into food, clothing, and other articles, which he requires, and instead of being compelled to trade his wheat, in parcels for each of these, by means of many different weighings or measurements, involving loss of time and labor, and necessitating many transportations in search of the producers, who might want to exchange for his wheat, even down, perhaps, to the value of a pint, he at once changes the ownership of his wheat for its representative and this he subdivides and distributes as he may wish, because it can be again converted into any product desired by any of those who have exchanged for it, at that, or any subsequent time, as it does not fluctuate in value with the fluctuations of perishable products received for consumption.

A person in the East Indies wishes to remove his possessions thence to England or America, and they consist of stores, vessels, animals, houses, and lands. He might search a long time for persons with whom to exchange ownerships directly, to the advantage of both parties, but money aids at once in the transaction. He converts his possessions into gold and silver, which are easily transported, and with these proceeds to the desired destination, and again finds no difficulty in converting them into houses, lands, and other goods, as he may desire, thus saving time, labor, and the products these might yield. But here, even gold and silver do not fully answer his purpose, and the labor-saving aid of bills of exchange or bank notes are invoked, as the business of exchanging ownerships has made the invention of such means necessary, and he may carry, by this means, a dozen ships, or a whole factory, or an immense plantation, in his vest pocket, and have them or their like at the end of his journey, after having thus transported them across a continent, or an ocean.

Follow but for one day the number of changes which may be produced by one dollar, and the amount of labor it has the power of calling forth and controlling, and the value of this dollar may be appreciated. It is sent to the collier, and builds a fire in the morning, goes to the baker for bread for a poor man's breakfast, then to the miller for flour, then to the farmer for wheat, to the smith for his labor, to the merchant for cloth, and again to the farmer for grain, and thus, after many labors of exchange, returns at night to the original owner, to start in the morning to light the fire again, but unimpaired by its day's service, and still ready for effecting other needed changes of form, place, and ownership, unless it fall into the hands of the unwise miser, who would let it lie useless and unproductive of good, which it will do if kept moving.

Money means: food, raiment, lands, houses, education, labor, wealth, and, when rightly employed, health, happiness, and good works; or, it may be made the source of much evil, by abuse, as it is a powerful engine to carry on all other machinery, and make it productive. Without its aid the factory would stand idle, the ship would rot upon the ocean, and the car of human progress, driven by steam or harnessed to the lightnings of heaven, would cease to roll its ponderous wheels, and the people of the civilized world, no longer holding intercourse with each other under the influences which this machine brings into operation, would again sink into barbarism.

As we have now adverted to each of the different changes which the labors of man, or the machines he has invented, are designed to produce, we will inquire in a few words into the object of these changes: Mankind, in the earliest records of profane history, is represented as rude, barbarous, and ignorant, and Central Africa, or the Western Territories of the United States, or the far Northern countries of both Europe and America, may serve as good examples of what the condition of man was during the earlier, but not earliest periods of the world's history. The wants and capabilities of the people were few, and the intelligence they possessed was scarcely sufficient for the preservation of the race, and, indeed, many of the earlier tribes have entirely disappeared, and others are now passing rapidly onward to extirpation. The comforts now possessed by the poorest civilized people are far superior to those enjoyed by ancient kings, even since the commencement of the Christian era, and many a school-boy of the nineteenth century possesses a greater knowledge of the exact sciences than did the sages of the past. The labor of sustaining the body was so great, that but few could live in sufficient ease to enable them to acquire any information beyond what would suffice to gain a meagre and uncertain livelihood, and the cultivation of the mind, even up to the point then attainable, high for that time, but only the common level surrounding the base of the "hill of science" at this day, was rarely ever reached. Human life was shorter in the average, less desirable, because less capable of yielding happiness, and far more oppressed by cares and toils than now, when the modern inventions of Poor Houses and Hospitals make the lives of the *present poor* more conducive to comfort and happiness, than were attainable by the rich of by-gone years.

Steadily, although slowly, the more densely populated districts advanced in knowledge and consecutive comfort. The possessor of property became more secure in his possession, and the rude implements of labor became more and more appropriate to effect their purposes, and production, and *changes of form, ownership*, and *place* became more easily effected, but the creation of new wants by the increase of mental culture, caused improvements to proceed more rapidly, for the supply of these wants, many of them not absolute, but yet all more or less necessary to be satisfied, to secure the comfort and satisfy the mind of those who were educated to feel the want.

Thus, the business of improvement in the means of physical comfort and in intellectual culture, proceeded slowly until, during the latter part of the last, and the beginning of the present, century, a more general spread of intelligence, effected by the art of printing, more generally and variously applied, and with much greater freedom than before, gave a new impetus to the car of progress, and prepared the way for the mighty strides humanity has been making towards the limit of human development, within thirty years. Forty years ago good roads were rare—canals almost unknown, in this country,—the steamboat was just beginning to stem the current of a few rivers—the railroad with the locomotive was unheard of—the telegraph was yet sleeping in the undeveloped brain of its inventor,—the farmer had only the wooden plow, and harrow (and this often a tree top), to put in his crop, and the sickle with which to gather his harvest, and the flails and hand fan to clean his grain, and his hand, alone, to shell his corn. His wife and daughters spun and wove his flax and wool, and manufactured his clothing, and knit his stockings,—and the whole family, from the grey-haired grand-sire down to the little urchin, scarcely able to carry the little basket of corn he assisted in planting, were compelled to toil for a mere subsistence. They had less of comfort, but, fortunately for their contentment, they had fewer intellectual wants, the gratification of which makes up so large a portion of the enjoyment and happiness of the present day.

But within thirty years more has been done to civilize and advance humanity than in centuries before, although the preceding steps were required to reach the point whence our present and future progress can proceed more rapidly. The farm implements have all changed; the suitable plow, of pattern adapted to the soil to be worked, the harrow of iron, the cradle, the winnowing mill, and the corn-sheller, took the place of the rude implements before in use, and a greater yield of products for an equal amount of labor followed. The factory relieved the females of the household from the constant drudgery of spinning, weaving, and knitting, giving them more time to cultivate the mind, and benefit by the refining influence of intellectual culture. But progress could not stop here, and the canal, the railroad, the steamboat, and the ocean steamer, and lastly, the telegraph, lessened the labor of reaching the consumer, and the work-shop of the artisan, keeping pace with other improvements, have in turn furnished the farmer with improved machinery, for the purpose of lessening his labor in producing,—and threshing machines, cultivators, corn planters, drills, broad-cast sowers, mowers and reapers, and many other apt contrivances have taken the place and perform the labor of thousands who now seek other and more profitable fields upon which to exert their more intelligently directed force. In short, the labor of the farmer, as well as the labor of every other producer, is becoming more and more effective with every improvement as to the means, and, as a necessary consequence of diminished requirement for physical employment, the mind has more time for cultivation, and the comfortable surroundings of the whole community are increased.

In Ohio, according to the statistics of 1857, the steam engines employed in manufactories are equivalent to the labor of 700,000 men; the transport effected by railroads, steamboats, and canals, far exceed the effective force of 300,000,000 of men; while the application of machinery to the purposes of agriculture in the State, does not fall short of, but perhaps far exceeds, an equivalent to 100,000,000 men, and we have thus a productive labor-force equal, for the purposes of production, to not much short of 400,000,000 of men, while the actual population of the State amounts to 2,368,000; while we are able to support, as well as the uncivilized world was supported a century since, one hundred and fifty times the number we now actually do support, and hence all the labor expended by machinery is devoted to increasing the wealth and comforts, favoring the mental development, lessening the cares and toils, and prolonging and rendering more happy the lives of the comparatively few, to whom all these productive resources belong, and the great problem of human progress is being rapidly solved by the machines now in use, to make human life happy and desirable, by lessening crime and its sad consequences, by removing the ignorance which is its only progenitor.

In the following table it will be seen that in thirty-five counties of the State, no agricultural machinery is reported to be in use; while in the remaining counties, many, and in some, all the improved agricultural machines are employed, with great advantage. As an example of the good effect of one machine, the steam thresher, it is reported in the Ohio statistics of 1857, that one man saved a thousand dollars by having his grain threshed out in time for a good market price, which speedily afterwards fell so low, that, had his grain been yet in the straw, or even threshed, but not exported, he would have lost the thousand dollars which were saved by machinery, which originally cost but $700, and was about as good for future use as before this more than full return for its cost.

Space will not permit a description of any of the very many machines, for a great variety of purposes, now introduced, to a greater or less extent, in Ohio, and we can only say that the illustrations of the principles involved, and the beneficial influences exerted by machinery, in advancing the work of enlightening and improving mankind are, perhaps, sufficient to awaken an interest in the subject, and we will only add that where this is understood in all its bearings, opposition to the introduction of machinery in every kind of labor where it can be made effective, will not only cease, but will be strongly favored by those now practically or theoretically opposed to its use in any department of industry.

FARM LABOR IN OHIO.

Intimately connected with the preceding subject, is a consideration of the relation of farm labor to the general prosperity of the country, and a wide field for the investigation of the intelligent patriot is presented therein. We have, however, only space to hint at this important subject of inquiry.

Labor, to be efficient and productive, should be free. Poland is politically enslaved, only because her laboring classes are held to forced or restricted labor. All human freedom begins by securing to the producer the right of possessing the products of individual labor. Labor to be free, must be sufficiently productive to afford a certainty of sufficient return to the laborer, to support himself, and those dependent upon him, in comfort. When, then, a farm laborer is not remunerated by obtaining directly the products of his labor from the earth, he should have, as a matter of right, so much of its representative, in money, as will secure him against all chances of want, and for this reason the right to employment should always be secured to him, at such rates as will render him free to labor when and where he may desire, and this remuneration should always have relation to his capacity, as a laborer, to effectuate a given result. Labor, to be most effective, should be skilled, and no unskilled labor should be encouraged on account of its seeming cheapness, because unskilled labor is the least productive, and, hence the right of the laborer to that education of the mind, which makes the work of his hands perfect of its kind. As shown in the preceding remarks, and exemplified by Watts, and many others, the results secured by the labor of the mind, preceding and directing the labor of the hand, being many times more productive than the unskilled labor of the hands alone, that labor which is directed by cultivated intelligence should always have the preference, and, if this preference were given, it would be an incentive to the laborer to acquire the skill on account of which his labor would secure a greater return.

In Ohio, with all the mechanical, labor-saving contrivances, now in use, there is often a great scarcity of farm-laborers, and the reason is, that skilled labor, in other departments, is more steadily and constantly productive than in farming, as skill is not, as yet, esteemed, in proportion to its real value, and unskilled labor is paid a price almost or quite as great as that which is directed by skill, while skill in all other departments has a more nearly equivalent, proportionate return.

Farm wages in Ohio are about $150 per year with board, $15 per month with board, and $1 to $1.50 per day without board, and female domestics receive from $1 to $2 per week. While, at the same time, artisans receive from $8 to $20 per week for performing less labor, as to the time employed, and are therefore better remunerated for the time spent in acquiring skill, than the farmer and are more certain of constant employment. Farm labor must be better paid and must be more skillful, else no amount of machinery can supply the demand for laborers. The farmer, the real laborer, must be educated, and having an education, must feel that this secures him a constant market for his labor, and a profitable investment of his capital, skill, and then the supply of labor will always equal the demand. No amount of theoretic elevation of the laboring classes and equalization of their wages can ever be effectual until both laborers and capitalists learn that their interests are common, and that skill and intelligence, in the application of labor, and not merely the labor itself, is what determines its productiveness, and consequent market value. With but rare exceptions, in all departments of human industry, except in agriculture, which is held back by want of comprehensive knowledge in regard to its real condition and wants, skill commands a greater remuneration, in the shape of wages, which are but the measure of the productiveness of the labor, than falls to the lot of the skilless artisan or workman in any such department.

The proper education of farm-laborers is thus demanded, and, as a mere matter of justice to them, their skilled labor should be certainly remunerative to such an extent that no fears of loss of opportunity to labor productively, will drive them into other fields of industry to the detriment, not of agriculture alone, but, of all other occupations, which look to this for a means of subsistance.

The construction of common, free-school laws in most of the States of the Union, and not only in these, but in many of the monarchial and despotic countries of Europe, is proof sufficient that the right, on the part of every one, even the poorest to be educated, is now generally conceded in the civilized portion of the world, and the steps taken to secure this right go far to show that it is not looked upon as a merely theoretical, but as a practical and practicable matter. This right being conceded, we look to the principle underlying the concession, and regard this as existing in the fact that the mind being that characteristic which gives man his pre-eminence over the lower orders of being, animate and inanimate, only manifests itself in the greatest degree of perfection for the control of these lower orders to make them subservient to the general good of the race when it is most highly cultivated, and this cultivation to obtain the highest good of all must not be confined to the few, but, should be universal as every mind prepared for it by proper development is able to yield its quota to the general strength of mankind to be expended in subjugating these lower existences.

Consequently, that kind of educational developement which is most conducive to the general good, is that which this conceded right most imperatively demands, and as the perfection of the power to make the earth most fruitful of resources for human comfort and happiness, lies at the foundation of all other industrial pursuits, the education of the mind with regard to this power, demands the first and greatest attention.

That attention has, in this country, however, not been devoted to this subject, the importance of which is so evident, while in several European countries, the means of an agricultural education, have been afforded by governmental enactments, and direct, pecuniary endowments of schools and colleges—an example which it would be well for Ohio, with her known liberality of expenditure for educational purposes, to follow.

The demand for, and the advantages of, an appropriate agricultural education being so great, we hope soon to see every High School in the State provided with the means of affording adequate instruction in all the fundamental and correlative agricultural sciences. And besides such means, the establishment of one or more Agricultural Colleges, under the direction and patronage of the State, would be hailed by every intelligent citizen as a matter of direct and immense public interest and advantage.

In such schools and colleges, all the sciences having a bearing upon the subject of agriculture, should be accessible to the future agriculturist, whether his circumstances are likely to place him in the situatiou of land-holder or laborer.

The following tables compiled from returns in this office explain themselves:

IMPLEMENTS.

Counties.	What new agricultural implements lately introduced.	Are subsoil plows used, and with what success.	Are horse rakes generally used?	Harvest hands.	Wages of harvest hands. Mower per day.	Cradler per day.	Raker and bin'r p.day	Farm h'ds per year.
Ashland	The various reapers, mowers, and cultivators.	Used.			$1 00	$1 50	$1 00	$150
Belmont	Manny & Ball's mowers; Manny's reapers.	Good.		Scarce	1 25	1 50	1 50	140
Brown	Reapers and mowers.	Good.	Yes.	Scarce	1 50	1 50	1 50	150
Carroll	Reapers and mowers.	No.	Yes.	Scarce	1 00	1 50	75	140
Clark	Reaping and mowing machines, drills, cider mills, sugar mills.	No.	Yes.	Scarce	1 00	1 50	1 00	150
Clermont	All the different agricultural implements and machines.	No.	Yes.	Scarce	1 00	1 50	1 50	150
Columbiana	Many new and valuable improvements.			Scarce				
Coshocton	Manny's reaper and mower.	Good.	Yes.	Scarce				
Crawford					1 00	1 50	1 75	175
Darke		No.		Scarce	1 00	1 50	1 00	180
Defiance	One Manny's reaper and mower.		Yes.	Plenty	1 00	1 50	1 00	250
Delaware	Allen & Ball's reaper.	No.	Yes.	Scarce				
Kelley's Isl'd		Good.			1 50	1 50	1 50	
Erie	Heath & Manny's reapers.	Good.	Yes.	Scarce	1 25	1 5	1 25	168
Fairfield	McCormick.	Good.	Yes.	Scarce	1 50	2 00	1 50	200
Fayette	Manny's, Dutton's reaper.				1 25	2 00	2 00	200
Franklin	All the good implements and machines.	Good.	Yes.	Scarce	1 37	2 00	2 00	180
Fulton					1 25	2 00	2 00	200
Gallia					1 00	1 50	1 00	150
Geauga	Allen's, Ball's, Manny's.	No.	Yes.	Scarce	1 50	1 50		200
Greene					1 50	2 00	2 00	200
Guernsey	Manny's reaper and mower.	Yes.	Yes	Scarce	1 00	1 50	1 50	96
Hamilton	All the new inventions; *steam thresher*, &c.	Poor.	Yes	Scarce	1 50	2 00	1 00	180
Hancock	" "	Used.		Scarce				
Hardin	Wheat drills, corn shellers, reapers, mowers, and all kinds used in State.	Good.	Yes.	Scarce	1 25	1 50	1 50	150
Highland	Reapers and mowers.	No.		Scarce	1 25	2 00	2 00	180
Hocking	Wheat drills, reaper and mowers.	No.	No.	Scarce	2 00	2 50	1 50	200
Huron	Ball's, Manny's, and McCormick's.	Good.	Yes.	Scarce	1 00	1 50	1 25	150
Jackson	One mower, cider mills, sugar mills, churns, &c.			Scarce	1 00	1 50	1 50	240
Jefferson	Reapers and mowers, horse rakes, Michigan double plow.	No.	No.	Scarce	1 00	1 50	1 00	200
Knox		Good.	Yes.	Scarce	1 25	1 50	1 00	175
Lake	Ketchum & Ball's.		Yes.	Scarce				
Lawrence		Good.			1 10	1 25	1 25	160
Logan	Corn and cob mills, mowers and reapers.	No.	Yes.	Scarce	1 50	2 00	1 50	200
Lucas	Threshing machines, wheat drills, stump pullers, cultivators, plows, horse rakes, &c.	Good.	Yes		1 25	2 00	1 25	150
Madison	Corn planters, drills, Atkins & Manny's mowers, reapers, &c.	No.	Yes.	Scarce	1 50	2 50	2 00	200
Mahoning		No.			1 50	2 00	1 50	160
Medina	Mowers, threshers, horse rakes, drills, &c.	Good.	Yes.	Scarce	1 00	1 50	1 25	150
Meigs	Threshers and mowers.	No.	Yes.	Scarce	1 00	1 50	1 50	160
Miami	Many new machines; varied success.	No.	Yes.	Scarce	2 00	2 00	1 50	150
Monroe	None lately introduced.	No.	No.	Scarce	1 00	1 50	75	200

IMPLEMENTMENTS—*Continued.*

COUNTIES.	What new agricultural implements lately introduced.	Are subsoil plows used, and with what success.	Are horse rakes generally used?	Harvest hands.	WAGES OF HARVEST HANDS. Mower per day.	Cradler per day.	Raker and bin'r p. day	Farm h'ds per year.
Montgomery.	Reapers and mowers.							
Morgan	Manny's.			Scarce	$1 00	$2 00	$2 00	$200
Morrow	Cider mills, corn planters, clover hullers, and improved machines of all kinds.		Yes.	Scarce	1 00	1 50	1 00	150
Muskingum .		Yes.	Yes.	Scarce	2 00	2 50		200
Noble	None.			Scarce	1 00	1 50	1 50	150
Ottawa					1 00	1 50	1 50	150
Pickaway ...	125 reapers been sold last 2 years.	No.	Yes.	Scarce	1 00	2 00	1 25	180
Portage	Mowers, reapers, drills, and horse rakes.	Good.	Yes.	Scarce	1 25	1 50	1 50	200
Putnam.....	Reapers and mowers.	No.		Scarce	1 00	1 25	1 0[illegible]	150
Richland	All kinds.	Poor.	Yes.		1 00	1 25	1 25	150
Sandusky....	Reapers and mowers.	Good.	Yes.	Scarce	1 00	2 00	1 00	150
Shelby......	Kendleberg cider mill.	Good.	No.	Scarce	1 25	2 00	1 25	125
Stark	All kinds.	No.	Yes.	Scarce	1 00	2 00	1 00	125
Summit.....	Very many.	Good.	Yes.	Scarce	1 60	2 00	2 00	200
Trumbull ...	Mowers, reapers, wheat drills.		Yes.	Scarce	1 25	2 00	1 50	180
Tuscarawas .	" "	No.	Yes.	Scarce	1 00	2 00	1 00	140
Union	" "		Yes.	Scarce	1 25	1 50	1 25	200
Van Wert...	Corn shellers, drills, and reapers.	No.	No.	Scarce	1 00	1 50	75	180
Vinton	Mowers and reapers.	No.	Yes.	Scarce	1 00	1 50	1 00	225
Wayne	All kinds.			Plenty	1 00	1 25	1 00	140
Williams	Corn planters.	No.	No.	Scarce	1 00	1 25	62½c	150
Wood	None.				1 00	1 50	1 00	168
Wyandotte ..	Many kinds.	Good.	Yes.	Scarce	1 00	1 25	1 25	180

WHEAT—IMPLEMENTS AND MACHINES.

Counties.	Method of Seeding to produce most uniform and most productive crop.	Length of time Threshing Machines been in use.	Are they now in general use.
Adams	Drilling.	25 years.	Yes.
Ashland	Drilling.	20 years.	Yes.
Ashtabula	Drilling.	18 years.	Yes.
Brown	Drilling.	20 years.	Yes.
Carroll	Drilling.	20 years.	Yes.
Champaign	Drilling.		Yes.
Clark	Ploughing and Drilling.	23 years.	Yes.
Clermont	Drilling.	7 years.	Yes.
Columbiana	Drilling.	20 years.	Yes.
Crawford	Drilling.	15 years.	Yes.
Darke	Drilling.	15 years.	Yes.
Defiance	Plowing.	16 years.	Yes.
Delaware	Drilling.	20 years.	Yes.
Erie (Kelley's Island.)	Drilling.	20 years.	Yes.
Fairfield	Drilling.	Many years.	Yes
Fayette	Drilling.	20 years.	Yes.
Franklin	Drilling.	15 years.	Yes.
Gallia	Ploughing.	20 years.	Yes.
Geauga	Harrowing.	20 years.	Yes.
Greene	Drilling.	20 years.	Yes.
Guernsey	Drilling and Plowing.	20 years.	Yes.
Hamilton	Each has its followers.	Many years.	Yes.
Hancock	Drilling.	Many years.	Yes.
Hardin	Harrowing.	17 years.	Yes.
Highland	Drilling.	20 years.	Yes.
Hocking	Drilling.	4 years.	Yes.
Huron	Drilling.	20 years.	Yes.
Jackson	Plowing in	15 years.	Yes.
Jefferson	Drilling.	25 years.	Yes.
Knox	Drilling.	25 years.	Yes.
Lake	Harrowing.	27 years.	Yes.
Lawrence	Drilling.	12 years.	Yes.
Licking	Drilling.	15 years.	Yes.
Logan	Drilling.	20 years.	Yes.
Lorain	Drilling.	Many years.	Yes.
Lucas		Many years.	Yes.
Madison	Harrowed.	Many years.	Yes.
Mahoning	Drilling.	Many years.	Yes.
Medina	Drilling.	20 years.	Yes.
Meigs	Ploughing in.	23 years.	Yes.
Miami	Drilling.	Many years.	Yes.
Monroe	Plowing and Harowing.	10 years.	Yes.
Morgan	Harrowing in.	12 years.	Yes.
Morrow	Drilling.	18 years.	Yes.
Muskingum	Drilling.	30 years.	Yes.
Noble	Harrowing in.	18 years.	Yes.
Ottawa	Harrowing.	Many years.	Yes.
Pickaway	Drilling.	21 years.	Yes.
Portage	Drilling.	20 years.	Yes.
Putnam		7 years.	Yes.
Richland	Drilling.	34 years.	Yes.
Sandusky		Many years.	Yes.
Shelby	Drilling.	Few years.	Yes.
Stark	Drilling.	25 years.	Yes.
Summit	Drilling.	20 years.	Yes.
Trumbull	Drilling.	18 years.	Yes.
Tuscarawas	Drilling.	31 years.	Yes.
Union	Drilling.	12 years.	Yes.
Van Wert	Plowing.	15 years.	Yes.
Vinton	Drilling.	15 years.	Yes.
Warren	Drilling.	20 years.	Yes.
Wayne	Drilling.	30 years.	Yes.
Williams	Drilling.	7 years.	Yes.
Wyandotte	Drilling.	Ever since co.	Yes.

PRIZE ESSAY

ON INSECTS BENEFICIAL TO THE AGRICULTURIST.

BY J. KIRKPATRICK, OF CLEVELAND, O.

There are no insects more interesting to the naturalist than those species which keep in check the immense hordes of other insects that feed on vegetation, and who by this means become the benefactors of agriculturists. The labors of these little friends are generally unobserved and unappreciated; but their work is none the less valuable to us. Their existence indeed, is absolutely essential to our prosperity, and in cases, almost to our existence. This is evident, if we take into consideration the fact that the vast majority of insects that draw their subsistence from the plants upon which man, and domestic animals feed, have an almost unlimited power of reproduction, and that many of them are either very small, or secrete themselves within the body, among the leaves of the plants or beneath the surface of the soil, defying the power of man to put a stop to their ravages.

Although the majority of the insect tribes feed on vegetable matter, yet few are polyphagus, and a very large number feed on plants which are of no use to the farmer, or gardener, but rather prove injurious as weeds. Unfortunately, many writers on "injurious insects" have placed in their lists species which should in fact be classed among those beneficial to the farmer. Take for example our butterflies. In the larvæ state they all feed on the leaves of plants, yet few species live on plants which are cultivated, and several devour the leaves of our worst weeds. Of the latter class are the three species of *Cynthia; C. atalanta* feeding on the nettle, *C. cardua* on thistles, and *C. Huntera* on Jewelweed and mousear. Of the other genera, the majority either on weeds or the leaves of our forest trees, while about a dozen species only feed on cultivated plants, and some of those are of such rare occurrence, that like the genus *Satyrus*, which feeds on our grain plants, they are so seldom seen that few farmers ever observed one in any of its states. Included in this class of insect benefactors are many species of moth, and all other insects of whatever kind that feed on useless or injurious plants alone. To give merely a list of such insects would far exceed the limits of this paper, and such a list would be useful to the entomologist only. These observations will be therefore limited to those races which devour others, whether in the larvæ, pupa, or perfect states.

This large class of carnivorous insects may easily be divided into two sections, the one capturing its prey and devouring it, while the other is parasitic in or upon its victim. To the first section belongs all the predaceous beetles, which live by rapine in all their states; also many true bugs—*Homoptera* and *Heteroptera*,—all the dragon-flies—*Libelula*, ant-lions—*Myrmeleon*,—wasps—*Vespa*—in part, with some species of two-winged flies—*Diptera*, while to the other section belongs the great family of Ichneumons, which, probably more than all others, thin the ranks of vegetable eating insects.

In an essay like this, it will be impossible to describe all the insects that are known at present, as benefactors of the farmer; and taking into consideration the fact that the habits of the greater part are unknown, and we are only made aware of the benefits which they confer, by the accidental observation of a single episode in their lives, while many species are so minute and retiring in their habits that it is with the greatest difficulty that anything like a proper knowledge of them can be obtained. Much of our knowledge, therefore, of the habits of species is derived from observations made upon a single individual, and a very large portion from what is positively known regarding some nearly allied race, for in insects as in the higher races of animals, a peculiar anatomical structure is direct evidence of the kind of food upon which they live; and although the organs are extremely varied, yet the possession of a certain form of mandibles or rostrum is as positive evidence of the flesh-eating habits of the owner, as are the canine teeth of the lion or the hooked bill of the eagle. Some species are known to be omnivorous, feeding on both animal and vegetable matter, but these have a more or less modified structure adapted to their wants.

BEETLES—COLEOPTERA.

Many of our predaceous beetles live and breed in places removed from cultivated ground. The tiger beetles—*Cicindelæ*—mostly frequent sandy banks or the sides of brooks, and carry on a war of extermination upon the different kinds of insects which inhabit such places. Some few, however, may be found in our pastures, and no doubt assist in keeping the insects which feed on our natural and artificial grasses, in check.

The large family of ground beetles—*Carabus*—perform no small part in this drama. Armed as they are for war, they spread destruction among the numerous tribes which feed on the roots of grapes, grains, legumes, and in fact nearly all the productions of the field, orchard, or garden. Many of them, when in the perfect state, chase their prey to the tops of plants, and some in both larvæ and perfect states do the same. The greater number, however, confine their rambles to near the surface, or even beneath it. The majority of the latter are of dull colors, often black, while the arboreal species, and many others who live and chase their prey among the tall grass, or reeds, are ornamented with the brightest metallic tints. To the latter belongs *Calasoma scrutator*, whose habits, in as far as they are known, agree with those of *C. sycophanta* of Europe. The latter insect, and probably the former, devour the caterpillars of processionary and other moths, and by this means may hinder to some extent the defoliation of our orchards by the "caterpillar" and its kindred; but unfortunately these beautiful beetles are comparatively rare. Many ground beetles emit a very powerful and disagreeable smell when irritated or handled, few fly with facility, while a large number are deprived of wings, the elytra or wing covers being soldered together at their inner margin. Nearly all, however, run with great speed, for which their limbs are well adapted, and they generally capture their prey by this means. The different species vary much in size, the largest in our State measuring over an inch in length, while the smallest are merely little living specks not a line long. All have hexapod or six footed larvæs, with an elongated and somewhat flattened body, large head, armed with two sharp sword-like mandibles, and with six eyes on each side of the head. The perfect insects have five joints in each tarsus. The outer lobe of the maxillæ distinct and articulated. The inner edge of the lower jaws armed with strong spines its entire length, and terminated by a hook. The antennæ are long and slender, while the maxillæ terminate in a simple point, which is not articulated like those of the tiger beetles—*cicindelæ*. The family is divided into a great number of genera, the distinguishing characteristics of which are often slight and unapparent to the unpractised eye. The naming of these genera and descriptions of them would not be in place in a notice of this kind. Among these genera of insect destroyers, one European beetle, the *Zabrus gibbus*, is known to feed on grain in the growing state, and many of the *Harpalidæ* have the same bad habit. These latter feed, however, on insects also.

Those familiar little beetles, the lady-birds—*Coccinella*—about which every schoolboy sings "lady-bird, lady-bird, fly away home"—are of great value to the cultivator, as in all active stages of their lives they kill and devour the green-fly—*Aphis*—which is so injurious to vegetable life. The eggs of the beetle are laid in little clusters on the different kinds of plants on which the green-fly feeds, and no sooner is the little animal hatched, than it attacks its helpless victims, who fall an easy prey to its rapacity.

These larvæs are six legged, rough looking grubs, and are much larger than the insects which they destroy, and can at once be distinguished from them. When we see, therefore, numbers of lady-birds swarming upon any plant, it is good evidence either that a cleaning out of the green-fly has taken place there, or that it will be the case soon. Some allied beetles are known, however, to feed on vegetables and grains, but not exclusively. As the families already named include nearly all the beetles beneficial to the farmers, we shall glance at the other great divisions of the insect world, a portion of the members of which live by rapine.

NEUROPTERA.

All the insects which compose this division are distinguished by their ample wings, of a thin membraneous structure, exhibiting a closely woven network of nerves. The larvæs of a great number are aquatic and extremely rapacious. The dragon-flies *Libelula*, *Agrion*, *Æshna*, *&c.*, are the tyrants of the water in the larvæ and pupa states, destroying without mercy every insect which they are able to master, their own race not being exempt,—the larger, whenever the opportunity offers, capturing and devouring the smaller individuals of their own or other species. They are in this state provided with a remarkable masklike appendage, which on the approach of their prey they dart forth, and with it seize their unwary victim. To us they are however most interesting in the perfect state. In the early summer months and during the whole season until autumn, the individuals comprised in this family may be seen darting over the surface of pools and streams in pursuit of other insects which they capture on the wing, and often devour without stopping to rest. The genus *Agrion* is however partially an exception to this, as it is not nearly so active as *Æshna* or *Libellula*. Some species of the latter genus hunt to a considerable extent on land, and may be found in our cultivated fields and gardens feeding on insects injurious to our growing crops. My friend, Mr. Carpenter of Kelley's Island, during the past summer observed an immense number of dragon-flies in a field of wheat—almost every ear had one upon it. Now as none of these insects feed on vegetable matters, it is but fair to infer that they were preying on some insect at that time living on the wheat and no one more likely than the wheat fly *Cecidomyia tritici*—so often erroneously called the "weevil." If this was the case it is difficult to estimate the amount of benefit conferred upon us by the *Libellula* in thus helping to keep in check this destructive pest.

Taking everything into consideration, there are few insects so beautiful as the dragon-flies. Their light gauzy wings often shine with a pearly lustre, and the richest emerald and azure, burnished like polished metal ornaments their bodies. On the wing they are the most rapid of all insects, and are possessed of the power of flying in any direction, whether forward, backward or laterally, enabling them to capture their prey with the greatest ease, or avoid the attack of any enemy—the swallow, with all her swiftness of wing being outmatched by this insect. The pairing of these flies is one of the anomalies in the insect world, differing from that of all others, in consequence of the peculiar anatomy of the parts.

Nearly related to the *Libellulidæ* are the ant-lions—*Myrmeleonidæ*, a family which has attracted the attention of naturalists in consequence of the peculiar habits of the larvæ. Unlike the former family the young of this pass the early part of their lives in the driest sand, in which they form a pitfall for the capture of their food, and in which, should an insect fall, it is sure to be seized by the concealed ant-lion at the bottom. But as these insects are not numerous in cultivated land, and not at all unless it is sandy, the benefits they confer are less than those we receive from more ubiquitous species. The perfect insects, many of which closely resemble the dragon-flies, remain at rest during the day among the shrubs and herbage, and fly abroad in the evening.

Belonging to the same order are the golden-eyed flies—*Chrysopa, &c.*, which differ from the last family and their habits when young, in hunting for their food, which consists principally of green-fly *Aphis*. In the perfect state they are small or medium sized insects, and the eyes of several species shine like burnished gold. The wings and body are often of a fine green, and the former are beautifully light and guazy. They are often to be seen during the summer fluttering over our fields and meadows. The female generally deposits her eggs in the vicinity of the ford of the larvæ, but I have found them attached to the leaves of *Yucca filamentosa* that was in no way infested by an injurious insect. These eggs are peduncleted or supplied with a footstalk or stem, the end of which is glued to the leaf, raising the egg many times its own length above the surface. When the larvæ comes forth, it immediately goes in search of food, and fastening upon the unresisting green-fly, with its powerful mandibles, which are apparently hollow, it sucks the juices from its victims, leaving the empty skin only. Being very rapacious, it speedily seeks a new prey, which it attacks with renewed vigor. So voracious are these larvæ that a very small number of them will soon clear a plant that shortly before threatened to be destroyed by the plant lice, so that these insects may be justly considered as benefactors to the farm, the orchard, and the garden. These larvæs are oblong and flattish, with six legs, the abdomen tapering to a point, and the segments very distinct, the head moderate sized, with large jaws. The perfect insect emits a very powerful and disagreeable scent when handled, and generally are to be seen flying during twilight. We have several species in Ohio, belonging to different genera, the larvæs of all of which feed on injurious insects.

Dr. Fitch, in his "Injurious Insects of N. Y.," describes a great number of these flies, and is of the opinion that the benefits resulting from them, in consequence of the number of minute grubs which they destroy, must be very considerable. He has seen, however, one of these aphis-lions pierce a syrphus larvæ—the young of a two-winged fly which also feeds on the green-fly, with its jaws and destroy it, and some European species are known to feed on each other, but this is more or less the case with all carniverous insects.

Other genera and species of this order are also known to feed on other insects, but their work is less apparent or general, but is still worthy the attention of the observant naturalist and agriculturist.

HYMENOPTERA.

To this extensive order belongs the bees, wasps, ichneumons, saw-flies, &c., some highly injurious, like the saw-flies—*Tenthredinidæ*, while others rank as those most beneficial to man, either directly like the hive bee, *Apis mellifica*, or indirectly by preying on insects injurious to the products of his fields, like the Ichneumonidæ which probably more than all other families of insects keep in check the increase of those that make vegetable matter their food. There is probably no species of butterfly or moth but has one or more of these enemies parasitic upon its caterpillar. And although very few of our native species of ichneumon have been described, much less their history studied, yet we have the best evidence of their existence and uses in the chrysalides which never become perfect insects, but are devoured by the larvæ of these flies, that undergo their transformations within the skins of their victims, through which they gnaw a hole and emerge a four winged fly, somewhat resembling a wasp. This occurs so often, that during many seasons it is rare to find an unstung specimen, and this is particularly the case after seasons in which such butterflies or moths were more than usually numerous, nature in this case having apparently provided that the number of feeders should keep pace with the increase of food. There is often no proportion between the size of the victim and its conquerer, as the latter is sometimes very small, while the former is of the largest size. This is the case with the parasite of the potato worm—*Sphinx quinquemaculata*, which makes up for deficiency in size, by increase in numbers, as many as one hundred or more, living on a single worm. Such little larvæs devour the fatty matter which exists in abundance in all large caterpillars, and by this means weaken the insect which in consequence is unable to undergo the toils of transformation. The various species of sphinx, which in their caterpillar state feed on the grape vine, are also attacked by this or a closely allied species, which is in all probability a *Microgaster* or some other genus nearly related, and the caterpillars of *Attacus polyphemus* and *A. cecropia* which feed on the leaves of our orchard and ornamental trees and shrubs, fall victims to a larger species which depositing an egg in the caterpillar, is hatched, and the larvæ feeds on the fatty parts leaving the vitals untouched until the last. Previous to this the caterpillar prepares to undergo its change to a chrysalis, but after spinning its cocoon it dies of exhaustion, without changing its state. If it has, however, sufficient strength to become a pupa, it dies shortly after. The ichneumon in the meantime has arrived at its full growth, and spinning a slight cocoon changes to a pupa within the skin of the caterpillar, in due time to emerge a perfect fly, to effect which it gnaws a hole through the skin and cocoon of its victim.

Scarcely any species of insect is secure from the attacks of the ichneumons. The wood boring beetle larvæs in vain, penetrate deep into the trunks of our orchard and forest trees, for there the *pimpla* and its congeners, who are supplied with very long ovipositors by unerring instinct, are enabled to discover the exact spot under which the hidden larvæ is burrowing, and there plunging her piercer into and through the intervening wood, she deposits an egg, which hatching, produces a grub that like the rest of its family, fattens upon and finally destroys the insect in which it has been deposited. Some members of this section of the *Ichneumonidæ* do not however feed on insect food in the larva state, but seem to devour the fibres of the decayed wood in which they are placed by the parent. It is rational however to suppose that many such larvæs are somewhat omnivorous in their habits and would probably prefer a good fat beetle grub to a piece of rotten wood. Many of the families which compose the order *Hymenoptera*, do however, oviposit in timbers, on the wood of which their larvæs feed, and some like the *Uroceridæ*, which is related to *Ichneumon*, are highly injurious to growing timbers. For this reason it becomes essential to distinguish between the injurious and beneficial insects of this class, and among which the novice would be likely to be led astray.

The larvæs of the *Dermestes* or meat-eating beetles, which attack our dried meat, lard, &c., as well as the caterpillars of our clothes; carpet and fur moths are attacked by Ichneumons, who tend greatly to keep these injurious insects in check. The *Aphidii* are parasitic on the various species of green fly, and are themselves very small. Mr. Say describes a species which oviposits in the abdomen of our grasshoppers—*Locusta*—and a gentleman who resides in Cleveland observed a small fly, which, from his description was the same insect in close pursuit of the grasshoppers in his yard the past season, nearly every grasshopper having a fly in attendance. As the attacks of this ichneumon must be fatal to the unexcluded eggs of the grasshopper, among which the parasitic egg seems to be deposited. We have but a slight idea of the amount of benefit conferred upon us by this little insect in checking to some extent the increase of these spoilers. *Chalris annulator* feeds on several of our moths, and *Spalangia nigra* on the pupa of the common house fly. *Chalcis emœna* was discovered by Say to feed on the chrysalides of *Thecla*, a butterfly, while a species of *Platygaster* attacks the larvæ of the much dreaded wheat fly or weevil—*cecidomyia tritici*.

Closely connected with the *Icheumonidæ* are the *Evaniidæ*, *Chalcididæ*, *Proctotrupidæ* and *Tubulifera*, having the same general habit of being parasitic on other insects when in the larvæ state. Some species are very minute, although none the less useful on that account. The entire history of very few of this interesting family of insects is known, and we are indebted for much of what we at present possess to the indefatigueable zeal of a few European authors. Luckily for us, along with the introduction of those foreign insects which injure our property, the parasitic antidote was also imported, we can therefore apply the knowledge contained in foreign books to a useful purpose.

Many of the wasps—*Vespa*—are to a certain extent benefactors, but the amount of benefit conferred is comparatively small. Their attacks in general, not being limited to injurious species, but to all which they have power to conquer, and one branch of the family makes the spider its prey, seizing and carrying off on the wing individuals almost equal in size to themselves. These insects are commonly known by the names of sand and wood wasps—*Fossores*—from the location selected by the female in which to build her cells, and in which cells along with the egg, she places a number of larvæs, or perfect insects to serve for food to her young, when hatched. Those imprisoned insects are alive, but seem to be paralyzed and are utterly unable to escape when an opportunity is afforded them. This is probably in consequence of the infusion of poison by the parent wasp.

HETEROPTERA—BUGS.

In this order there is greater difficulty in the novice identifying the benificial species than in that of any other. This is peculiarly the case among those genera and species which serve as connecting links between the truly carnivorus and herbivorus portions of the group. Many species are omnivorus in their taste, and relish the juices of an insect equally with the sap of a plant. All are supplied with a peculiar rostrum which they plunge into the substance on which they feed and through which they suck the juices which it contains. The insect eating species are generally provided with raptorial fore-legs with which they can grasp their prey in the same manner as the *Mantidæ*, and their rostrum is shorter, stronger, and sometimes curved, with this they can inflict a very painful wound, the more so as they inject at the time a small drop of a poisonous fluid. The family *Reduviidæ*, contains the majority of such as may be called benficial, and no other family of insects differs so much among the species which it contains, in shape, size, and coloring. Some are short and thick, while others like *Emesa* are as slender as they well could be, with long legs, almost like hairs. I am not aware that any member of this order attaches itself exclusively to any one of our noxious insects, unless it is the *Reduvius personatus*, which is said to feed on the bed-bug—*Cimex*—an insect belonging to the same order. Some years ago I observed an insect belonging to this family attack and destroy a lady-bird—*Coccinnella*—which, at the time was feeding on the *aphis* or green fly, and in this case the benefit conferred was all the wrong way. Other species have been observed to attack caterpillars, while the aquatic genera are nearly, if not all insect feeders, the larvæs of the harmless June-flies serving them for food along with other aquatic insects. The largest insect which we have in Ohio belongs to this group, if size of body is alone taken into consideration, and extent of wings left out. This is a species of *Belastoma*, which is pretty plentiful in the Cuyahoga river. European writers have generally supposed that this genius was exclusively tropical.

DIPTERA—FLIES.

Although the two-winged flies contain in their ranks a very large proportion of those insects, which are mostly to be dreaded as enemies to the products of the farm, or which prey on our living or dead property. Yet there are a few species which are really beneficial to us in all their states of existence. There is one thing however, which is quite remarkable, and that is, while the females of whole families are carnivorous, or rather blood-suckers, the males imbibe the honey of flowers only; and among the insectivorous species it often occurs that this is a purely feminine accomplishment. This is the case with the genus *Empis* and its congeners, a family of small flies which may often be found hovering over waters in great numbers. Several other nearly related families also devour insects, and one genus—*Hemerodromia*—is supplied with raptorial fore-legs. The transformation of many of these insects are not known, and the larvæs of some are known to feed on the roots of plants, so that the benefits con ferred by the perfect insects may be more than balanced by the injuries inflicted while in the larvæ state.

The genus *Syrphus* is a truly valuable one, as its larvæs feed entirely on the green fly. These larvæs are blind, of a taper form, the head being the apex. The mandibles are in the form of a trident, and with this the insect transfixes its prey, which it raises in the air and sucks at its leisure. The parent fly deposits her eggs in the immediate vicinity of the aphis, so that her blind progeny may have no difficulty in obtaining a sufficiency of food. These larvæs are extremely voracious, and soon arrive at their full growth, but in that short time generally succeed in clearing the infested plants of the green fly. The grubs of the genus *Tachina* are parasitic on the caterpillar of Lepidoptera, and assist in reducing the number of butter-flies and moths.

Along with the true insects which are beneficial to man, by reducing, or keeping within proper bounds the immense number of injurious species, may be ranked nearly all the spiders. The common house species makes constant war, as all know, upon the house fly and the little insects which pester cleanly housewives. A multitude of other species, some of which weave webs, while others do not, prey upon the insects which are to be found in every place during the summer months. An interesting family, the individuals of which are to be found nestled in flowers, capture those insects who frequent their bright and fragrant hiding places. These spiders are bright colored, and generally inhabit flowers of their own color.

Such is a brief glance at the tribes of insects, indirectly beneficial to man, by devouring those which lay waste the products of his fields, orchards, or gardens, and to them we owe a debt of gratitude for doing for us that which we are often unable to accomplish for ourselves. Their habits and transformations are worthy our study and attention, as with a proper knowledge of these habits it might be in our power to occasionally check the inroads of an obnoxious species, by introducing or encouraging the increase of its enemy. We use the cats to kill mice; terrier dogs and ferrets to destroy rats. Encourage the visits of insectivorus birds, &c. Therefore, by the same rule we may be led to value a *Calosoma* or an *Ichneumon*.

Descriptions of some of the Beneficial Insects of Ohio.

CICINDELA SEXGUTTATA.

Brilliant green when viewed from above, changing to steel blue in a lateral light. Labrum three toothed, whitish, sometimes edged with black. Elytra with three whitish spots. A variety occurs here with a fourth spot, and others have this united to the anterior one, with a slight transverse bar. Length rather less than half an inch.

This species may often be found in paths through woods, also on fallen trees lying in the sunshine. It is easily caught with a butterfly net. I once obtained two living specimens from the middle of a rotten log, in the month of May. The log was split or rather broken in pieces for the purpose of procuring specimens of such insects as might have undergone their transformations in it. There was a great number of larvæ of different kinds, and a few perfect insects, and among them there were two *Cicindela.* Can it be possible that this species passes its larvæ and pupa states in rotten timber? If so, it is an exception to the general rule, as all the species whose habits are well known, burrow during their youth in sand. Feeds on all forest insects that it is able to conquer.

The remainder of the species of this genus, indigenous to Ohio, are *C. Leconter, rugifrons, patruela splendida, purpurea, generosa, vulgaris, duodecimguttata, Baltimorensis, hurticollis punctulata,* and probably several others. Some inhabit woods, others the margins of rivers and streams, and several prefer the fields and dusty roads. All feed on other insects.

CALASOMA SCRUTATOR.

Fig. 34. Natural size. Thorax and head violet blue, edged with orange; elytra metallic green, outer and posterior edges orange; legs steel blue. This beautiful insect ascends trees and feeds on the caterpillars of different species of moth, and are said to devour large numbers of the canker and palmer worm, so injurious to the apple tree. In the larvæ state it is also arboreal, and feeds on the same insects.

The *C. calidium* has like habits, and is of a dark greyish brown, with three rows of copper colored depressed spots on each elytra. This species may often be found during the day beneath rotten wood. When handled it emits an intolerable smell. Its size is nearly the same as that of the former species.

MANTIS.

Fig. 33. The specimen from which this was drawn was obtained in the garden of Mrs. Francis D. Gage, at St. Louis, Mo., and by her presented

to Mr. Thos. Brown, of the Ohio Farmer, and it is quite likely that individuals may be found in the southern part of Ohio. The whole insect was of a uniform light green when I saw it, but as it had been kept in alcohol for more than a week, the color may have undergone considerable change. The raptorial structure of the first pair of legs enables the animal to capture many small insects, and it assists to some extent in reducing the number of injurious insects. All the motions of the *Mantis* are slow; it creeps towards its prey in the stealthy manner of the cat, and when it approaches within striking distance, captures its victim by thrusting out the fore leg and grasping it between the tibia and femur, which are armed with teeth and close together.

PIMPLA LUNATOR.

Fig. 32. Natural size—female.

Color, head brown with yellow front, and encircled with two bands of yellow and one of brown, and a brown band between the eyes. Thorax brown, with a trident-shaped mark on the upper side. The abdominal rings brownish, with lunate-shaped yellow bands. It is somewhat doubtful if this species is really beneficial. With its long ovipositor it penetrates the wood of partially decayed trees, and therein deposits her eggs, but whether the larvæ feeds on those of wood-eating insects, or it devours the wood itself, is not positively known. Judging, however, from the well known insect-eating habits of its congeners, there is every reason to think that it is at least partially an insect-eater. If the wood of the tree which the *pimpla* selects for the depository of her eggs, is not sufficiently decayed, it sometimes happens that she is unable to withdraw her ovipositor; in that case she falls a victim to her maternal solicitude, remaining attached until she dies.

PLATYGASTER TIPULÆ.

Fig. 29. 1 natural size, 2 magnified.

This minute insect belongs to *Proctotrupidæ*, and to it we are indebted for the destruction of myriads of the wheat midge. The female is of a shining black color; wings transparent; without nervures; antennæ ten jointed; bright ocherous; thighs and shanks clubbed; feet long, slender, and five-jointed. The tip of the abdomen is armed with a long curved ovipositor, with which it pierces the larvæ of the wheat-fly and deposits an egg, which speedily hatching becomes a small grub, that living upon the fatty matter of the midge larvæ, ends by destroying it.

Curtis, one of the best European entomologists, says of this insect: "This insect, of all others known, is the greatest enemy of the fly. It does not like strong sunlight, but takes shelter within the husk of the grain, and among the leaves. When about to deposit its eggs, it travels over the whole head with great rapidity, and bending its body, inserts the ovipositor, with a vibratory motion, into the larvæ of the fly. In a short time, the deposited egg hatches, and the grub begins to feed upon its victim. By this means the immense increase of the fly is reduced, as these stung larvæs never become flies."

MACROGLENES PENETRANS.

Fig. 30. The female of this insect has the same habit as the preceding species. The male (fig. 2, 1 natural size, and 2 magnified) is of a shining bottle green color, antennæ black, short and clubbed; head large, with very large, reddish-brown eyes; abdomen compressed and thin; wings transparent, the fore-one very large, having a minute clubbed branch on the costa, or outer angle. The feet are white and dark at the ends. The female has the antennæ shorter, with larger club, the eyes smaller and brown; the abdomen truncated, and the ovipositor projecting.

When the female *Aphidius* discovers a colony of the particular green-fly, in which nature prompts her to deposit her eggs, she alights, and approaching an aphis touches it with her antennæ, and by that means discovers if it has not already received an egg from some sister insect. Should this be the case, she leaves it without depositing, but if she finds it unstung, she bends her ovipositor, plunges it into the body of her victim, leaving therein an egg. Proceeding from fly to fly, she treats the whole colony alike, if she has sufficient eggs to do so. These eggs produce a minute grub, which feeds on the fatty matter contained in the body of the fly, in the same manner as do the young of other Ichneumons. During this time the green-fly feeds and grows, but when the Aphidious is nearly full grown, the fly dies with its rostrum still inserted in the bark or leaf upon which it feeds, and firmly fixed by its claws. At this time, the green-flies are much swollen, and of the color of clay. In a short time the inclosed grub undergoes its changes, and, forcing a passage through the body of the Aphis, emerges a minute four-winged fly. The annexed cut represents an European species—*Aphidius arenæ*—Fig. 28 (1 natural size, 2 magnified), which is parasitic on the aphis which feeds on wheat. As the latter insect seems not to be known here, at least to any extent, and we have never heard of any being found, the latter of course is not an American insect. The Aphidiidæ are, however, well represented here. Dr. Fitch describes several species parasitic on the green-flies, which feed on several of our fruit trees, &c. All have a general resemblance, and can be easily identified if discovered.

NATURAL HISTORY OF OHIO.

GEOLOGY, METEOROLOGY.

No more important and appropriate subject than the relation between the natural sciences and the science of farming, could be introduced as a preliminary to the annual report of the State Board of Agriculture. That such a relation exists, has been in a great measure overlooked until within a comparatively short time, and even now, the extent and vast importance of this relation is but very imperfectly known and appreciated by that portion of the community which is perhaps most directly interested in an investigation of the subject.

To bring a knowledge of this relation between science and agriculture before the public mind, we will devote a few pages to a discussion of the subject and an elucidation of the question, "How is agriculture to be benefited by science?" And to do this plainly and fully, we will take up and discuss separately the relations of botany, zoology, geology, chemistry, &c., with the different departments of the profession of agriculture, and hope to establish in the mind of the people a knowledge of the great advantages which an accurate acquaintance with these sciences confers.

Botany is a science of the first importance to the agriculturist, a fact which can only be fully appreciated by those whose attention has been awakened to the vast field of inquiry which lies before the student of nature's laws in this department. It is the science, which in its more comprehensive signification, teaches us the nature, use, mode of growth, propagation, cultivation, classification and natural and acquired habits and properties of plants, and a knowledge of these subjects involves besides a more extended acquaintance with the nature of soils, climate and other conditions upon which the growth and perfection of plants depend than would at first view be supposed, and this knowledge would greatly aid the cultivator in pursuing a course which would certainly secure the results he might desire, and without which success would be left entirely to chance.

Having made this general statement of the question, we may indulge in a very few illustrations of the importance of a knowledge of botany, to the cultivator. First, as a general truth it may be stated, that plants of the same family will be found to flourish best under the same or similar conditions of soil and climate. Take for example the family of the coniferæ or pines, and in all countries and longitudes, and the most varied latitudes and longitudes they are found most flourishing and abundant upon mountainous regions of country. The oaks, beeches, maples, walnuts, and all other trees have their preferences of situation, soil and climate, but not only the trees of the forest but the most insignificant plant has its *home*, and will pine away and degenerate when removed from that home selected, for it in accordance with the laws of its being. And it is so true that the flora of a particular region is indicative of the nature and capacities of the soil and climate of such locality that one well skilled in all that pertains to a correct knowledge of botany may determine by an examination of a few plants of a particulsr space of country, what other plants do or may flourish in the same place, and knowing this, would not be compelled to wait for experiment to determine the propriety of attempting to cultivate particular plants where loss of time and labor would at last convince him of what science would have taught him at first.

There are plants which grow and flourish in certain peculiarly formed geological regions, and will grow no where else. Among these may be mentioned as the more prominent in this peculiarity, the calomine flower, a species of violet which grows no where but in the neighborhood of the zinc mines. The lead too, has its *blossom* the iron its favorite plant, and to know these points to the geological formation of the country, and where these grow, other plants delighting in an abundance of the same elements will likewise flourish. (See page 386.)

Again, certain plants will not grow in soils well calculated to produce abundantly of others more valuable to man, and when these are found, it is a proof that the spot occupied by them is unfit for cultivation until the elements necessary for or injurious to the valuable plant have been added to or counteracted in the soil of such place.

There are many plants not of themselves perhaps directly beneficial to man, but which are indirectly very valuable, as they may protect useful plants from the ravages of insects, by being either directly poisonous to these, or indirectly, by supplying the conditions necessary for the propagation of other insects, harmless to man, but the destructive enemies of those which are hurtful. Every *weed* has its use!

Yet again, a knowledge of botany will, in the future, reveal to man a profitable application of many plants, now entirely neglected or unknown, either as esculents for the table, food for domestic animals, or valuable remediable agents.

And besides all these advantages, the pleasure flowing from a cultivation of the mind and an increased range of subjects which give delight to the intellectual man, and lead him away from the more sensual enjoyments to which he is compelled to resort, for want of more rational, and at the same time more perfect means of recreation, is the last but most important of the advantages which we will attribute to a study of botany, in advocating which, volumes might be written without exhausting the subject.

In the body of the report will be found lists of a number of grasses, and some other plants, which will show how much, even in a very limited department of the botany of Ohio, is yet to be learned by the reader.

We will only add, in reference to this subject, that no man can be a universally successful cultivator of the soil, without a good knowledge of botany, and its importance is so great that it should be made as indispensable in the course of a common school education, as is arithmetic, or grammar. The young will learn its principles, and many of its details, with avidity and delight, if instruction in it be directed to the understanding and reason, rather than to the memory, which is now cultivated almost exclusively, while the remaining faculties of the minds of the young are left to take care of themselves, or lie dormant till stern necessity awakens them to a painful sense of their lack of cultivation.

To make botany an interesting study for children, every common school teacher should be required to have at least enough practical knowledge of botany to analyze a plant, and determine its class and order readily, and generally the germs and species of the more common varieties, and then to teach the pupils by demonstration, these practical matters, together with such a clear and intelligible account of the nature and habits of the plant, as add to the stock of positive knowledge of the pupil at every lesson. Every school district should have an herbarium, containing all the plants within its limits, carefully preserved, and always ready for the study of the youth of the school—traveling from the familiar to the unknown in the knowledge of this great department of nature, would soon be found a delightful and useful employment for youth, and prevent waste or worse than waste, of their only earthly wealth—Time.

Chemistry, of equal importance to the farmer, is scarcely known by cultivators, except by name, but did they know that a knowledge of the chemical properties of their soils and the elements in them, which determine their productiveness, was of as much or more importance than the seasons which form so large a portion in the themes which they discuss, they would try speedily to aquaint themselves with the laws and principles ot chemical science.

Chemistry gives us the key to the mysteries of growth in the vegetable world, and we can only master the material elements of nature, and make them subservient to our happiness, by opening the arcanum of her secrets.

Some plants grow and flourish without drawing, except the smallest part of the materials for their development, from the earth, while others take out of the elements within the soil, the principles upon which their growth depends. Some plants enrich, or at least do not render less productive the soil where they grow, while others impoverish it to such an extent that in a few year's constant cropping, the ground refuses to yield to the unscientific cultivator. But a knowledge of chemistry, properly applied, would enable the farmer to supply these lacking principles, and thus secure continually a reward for his skillful labor.

Some plants grow in one soil and not in another, seemingly to the common observer as well fitted in every respect. The chemist, however, by simple and certain processes, determines the nature of the soil and its aptitude for the growth of certain plants, or the contrary, and can then prescribe the mode of supplying deficient elements until the "wilderness may be made to blossom as the rose." It has been said, that, he who makes two blades of grass grow where but one grew before, is a benefactor to his race, and this the chemist-farmer can do until the limit of productiveness is reached.

Geology is a science which adds wonderfully to the ability of the farmer to act in accordance with those laws of vegetable life, which, being obeyed, secure him from the loss of time, money and pleasure, accruing from labor in vain. It is from the geologic elements within the soil that many of the principles abstracted by growing plants must be replaced, and knowing this fact and its relation to botanical physiology and chemistry, will be wonderfully profitable in time saved and money earned, by a wise adaptation of means to the end desired, the best crops for the smallest outlay.

Zoology claims especial attention at the hands of the farmer, as in all its various subdivisions it presents subjects of most interesting and profitable inquiry. The comparative and special anatomy, the physiology and pathology of the domestic animals, their habits and wants, are all subjects which will amply remunerate the careful student, in time and money saved by his increased ability to prevent and cure their diseases, correct their bad habits, and make them more generally useful or saleable.

Ornithology will speedily demonstrate to the inquirer that every bird shot by the sportsman, blows away in noise and smoke bushels of grain, or some noble forest tree that the bird would have saved by destroying injurious insects, enemies of one or the other, with which man is unable to cope without the aid of his natural friends and allies, the feathered songsters. A single aphis, a hurtful insect, can be demonstrated to multiply itself many billions of times, in the number of its progeny, in a single season, and a single insectivorous bird will destroy thousands of these, and thus cut off the swarming millions which would, in a single season, destroy more wealth in the vegetable world than all the birds which might be found in the same space would do for years. The grasshopper tribes, sometimes and in some countries, lay large tracts entirely waste. If our song birds be killed and driven away it may soon be our lot to suffer from a like scourge.

"Don't kill the birds!" And ornithological farmers will too well understand their own interests to do so, as they prey largely upon insects highly injurious to fields, orchards and forests.

A study of ichthyology will be of use, and as its result, many farmers would find amusement and profit in cultivating fish for their own tables and for the market. And, besides a study of the Molluscous fishes of a region will aid in determining the purity of its waters and their aptitude for the support of useful members of the finny tribe.

Entomology opens a vast field of profitable inquiry to the farmer, and a lack of this knowledge is, in a great measure, the cause of the loss to Ohio, of several millions of bushels of wheat per annum, by the ravages of the fly and other insects, which might be prevented by properly applied knowledge of the nature and habits of these scourges, insignificant, when viewed as single individuals, but of immense importance when their innumerable myriads of destructive armies are considered. Let the cultivator satisfy himself by a study of entomology of the great value of the information which he gains in this field and the question: "Will it pay?" is answered by him affirmatively and positively.

There are beetles which deposit their larvæ in trees, in such formidable numbers that whole forests perish beyond the power of remedy. The pines of the Hartz have been thus destroyed to an enormous extent; and at one place in South Carolina, at least ninety trees in every hundred, upon a tract of two thousand acres, were swept away by a small black winged bug. And yet the people are in the habit of destroying the red-headed wood-pecker, the great enemy of these insects, because he occasionally spoilt an apple! "Would it be believed," says Wilson, "the ornithologist, that the larvæ of an insect or fly, no larger than a grain of rice, should silently and in one season, destroy some thousand acres of pine trees, many of them from two to three feet in diameter, and a hundred and fifty feet high? In some places the whole woods, as far as you can see around you, are dead. Stripped of the bark, their wintery looking arms and bare trunks bleaching in the sun, and tumbling in ruins before every blast."

Meteorology is a subject which every farmer should be well versed in; and this assertion may not be deemed as requiring too much, when it is known that the skillful meteorologist can determine the often important question, "Will it rain to-day?" with absolute certainty, and the same question as to to-morrow with great probability. To know in the morning that it will rain before night may prevent frequently, great inconveniences and losses, and meteorology properly attended to puts us in possession of the requisite knowledge.

Thus we have gone over, in a cursory, but we hope not in an unimpressive manner, a few of the prominent advantages to be derived from a study of the natural sciences. We have done so because our limits admit of only a few hints, but we would earnestly admonish every farmer to apply himself diligently to the study of these matters, upon which his interests and those of the nation and the world so greatly depend.

Besides all the foregoing subjects, there yet remains to be mentioned, as having an important bearing upon successful farming, a knowledge of the principles of mechanics, and other matters included in the term "Natural Philosophy." The advantages flowing from an acquaintance with these subjects, consist in time and labor saved in accomplishing what would otherwise demand an immense outlay of strength and waste of time.

It may be objected by some that science and agriculture have no interests in common, and we can therefore do nothing better than relate the debt of obligation which the latter owes the farmer already, and demand a speedy cancellation of the debt.

Within the memory of not even the oldest inhabitant, the farmer used as farm implements a few uncouth machines, now scarcely anywhere to be seen—the wooden plow and harrow, the sickle, hoe, flail and winnowing fan moved by hand. He delved from morn till night, and truly "eat bread by the sweat of his brow!" He plowed badly, sowed by hand, and often harrowed worse, using an uncouth wooden harrow, or even a bundle of brush to cover his grain; his wife and daughters wrought in the harvest field to reap, bind and secure his crop. His entire winter was passed in threshing and cleaning his grain, for which he received but an exceedingly low price when he could find a market at all. His wife and daughters spun and wove his garments, and his evenings were spent in shelling a few pecks of corn by hand, and so continually. He had no time for mental culture, nor for the higher enjoyments of mind. But science came unasked to his aid, first with the grain cradle, then the improved plow, then the winnowing mill, the threshing machine, the corn-sheller, the steam-mill at his door, the improved road and improved wagon to move on it, the canal, the steam-boat, the railroad, the ocean steamer, the electric telegraph, all tending to the interest of the agriculturist in saving time, labor and expense, in securing his crops, and when this secured bringing him a market to his door and giving him the highest price for the produce he sells, and putting it into market at the moment when and where its value is greatest. While on the other hand the factory and facilities for exchange have lessened the cost of those articles of domestic consumption, which were once luxuries enjoyed by the very few, but now considered the necessaries of life in the poorest family. Thus the amount of labor by the whole community has been diminished to less than half what was required to accomplish the same object one quarter of a century since, and that labor has been more than doubled in its productiveness for the skillful laborer, and consequently in its value. Thus science has come to the aid of the farmer to lessen his labors and his cares, and multiply his material enjoyments and afford him time for mental culture, which has produced a mighty revolution in the field of intellectual pursuits, and men of no learning are now looked upon as exceptions, where they were formerly the rule. Agriculture owes to science a vast debt which her votaries are scarcely willing to acknowledge, but payment in kind is justly demanded. Shall not science receive at the hands of agriculture a fostering care, a friendly attention, in recompense for all the advantages conferred, and for which she can and will repay in a thousand ways, by still more reducing farm labor, enhancing its value and rendering it more certainly and uniformly productive?

OUTLINE SKETCH OF THE GEOLOGY OF OHIO.

BY CHARLES WHITTLESEY, OF THE LATE GEOLOGICAL CORPS OF OHIO.

1848.

This condensed notice of the geological formations of Ohio, is reproduced from "Howe's Historical Collections," for which it was prepared, eight years since:

In the State of Ohio, no primitive rocks are found in place. Her rocks are all sedimentary and stratified, and as they are nearly horizontal, the strata that appear at the surface are few. Her geology is, therefore, very simple and easily understood, especially when we compare it with that of Pennsylvania and New York, where a much greater variety of formations is seen.

The lowest visible rock in Ohio is the "blue limestone" of Cincinnati, which is also the lowest in a physical, as well as in a geological sense.

The bed of the Ohio river, near Cincinnati, is 133 feet below the level of Lake Erie, and is the most depressed portion of the State of Ohio, being only 431 feet above tide water. Here the blue limestone is seen, with its beds of "dun" and "blue" marl. The strata dip in all directions from the southwestern angle of the State, which occupies a crown, or geological summit, rather than a synclinal axis.

Any one would be convinced of this by traveling from thence in any direction and observing the rocks. If he should go up the Ohio river, he would perceive that the surface of the blue limestone descends, and finally passes beneath its channel at a distance of less than 100 miles. In the same way, on descending the river, he would discover the hills about Madison, in Indiana, capped by a different rock, the "cliff limestone," which overlies the "blue," and arriving at the falls of the Ohio, at Louisville, the "cliff," continually sinking, reaches the bed of the river and causes the falls. Go up the Great Miami to Dayton, and the cliff makes its appearance, although the descent in this direction is slight. A part of the disappearance of the blue is here owing to the rise of the country. In the same way, if one passes up the valley of the Licking or the Kentucky rivers, the overlying cliff settles down into the level of the blue, and apparently occupies its place in the horizon.

We have no means of ascertaining the thickness of the blue limestone, for we have not penetrated through it to the rocks beneath; yet it is estimated at more than 1,000 feet, 600 to 700 of which are visible.

If we group the rocks of Ohio according to their lithological characters, there are *five distinct divisions*, that any person will discover on examination. The difference in appearance, hardness, color and composition is so marked that no more natural division could be made.

1st.	*Limestone,* visible thickness in Adams county, according to Dr. Locke..	772 feet.
2d.	*Black shale,* thickness at the same place	251 "
3d.	*Fine grained sandstone,* thickness	343 "
4th.	*Conglomerate,* "	200 "
5th.	Coal series, " estimated	2000 "
	Thickness in Ohio	3566 "

This is dividing the rocks, not according to strict geological rules, but according to external characters.

A person traveling from the west line of Adams county eastward, to the Little Scioto, in Scioto county, would pass over the outcropping edges of all these rocks, and would see all the formations of Ohio.

They here plunge in the direction south 80 1-2° east, and sink to the eastward at the rate of 37 4-10 feet per mile;* consequently, the cliff limestone, the upper member of the great limestone deposit, which, at West Union, Adams county, is 600 feet above the river at Cincinnati, at Brush Creek, 6 miles east, is found only about 350 feet above the same level.

And the fine grained sandstone which caps the hills east of Brush Creek, and west of the Scioto, as we approach the little Scioto, sinks to the base of the hills and appears beneath the conglomerate. This inclines continually to the river surface, and plunges beneath the coal.

In other parts of the State, as will be seen hereafter, although the same rocks prevail, and always in the same order, their thickness, mass and dip will be different. There is no place where they can all be seen in so short a space as in Adams and Scioto counties, and here Dr. Locke made his section in 1838.

As we proceed along the outcrop of these strata, by which is meant the irregular line of junction between the faces of the strata, we find that, in a level country, it coincides with a horizontal line separating one rock from another; and following the union of these rocks—for instance, the black

* 2d vol. Ohio Geo. Report, page 238.

shale and the fine grained sandstone—to the northward, we shall observe a *change* in the *direction* of the line of bearing, and also of the dip or plunge.

Rockville, Waverly, Chillicothe, Reynoldsburg, Mansfield and Newburg, are towns in or near the western edge of the "fine grained sandstone," or at its "outcrop," forming a continuous, but crooked line from the Ohio river to Lake Erie. By the attached map of the State, the fine grained sandstone will be seen to occupy an irregular belt about 10 miles wide, embracing those places. Next, westerly, is a strip of the black shale accompanying the fine grained sandstone, somewhat broader, and bounded by it on the east. On the west of the whole, and covering about one-third of the State, in the west and northwest, is the cliff or buff-colored limestone.

In the southwest corner is the blue limestone, occupying a circular space from West Union, by way of Dayton, to the State line.

On the east of the line of towns above given, is the conglomerate, bending around from Cuyahoga Falls to Burton, in Geauga county, and then eastward into Pennsylvania. Adjacent to this line of outcrop, are the coal-bearing rocks, occupying the east and southeastern part of Ohio, within a line from Sharon, on the Pennsylvania line, to Ravenna, Akron, Wooster, Dover, Brownsville, on the National Road, Logan and Hanging Rock. If we examine any of these rocks over large tracts of country, at points 10, 40, or 100 miles apart, we soon discover that the line of outcrop changes in direction, and with it the line of greatest dip or plunge, which is at *right angles* to the line of bearing.

Thus, from Rockville to Chillicothe, the course is north, about 10° east, and corresponds very nearly with the line of outcrop of the fine grained sandstone for that distance. The dip at Rockville is given at s. 80 1-2° east, almost a right angle, and the rate of dip 37 feet per mile. At the other end of the line, at Chillicothe, the general dip, rejecting fractions, is south 70° east, 30 feet to the mile, the line of bearing thus makes a curve to the *eastward*, and the line of dip a corresponding change to the *southward*. This is the universal law; consequently, when we course around the edge of the coal basin to the northward, and the line of bearing changes to an almost *easterly* direction, the dip is nearly *south*. It would be thus, if we should make the entire circuit of the great Allegheny coal field. Pursuing its northern boundary through Meadville, in Pennsylvania, we should soon turn southward, and, arriving at the Portage summit railroad, should observe the lowest bed of coal there at the door of the station-house, on the summit of the Alleghenies, 2500 feet above the ocean, it would be found plunging rapidly to the *westward*. Following down the

Alleghenies to the southwest, through Pennsylvania, Virginia and Tennessee, to the southern termination of this great coal basin, the rocks and the coal strata are found to dip more and more to the northward, and finally, at the flexure of the course, when we turn back to the north, the dip changes from north to northeast. Continuing on northward, on the west side of the coal field, through Tennessee, across the Cumberland and Kentucky rivers to the Ohio, we come to the starting point, the dip being northeasterly, easterly, and finally south of east.

These lines of dip point to a common centre, or depression in the strata, at the foot of the western slope of the Alleghenies, in Virginia.

In farther illustration of the geological map, it should be said that the scale is too small to give the exact outlines of the formations, even if they were exactly known. In the northeastern part, I have attempted to show the limits of the strata, but without success, owing to the limited scale of the map. For instance, much of the county of Medina is represented as being a conglomerate rock at the surface; but the streams, particularly the south branch of Rocky river, cut through the conglomerate and reach the fine grained sandstone beneath. It is the same with Rocky, Cuyahoga, Chagrin and Grand rivers, and Ashtabula and Conneaut creeks. The shale and this sandstone, therefore, extend in narrow bays up the valleys of these streams and their branches. Between the fine grained sandstone and the conglomerate, is a mass of coarse grained sandstone, without pebbles, which furnishes the grindstones of Lake Erie, extending from the Vermillion river, through Lorain county and Cuyahoga, into Lake county; but where it terminates I do not know. At Newburg, Warrensville, and Chagrin Falls, the section of this intermediate mass is as follows—beginning at the top of the fine grained sandstone:

1st. Black shale, with thin layers of sandstone	10 feet.
2d. Red shale, very soft	30 "
3d. Grindstone grit	40 "
4th. Shale, ash color, and layers of sandstone to lower face of conglomerate	81 "

In Lorain county, the coarse sandstone grit appears almost to displace the fine grained sandstone and red shale—thickening downwards at Elyria to the black shale. Farther examination is necessary to classify these intermediate strata.

The projecting ridges of highland between the Black and Cuyahoga rivers, the Cuyahoga and the Grand and Mahoning rivers, are composed of conglomerate, as the surface rock, its most northerly point being an outlier, called the "Little Mountain," within 5 or 6 miles of the Lake at Kirtland, and elevated 600 feet above it.

The grindstone grit, red shale and ash-colored shale vary much in thickness, and at the south of Elyria, owing to the drift, it cannot, without farther examination, be decided where they cease, and where the fine grained sandstone rock may be first seen. In the valley of the Cuyahoga, they are seen distinctly at Brandywine Mills, and at the Peninsula in Boston; and between Peninsula and Old Portage, appear to run out and to be lost in the shaly portions of the fine grained sandstone.

So with the narrow belt of fine grained sandstone overlying the shale, or black slate formations, and skirting the highlands that overlook the Lake, it is not easy to determine the line of division between the two formations, particularly in the valleys of Grand river and the Mahoning.

Returning to the consideration of dip, a few instances more may be given, to show the surprising regularity of the sedimentary rocks of Ohio, and also the change in direction which has just been noticed.

Take the town of Chillicothe, in Ross county, the village of Newburg, in Cuyahoga county, and a point in the west line of Crawford county, all situated at the surface of the "black shale"—these three points form a triangular plane of stratification, of which we know mathematically the relative elevations and the distances. By a trigonometrical calculation, we deduce the "line of bearing" and the "dip" of this rock, or the plane of its superior face. The result is as follows: course of dip s. 59 1-2° east; bearing N. 30 1-2° east.

Taking three points in the lowest bed of coal, Tallmadge, Youngstown and Sharon, we obtain for the bearing, N 77 1-2° east; dip, s. 12 1-2° E; amount, 20 6-10 feet per mile. These results, therefore, are not surmises and speculations, but physical facts, arrived at by measurement.

A "geological section" is an imaginary vertical cut, made through the rocks on a line of dip or greatest inclination; and since this line, in Ohio as elsewhere, is constantly changing, the section made at any place does not represent the bearing or plunge of the rocks at others, but only their order of superposition.

A general section is here given, (extending from Dayton to Columbus, Zanesville and Wheeling, taken from the geological reports of Ohio.) It shows all the general formations of Ohio, but on a scale so diminutive, that the subordinate members, or subdivisions of the formation do not appear. This would require a plan many feet long.

To comprehend this section fully, it is necessary to imagine the cut made along the line indicated, and one-half of the mass removed, so that the observer has a view of the edges of the strata.

On a scale so limited, it is necessary to reject a very important member of the geological column, the "drift," "superficial materials," or "diluvial deposits," as it is variously named: a coating of earth, gravel, clay, stones and boulders that overspread the whole country, hiding the rocks from view. This will, however, be touched upon in its place.

The relation between the horizontal and vertical distances must, of course, be disregarded in the scale here adopted; for if it was observed, the elevations would be comparatively nothing, and little could be shown. The consequence of this disproportion is, to make the angles of dip appear much *greater* than they really are, but this cannot be avoided.

The horizontal line represents the level of the lake, and the irregular line above it, the surface of the earth, the elevations of which are in figures at a few points. As a survey has been made along the National road, this can be done with great accuracy.

The order of strata is here seen to be the same as given above. Near the west line of the State, or the section, the dip is slight. It is probably greater in a northerly direction. It is not very rapid between Dayton and Columbus, but increases materially between Columbus and Zanesville, in crossing the rocks between the limestone and the coal.

Dr. Locke gives the dip, at Montgomery and Miami counties, at N. 14° east, 6 feet per mile. At Columbus, I found it to be, S. 81° 52 min. east, 22 feet 73 hundredths per mile.

The thickness of these formations is very variable at different points. The "fine grained sandstone," at Newburg, is not to exceed 80 feet in thickness, at Reynoldsburg and Jacktown about 500 feet, at Waverly 250 to 300 feet, and at Brush creek, Adams county, 343 feet. The "black shale" is more uniform, being at Brush creek 251, Alum creek 250 to 300, in Crawford county about 250. At Newburg, and along the lake shore, its thickness is unknown.

The conglomerate is more irregular. In Jackson county, by estimate, 200 feet; in Licking county 100; Cuyahoga Falls 100 to 120; Burton, Geauga county, 300.

The great limestone formation is divided into several numbers. At Cincinnati, at the bed of the river, there is—

1st. A blue limestone and slaty marlite.
2d. Dun colored marl and layers of lime rock........................ 250 feet.
3d. Blue marl and layers of blue limestone............................ 160 "
4th. Marl and bands of limestone, with immense numbers of shells to surface.

In Adams county the detailed section is thus—

1st. Blue limestone and marl.
2d. Blue marl... 25

3d. Flinty limestone	51 feet.
4th. Blue marl	100 "
5th. Cliff limestone	89 "

The coal measures of Ohio, like those of England and Pennsylvania, are composed of alternate beds of coarse grained sandstone, clay shales, layers of iron stone, thin beds of limestone, and of numerous strata of coal. If the geological explorations of the State had been prosecuted, there is little doubt but the number of coal beds or strata, lying one above the other, would have been shown to be numerous, and that there are 10 to 15 of them thick enough to be worked.

Here, as usual, the coal region is also an iron region. From Jacktown, on the western edge of our coal field, to Concord, in Muskingum county, in Mr. Foster's section, (2d Geol. Reports, p. 72,) a distance of about 42 miles, there are shown eight beds, or separate strata, of coal, and seven beds of limestone.

In my section, (2d Report, p. 57,) from Freedom, in Portage county, to Poland, in Trumbull county, about 35 miles, there are five distinct strata —three of them in places capable of being wrought. Among them are distributed three beds of limestone and many beds of iron ore.

Dr. Hildreth made a section of the hills at Dillon's furnace, Muskingum county, from the bed of the Licking or Pataskala river upward, 206 feet. In this vertical distance, there were four beds of iron ore, two of coal, and one of limestone.

But by far the greatest mass of coal and iron measures is composed of sandstone and shale. The beds of coal and iron are comparatively thin; the beds of sandstone from 10 to 20, and 80 feet thick; of shale, 5 to 50 feet thick. A bed of coal is considered workable, if the roof and drainage are good, when the thickness is *three feet* If it is four feet, it is considered a good mine, and very few of them average five feet. Occasionally it increases to six, and, in one or two cases, to ten and eleven feet, for short distances; but for such extreme thickness the mine is certain to suffer in consequence of its irregularity. The cases where a bed of the ordinary "heft" of four feet falls below that standard, are much more numerous than where there is a greater thickness.

In Lawrence and Scioto counties, in the distance of 30 miles, across the edge of the strata may be seen eight principal beds of ore, and new ones are being discovered. There are also four beds of coal and three of limestone.

The ore varies in thickness from 4 inches to 12, thickening up, in some places, to 2 feet; but this is an irregularity.

There are 17 furnaces on the Ohio side, supplied with ore, flux and fuel to drive the engines, from the strata represented in the section. A large portion of the ore is taken from beds of a few inches in thickness, the rule being to strip a *foot* of earth for an *inch* of ore.

Sometimes beds of 2 or 3 inches are worked a few feet into the hill; but, in general, the valuable beds are from 4 to 6, 7 and 10 inches in thickness. The calcareous ore, resting upon the second bed of limestone from the bottom of the section, being very rich, is sometimes obtained by drifting, but far the greatest part of it is procured by "stripping." The hills, or more properly, the valleys of this region are so numerous, that the strata crop out, continually, showing their edges to the miner along the slopes. Here he can follow the stratum into the earth till it becomes too deep, and then work along the side hill at the same level. The immense length of the line of outcrop for each bed, in a country completely intersected by hills and valleys, can easily be imagined. If, instead of being uneven and hilly, it had been flat, the strata remaining as near horizontal as they now are, it will be readily seen that none but such as are thick enough to "drift" would be worthy of attention.

Among the iron beds, there are but two or three that would at present, pay for working by drifting. The ores are not all of them fit for use, in the present state of metallurgy, on account of silicious impurities that render them hard to melt; but the exceeding value of this region is caused by the general goodness of the ores in relation to ease of reduction.

There are many parts of the United States where richer ores may be found, and in thicker beds, but probably none where iron may be produced with as little fuel as on the Ohio river. They range from 30 to 40 per cent. of iron, and are so happily tempered with calcareous and aluminous matter, that they require a small amount of flux. But where a flux is needed, it is found everywhere in the limestone beds which nature has interspersed with the other mineral strata.

The iron interest of Ohio has materially improved since 1837. At that time, it was thought to be a good yield if a furnace produced 3½ to 4 tons per day. This was with the old-fashioned cold blast. In 1829, an improvement was introduced at the Clyde works, Scotland, by Mr. Robert Neilson, of Glasgow, which consists principally in using a blast of *hot* instead of *cold* air. Mr. Dunlop, of the Clyde works, and Mr. Dixon, of the Calder iron works, improved upon Mr. Neilson, by raising the temperature of the blast from 300 to 600 degrees, Farenheit. This improvement did not reach Ohio until 1841–2, although it was recommended by Dr. Hildreth in his Geological Report of 1836. The result is, an increase of product of nearly one-half, raising the daily yield from 3 1-2 to 5, 6, and even 7 1-2 tons per day, diminishing the consumption of charcoal, per ton, from 250 bushels to 160 or 180.

In April, 1844, Mr. Gliddon, the master and owner of the "Franklin Furnace Junior," Lawrence county, Ohio, gave me the yields of his furnace during a blast of 8 months, 1 day and 4 hours, commencing May 8th, 1843, at 1,845 1-2 tons of 2,268 pounds, or 7 tons 65 hundredths per day. Charcoal per ton, before the hot blast, 210 bushels; for this blast, 161 bushels. Stone coal per ton, for engine and hot blast, 18 bushels and 9-10 of a bushel, cost of ore per ton of iron, $3.17; the amount of ore, 2 tons 54-100.

The saving in charcoal of 49 bushels, at $1.75 the hundred bushels, is 85 1-2 cents per ton. But the great item is in the labor, the same hands turning out about 40 per cent. more iron.

There is scarcely a doubt but the cost of iron may be still more reduced by the use of *mineral coal*, in whole or in part, in the place of charcoal; an experiment now going on in the counties of Summit and Mahoning, with apparent success.

When these expectations shall be realized, it will be seen by a due consideration of the extent of the mineral region of Ohio, its richness in all the materials of value in the manufacture of iron, that this state will soon turn out immense quantities of that metal.

By the census of 1840, she had 72 furnaces, which produced 35,236 tons of pig metal the year previous. She had 19 forges, that made 7,466 tons of bar iron in the same time.

In this notice of the Ohio strata, I have not spoken of them by the scientific divisions and names, because their place and nomenclature in the system is not yet well settled among geologists.

The geological survey of the State was abandoned by the legislature when it was about one-third completed, and upon the work done no *final* report was made or required. The survey was dropped by the sudden withdrawal of the funds, the corps never having been formally disbanded.

Two annual reports were made, but not anticipating the abandonment of the survey, they contained only such facts as appeared to be of present practical value, reserving the theoretical and purely scientific matter for a future and final report.

Since that time, the splendid reports on the New York survey have been made, and as those geologists had a great range of observation, from the coal down to the primitive rocks, their classification has become, for the present, the standard for the United States.

In Ohio, many formations, well developed in New York, are *wanting* leaving gaps in the series. Mr. Hall, of the New York survey, in his extended geological map of the Western States, makes the blue limestone of Cincinnati equivalent to the Trenton and Birdseye group of New York members of the lower Silurian system, within two formations of the bottom of the sedimentary rocks. These are the "Potsdam sand stone," which rests on the primitive, and the "calciferous sand rock," lying between the Potsdam and the Trenton limestone.

In New York, next above the Trenton, is—1st, "Utica slate;" 2d, "Shawangunk grits;" 3d, "Hudson river group;" 4th, "Medina sandstone;" 5th, "Clinton group."

Next above these rocks, in New York, is the "Niagara limestone," represented in Ohio, according to Mr. Hall, by the lower part of the cliff limestone, the upper part being here the geological equivalent of the "Helderberg limestone" of New York.

Between the Helderberg and the Niagara is found the "Onondaga salt group," of which only uncertain traces are found in Ohio. Our "black shale," which rests on the cliff limestone, represents the "Hamilton group" of New York, and the New York geologists discover in our fine grained, or "Waverly sand stone" the "Portage and Chemung group" of southern New York, which there plunges south and beneath the coal series, as it does here. Our conglomerate, underlying the coal, does not reach New York, but follows the edge of the coal field, as I have above described it, around through Pennsylvania, Virginia, Tennessee and Kentucky, back to Ohio.

The coincidence and equivalency of our rocks with those of New York cannot, in all respects, be regarded as settled. The fossils of the Ohio rocks, the great guide in classifying formations, have not been fully discovered or studied. The division of the fine grained sandstone into two members, equivalent to the Portage and Gardeau rocks, did not occur to the Ohio geologists, but may, notwithstanding, be a good division. There will, probably, be occasion to divide the blue limestone into more members than are given above, when its multitude of fossils are completely understood.

An attempt was made at the meeting of the "Association of American Geologists and Naturalists," at Washington, May, 1844, by Professor H. D. Rogers, to adopt a system of names for the several formations, that should answer for the whole United States. Hitherto, the geologists of each State, following the example of those of England, have given to their strata the name of a locality or region, by which the same rock, when it crosses a State line takes another name or designation. To make the science easy to learners and readers, and to give simplicity to the system among its professors, a nomenclature that shall be uniform in the United States, and even over the world, is indispensable.

The coal series of Ohio present no striking difference from the coal fields of other States and kingdoms, except in the presence of the "buhr stratum." All coal-bearing strata present alternate beds of iron ore, sand stone, shales, limestone and coal in their beds, and consequently changing frequently as we ascend or descend in the series.

In the 1st Geological Report of Ohio, p. 28, Dr. Hildreth notices the "calcareo-siliceous," or "buhr stone rock," of the coal series of Ohio, which resembles very closely the French buhr, used in this country for mill stones, and imported from France. On Raccoon creek, and at other places in the south, near the Ohio river, this rock is wrought into mill stones to a considerable extent; but millers, as yet, prefer the foreign buhr, at a considerably higher price.

In this brief view of the outlines of the geology of Ohio, I shall omit to notice the fossils, because upon this subject geologists are, as yet, only partially instructed.

The most numerous and striking are the trees, plants and stems of the coal-bearing rocks, the shells and corals and crustacea of the limestone, and the timber, leaves and dirt-beds of the "drift." The latter is the general term for the earthy covering that conceals the rocks, varying in thickness from nothing to 200 feet.

It is sometimes called the "superficial deposits," having been brought on by some force, after the deposition and induration of the rocky beds.

There are many theories respecting the manner in which this immense mass of clays, sand and gravel was brought on, the discussion of which would occupy much space.

The "boulders," or lost rocks, that lie scattered over this State in most of its parts, and of the northern half of the United States, are objects of great curiosity, because they have evidently been transported a great distance. They are fragments of primitive rocks, granite, gneiss and Hornblende rock, which do not exist in place in Ohio, nor within about 300 miles in any direction.

As we go northward to the mountain ranges that skirt Lake Superior, we find the nearest rocks that answer to the specimens found here; and from this and other reasons, it is conclusively shown that they *are from the north.* In almost every quarry where the superficial earth has been stripped off, especially on the summits of hills, we find scratches. grooves and furrows, that are in a northerly and southerly direction, varying from N. 15° to N. 40° west. There is an evident connexion between the boulders and these diluvial furrows and also with the drift or diluvium itself. It is supposed by some geologists that the drift and the boulders were brought on by the action of glaciers of ice moving down from the north, in remote ages, when the northern hemisphere was, as the Alps are now, bound up in continual winter.

By others, that the waters of the Northern Ocean once stood several thousand feet higher than at present, and that by means of heavy currents in those ancient seas, the drift and boulders were brought on.

Others join the two theories, and suppose an elevated state of the waters and a great degree of cold, but not continual, as in the Alps, and currents of water acting in a double capacity as transporters of sand, clay and gravel, and of huge icebergs, that enclosed and brought along the rocks we now see.

By this supposition, a greater number of the phenomena of the drift can be explained than by the aqueous or the glacial alone. It is called the "aqueo-glacial" theory. The glacial explains how the scratches and furrows may have been formed, but by this the sands, clay and gravel should be mixed and in confusion, whereas we find them stratified.

By the aqueous doctrine, it does not seem probable that a force could be acquired sufficient to tear off and transport huge rocks many hundred miles.

Icebergs are now seen floating in the ocean, of many square miles in extent, and 2000 feet thick.

If the ocean or Lake waters were elevated, so as to cover the highest land in Ohio, which is near the sources of Mad river, about 900 feet above the Lake, or 1450 above the ocean, one of those largest icebergs would not float in the basin of Lake Erie. In Massachusetts, the same grooves, boulders and scratches which are seen here, are met with much *higher than any land in Ohio*, at 2400, 2600, and at 3200 feet above the level of the sea.

These facts show conclusively, either that the waters were higher, or the highlands lower than at present. If masses of ice existed then as now, and drifted southward, they would be likely to embrace fragments of the northern rocks, and in passing across our ranges of hills, would wear away the most exposed points, leaving scratches and furrows on the rocks.

The "superficial deposits" of Ohio may properly be arranged in two geological formations:

1st. The "ancient drift" of *these* members:—1. Blue clay, marl, and hard pan. 2. Yellow clay and hard pan. 3. Sand and gravel.

2d. The *modified* or "valley drift," occupying the valleys of large streams, such as the Miami, the Scioto, and the Ohio.

The members of drift formation No. 1, may be thus described:

1st. At the bottom, *blue clay*, or "hard pan," with gravel stones, of both primitive and sedimentary rocks, and contains carbonate of lime. These gravel stones are not, in general, as much worn as in the superior strata, and are scratched and striated—thickness sometimes 150 feet.

2d. The *yellow clay*, or "hard pan," of the well-diggers, with gravel stones similar to the "blue hard pan"—the stratum in general not as thick.

3d. Sand and gravel less perfectly stratified, and embracing more pebbles of the sedimentary rocks, such as limestone, sand stone, iron ore, coal and shale—the pebble more polished and rounded.

No. 1 of these divisions includes great numbers of logs, trees, leaves, sticks, and what the well-diggers call "grape vines." All these members occupy the surface at different places.

The section in the basin of Lake Erie is as follows:

1st. From the Lake level upwards, fine blue marly sand, 45 to 60 feet.

Its depth below the surface of the water is unknown—probably 50 to 100 feet, making a thickness of 95 to 160 feet.

2d. Coarse grey water-washed sand, 10 to 20 feet.

3d. Coarse sand and gravel, not well stratified, to surface, 20 to 50 feet.

The lake ridges from Erie to Norwalk belong to this stratum.

Stratum No. 1 is easily dissolved by the action of water, and it is upon this, being at the water level, that the principal encroachment of the lake is effected. It may be traced along the shore around the western half of the lake in Ohio, Michigan and Canada, everywhere undergoing loss by the perpetual movement of the waves, and sliding into the lake in heavy masses. It contains carbonate of lime, magnesia, alumina, iron, sulphur, silex and a few decayed plants, sticks and leaves. There are also pebbles of primitive rocks, but they are not numerous. Its upper surface is almost horizontal, for the difference between the south shore at Cleveland and the north shore at Port Burwell, in Canada, does not exceed 15 feet. It is heavy and compact, so as to be impervious to water, causing numberless springs to flow out at its upper edges. In contact with water, it becomes quicksand, and is easily washed away. The coarse sandy stratum, No. 2, resting upon it, is porous, and suffers the water to settle through it readily.

It is the same with No. 3, on the surface stratum or soil, occupying a long, narrow belt along the south shore, and also the broad and level region of southeastern Michigan and the western portion of "Canada West," between lakes Erie and Huron.

The ridges of sand and sandy materials that are so common over all this space, appear to have been formed *beneath the surface* of the ancient waters, and were formerly parallel with the ancient shore.

They are seen at various levels above the lake, from 30 to 140 and 200 feet, but of greater length and regularity, at 90 to 120 feet. They were probably formed when the waters were at various heights, and by the same process that sand bars are now formed in the lakes and the ocean. Beneath the surface on the coast of the United States, opposite the States of New Jersey, Delaware, Maryland, Virginia and North and South Carolina. In lake Erie, also, such ridges are known to form, having a general direction parallel with the shore. Should the water recede rapidly, or the bed of the ocean rise suddenly, they would be left in form and extent like our lake ridges. Similar ridges or terraces surround Lake Ontario. At Toronto, on the northern shore, Mr. Roy has given the elevation of several of them, referred to the lake level as follows. The base of the 1st, or nearest ridge to the lake, 108 feet; 2d, 208 feet; 3d, 288 feet, and the highest near the summit, between Lakes Ontario and Simcoe, was found to be 680 feet, or 448 feet above Lake Erie. In Canada, those of the northern shore of Lake Ontario extend across the level region between Lake Erie and Lake Huron, forming there ridges that belong to Lake Erie. Examination will no doubt show, hereafter, higher ridges on the south shore of Lake Erie than those above given.

Formation of No. 2 of the drift of Ohio, being that which is found in the valleys of large rivers and lowlands, but of greater extent and thickness than the alluvium, does not, so far as I know, possess within itself subdivisions of strata like formations Nos. 1 and 2. Its pebbles are numerous, and generally from rocks of a sedimentary kind. Pebbles of primitive rocks may be occasionally seen, but seldom. In the valleys of the Scioto and the two Miamies, rivers flowing in or near the limestone formation, the gravel is principally of limestone, well water worn and rounded.

The "Hickory Plains" at the forks of the White Water and Great Miami, and also between Kilgores mill and New Richmond, in Ross county, and in Pickaway county, are examples of this modification of the drift. It is probably the result of heavy diluvial currents, that exerted themselves irregularly during the *subsidence of the waters*, and acting in the direction of the great valley.

In laying down the outlines of the grindstone grit, it should be observed, that, on the west, the junction between it and the fine grained sand stone is covered with drift, and, therefore, its limits are conjectural.

The grit and its shales appear to be in the form of a wedge between the conglomerate and the fine grained sand stone, which, as we go from the lake, diminishes in thickness, and is displaced by the Waverly thickening up.

This accounts for the appearance of the Waverly in the east fork of Rocky river, at Old Portage, and at Warren, Trumbull county, where its surface is higher than at the lake. Along an east and west line through these places, the surface of the Waverly, or fine grained sand stone, has been elevated by an upward increase of thickness.

NOTE.—The geological map and sections, is the map facing plate 1 of the "Wheat Heads" in this volume—the lithographer omitted to name or number the maps. The vertical height of the sections are greatly exaggerated, in order to present the inequalities of the surface—if these sections were drawn upon a correct scale, the inequalities of surface in Ohio would not in comparison much exceed those on the surface of an orange. The points of elevation *numbered* on the several sections in the plate are as follows: [*Klippart.*]

SECTION I.

No. 1 Level of Lake Erie at Toledo.
" 2 Maumee at Defiance.
" 3 Blanchard's Fork, Hancock county.
" 4 Bremen Summit, Auglaize county.
" 5 Summit in Logan county.
No. 6 Summit on Miami canal.
" 7 Greenville.
" 8 Miami at Dayton, on canal.
" 9 Hillsboro.
" 10 Cincinnati 133 feet below Lake Erie.

The dotted line represents a profile of the Miami Canal.

SECTION II.

No. 1 Miami at Dayton.
" 2 Scioto at Columbus.
" 3 Jacktown.
No. 4 Muskingum at Zanesville.
" 5 Norwich.
" 6 Ohio at Wheeling.

SECTION III.

No. 1 Ohio River 90 feet below Lake Erie.
" 2 Chillicothe.
" 3 Hocking at Athens.
" 4 Muskingum at Zanesville.
" 5 Norwich.
" 6 Licking Deep Cut.
" 7 Dresden.
" 8 Carrollton.
No. 9 Beaver at New Lisbon.
" 10 Point between New Lisbon and Salem.
" 11 Salem, Columbiana county.
" 12 Warren.
" 13 Little Mountain in Lake county.
" 14 Akron Reservoir.
" 15 Swamp in Ashtabula county.
" 16 Lake Erie.

The dotted line represents the Ohio Canal.

A CATALOGUE

OF THE

SHELL-BEARING SPECIES OF MOLLUSCA, INHABITING THE VICINITY OF COLUMBUS, OHIO, WITH SOME REMARKS THEREON.

BY FRANK HIGGINS.

The Mollusca of the vicinity of Columbus, Ohio, embrace one hundred and forty-four species, representing eighteen genera and sub-genera, confined to seven families of the Mollusca. As regards the number of species here represented, the abundance of individuals, the great size and rare beauty to which many of them attain; this locality will compare favorably with any locality possessing similar geological features and of similar climate, and its Mollusca may be considered fair types of the Mollusks of the State of Ohio.

LAND SHELLS.

The land shells are represented by forty-nine species, of which the larger proportion are Helices. The bottoms of the Scioto and its tributaries being covered with a remarkably heavy growth of timber and underwood, are highly favorable localities for the increase of the Helices, all the larger species here are found in immense numbers and attain their greatest size. The swamp prairies common in this vacinity, afford a peculiar locality for some of the Helices and present new varieties. They are especially favorable for H. Leaii—Ward, H. multilineata—Say, H. concava—Say, H. hirsuta—Say, at the edges of these prairies many of the small and minute species are found in great numbers. The temporary operculum with which the Helices provide themselves during the winter season varies considerably in different species. Those species most exposed to the weather during the winter, as H. fallax—Say and H. profunda—Say, is thick and heavy, while in those species which bury themselves deep in the soil the operculum is thin and transparent. That of H. profunda —Say, which is more exposed during the winter than any other species of this locality, is remarkably thick and resembling vellum, of a dirty white color. The Helices vary considerably in the secretion or slime which they emit, the proximity of a specimen of H. fuliginosa—Griffith, may be readily known by the presence of this secretion, being different from any other species. The secretion of H. solitaria—Say, H. alternata—Say, and H. perspectiva—Say, is in each peculiar and remarkably abundant. The fulcrum or inner tooth has been noticed in the following species of Helix, found in this locality, H. monodon—Rackett, H. inflecta—Say, H. Leaii—Ward, H. fraterna—Say, H. hirsuta—Say. The habit of H. multilineata—Say, in collecting together during the winter season has often been noticed, but the same is true to some extent, of several other species; the H. Leaii—Ward, H. concava—Say, and H. hirsuta—Say, do so in the swamp prairies, and the H. tridentata—Say, does so in rocky places. The smaller Helices are generally found in clusters, especially late in the fall and in early spring, which is the best season for collecting them. Such is the case with H. perspectiva—Say, H. striatella—Anthony, H. lineata—Say, H, liamatula—Ward, H. miniscula—Binney, H. arborea—Say, and H. electrina—Gould.

FLUVATILE SHELLS.

The fresh water shells of this vicinity are represented by ninety-five species, of which thirty-six species are univalves and fifty-nine species are bivalves. The different species of Paludina and Melania, blend together by such insensible gradations that it is almost impossible to separate the recognized species, the list of Melania herewith submitted, was collated by specimens from this locality sent to Isaac Lea, John G. Anthony, and other authors, and by them named. The bivalves of the Scioto river are remarkable for the immense size which they attain, and many of them are celebrated for the brilliant colorings of their nacres. The Scioto and Little Miami rivers produce the largest fresh water mussels of the world; the following species especially are of a very large and ponderous growth; U. crassus—Say, U. plicatus—Say, U. ventricosus—Barnes, U. cuneatus—Barnes, U. alatus—Say, U. rectus—Say, Alas. rugosa—Barnes, Ano. plana—Lea, var. gigantea—Lea. In the Unios the proportion of males to females among adult speceimens shows a great proponderance in favor of the males; in the following species more particularly noticed, the proportion is about two males to every female; U. ventricosus—Barnes, U. siliquoideus—Barnes, U. multiradiatus—Lea, U. triangularis—Barnes, and U. lappilius—Say. Pearls are quite common in the larger bivalves of the Scioto river, and are generally found in old and diseased shells. The peals are generally attached to the nacre of the shell, but are often loose and enveloped in the body of the animal. They are found of pink, purple, and salmon colors, but are generally white. About one shell in fifteen will be found to contain pearls, and about one pearl in two hundred will be of any considerable value. Pearls as large as a pea are occasionally but rarely found.

INCREASE OF THE MOLLUSCA.

The influence of civilization on the Mollucca of this vicinity, has effected a gradual decrease of most of the species, and in some instances has worked a total extermination of species from the vicinity. But in some few instances the influence of civilization has been favorable to the increase of the Mollusca.

In the yards and gardens in and near the city of Columbus some of the smaller Helices abound in great numbers. H. arborea—Say, H. striatella—Anthony, H. lineata—Say, H. miniscula—Binney, thrive exceedingly well, but especially H. pulchella—Muller, which may be found in abundance in almost every yard and garden.

The Columbus feeder of the Ohio Canal, near its junction with the Scioto river, and also the Ohio Canal at its crossings of the Big and Little Walnut creeks, have proved highly favorable localities for a certain class of shells suited to a muddy bottom and still waters. Many species have traversed the whole length of the canal, and many species there thrive and become abundant which are quite rare in the adjacent rivers. U. Sayii,—Ward, has traveled over the whole extent of the canal in this vicinity and indeed over the whole extent of the canal in the southern part of the State, and is now abundant and is one of our most common shells. The following Unios flourish well in the above localities U. rubiginosus—Lea, U. pluatus—Say, U. siliquoideus—Barnes, U. parvus—Barnes. All the Anodons are abundant, and also most of the Univalves of the Scioto, more especially the Paludina. The Cyclas are more particularly abundant. They may be collected by millions, and are found in such numbers as in some instances to cover the bottom of the canal.

DECREASE OF THE MOLLUSCA.

Gentlemen who collected the shells of this vicinity in early times, found many species in great abundance which have at this day either totally disappeared or are represented by occasional straggling specimens, and all species, with but few exceptions, have gradually decreased in numbers. The following species have become entirely extinct: Helicina orbiculata

—Say, Helix suppressa—Say, H. inornata—Say, U. cicatricosus—Say, U. cornutus—Barnes, U. donaciformis—Lea, U, elegans—Lea, U. ellipsis—Lea, U. tenuissimus—Lea. The following species are nearly extinct: U. alatus—Say, U. rectus—Say, U. pustulosus—Lea, and U. verrucosus—Barnes. Thus three species of the land shells are extinct, and eleven of the fluvitale shells are also extinct, or nearly so. This remarkable decrease and extinction among the mollusca, may, to a great degree be acounted for, when we consider the immense change which the surface of the country has undergone. The change of a wilderness into a highly cultivated country, the immense area of forest which has yielded to the plow; the decrease in the volume of the water in our rivers and creeks, the total change of vegetation and change of climate from moist to dry, have each had their influences upon the character and increase of the Mollusca of this vicinity.

CATALOGUE.

Family-Unionidæ—Unio 37, Alasmodon 4, Anodon 7	48
Family-Cyclaidæ—Cyclas 7, Pisidium 4	11
Family-Limnæidæ—Limnæ 6, Physa 4, Planorbis 7, Ancylus 2	19
Family-Paludinidæ—Paludina 4, Amnicola 3, Valvata 1	8
Family-Melaniadæ—Melania 8, Anculosa 1	9
Family-Helicidæ—Helix 35, Pupa 7, Succinea 4, Zua 1	47
Family-Cyclostomidæ—Helicina 1	1
	144

UNIO.

1. U. alasmodontinus, Barnes, Scioto river and tributaries, rare.
2. " alatus, Say, Scioto, nearly extinct.
3. " Bourneianus, Lea, Scioto, very rare.
4. " cuneatus, Barnes, Scioto, rare.
5. " coccinneus, Hild., Scioto, very common, somtimes inflated, generally flat, with nacres ranging from dark pink to salmon and white.
6. " cicatricosus, Say, Scioto, extinct.
7. " cylindricus, Say, Scioto, common, often found with pink teeth.
8. " crassus, Say, Scioto, very common, attains a very large size, rarely with nacre of pink color.
9. " circulus, Lea, Scioto, very common, U. lens, Lea, young.
10. " clavus, Lam., Scioto, very common, U. patulus, Lea, young.
11. " cornutus, Barnes, Scioto, extinct.
12. " donaciformis, Lea, Scioto, extinct.
13. " elegans, Lea, Scioto, extinct.
14. " ellipsis, Lea, Scioto, extinct.
15. " Gouldianus, Ward, Scioto, very rare, animal red colored, as red as Unio trigonus, Lea.
16. " gibbosus, Barnes, Scioto, very common, var. U. arctior, Lea, rare.
17. " gracilis, Barnes, Scioto, nearly extinct.

18. U: irroratus, Lea, Scioto, rare.
19. " lappilus, Say, Scioto, rare, sometimes found attached by a byssus.
20. " multiradiatus, Lea, Scioto, common.
21. " phaselosus, Hild., Scioto, common, vars. U. camelus, Lea, and U. planantulus, Lea, rare.
22. " pustulosus, Lea, Scioto, rare.
23. " parvus, Barnes, rare in Scioto, and common in Ohio Canal.
24. " perplexus, Lea, Scioto, very common.
25. " plicatus, Say, Scioto and Ohio Canal, very common, generally flat, occasionally inflated.
26. " Rangianus, Lea, Scioto, rare.
27. " rubiginosus, Lea, Scioto and Ohio Canal, with salmon and white nacres.
28. " rectus, Lam., Scioto, nearly extinct.
29. " siliquoideus, Barnes, Scioto and Ohio Canal, very common.
30. " subrostratus, Say, Scioto, very common.
31. " solidus, Lea, Scioto, very rare.
32. " Sayii, Ward, Scioto and Ohio Canal, very rare in the Scioto, but very common in Ohio Canal.
33. " tuburculatus, Barnes, Scioto, rare.
34. " tenuissimus, Lea, Scioto, extinct.
35. " triangularis, Barnes, Scioto, very common.
36. " verrucosus, Barnes, Scioto, rare.
37. " ventricosus, Barnes, Scioto, vars. U. occidens, Lea, and U. subovatus, Lea, very common, attains a large size, is generally finely rayed,—has often pink teeth, and is occasionally deep pink throughout the whole nacre.

Alasmodon—*Say.*

38. A. ambigua, Say, Scioto, common.
39. " calceola, Lea, Scioto and Ohio Canal, common.
40. " truncata, Say, Scioto, common.
41. " rugosa, Barnes, Scioto and Ohio Canal, common.

Anodon—*Cuvier.*

42. A. aerolata, Swain, Scioto and Ohio Canal, common.
43. " Buchanensis, Lea, Scioto and Ohio Canal, very rare.
44. " Ferrussaciana, Lea, Scioto and Ohio Canal, rare.
45. " imbecilis, Say, Scioto and Ohio Canal, very common.
46. " pavonia, Lea, Scioto, rare.
47. " plana, Lea, Scioto and Ohio Canal, very common; A. decora, Lea, young.
48. " salmonea, Lea, Scioto, rare.

Cyclas—*Bruguierre.*

49. C. edentula, Say, Ohio Canal, rare.
50. " occidentalis, Prime, swamps, common.
51. " partumeia, Say, swamps, rare.
52. " solidula, Prime, Scioto and Ohio Canal. This species is not very common in the Scioto, but they cover the banks of the Ohio Canal, near its junction with the Scioto, in such myriads that they might be collected by the bushel.
53. " similis, Say, Scioto and Ohio Canal, common.
54. " rhomboidea, Say, Ohio Canal, found in great numbers, although confined to one small locality.
55. " transversa, Say, Scioto and Ohio Canal, rare.

PISIDIUM—*Pfeiffer.*

56. P. dubium, SAY, Scioto and Ohio Canal, rare.
57. " compressum, PRIME, Ohio Canal, rare.
58. " abditum, HALD, Ohio Canal, rare.
59. " ferrunginium, PRIME, Ohio Canal, common.

LIMNÆ—*Lamarck.*

60. L. caperata, SAY, swamp ditches, rare.
61. " desoidosa, SAY, swamp ditches, common.
62. " humilis, SAY, Scioto, Ohio Canal, and springy places, common.
63. " reflexis, SAY, swamps, very common.
64. " umbrosus, SAY, swamps, rare.
65. " ? swamps, rare. This species appears to be undescribed.

PHYSA—*Draparnaud.*

66. P. ancilliara, LEA, Scioto, rare.
67. " elongata, SAY, swamp ditches, rare.
68. " gyrina, SAY, Scioto, very rare.
69. " heterostropha, SAY, Scioto, Ohio Canal, and swamps; common everywhere.

PLANORBIS—*Muller.*

70. P. armigerus, SAY, swamp ditches, rare.
71. " campanulatus, SAY, Scioto, rare.
72. " bicarinatus, SAY, Scioto and Ohio Canal, common.
73. " dilitatus, GOULD, swamps, very rare.
74. " parvus, SAY, Ohio Canal and swamp ditches, common.
75. " lentus, SAY, Scioto, common.
76. " trivolvis, SAY, Scioto swamps and Ohio Canal; common everywhere.

ANCYLUS—*Geoffroy.*

77. A. tardus, SAY, Scioto and Ohio Canal, common.
78. " ? Scioto, rare; a very minute red shell; does not appear to have been described.

PALUDINA—*Lamarck.*

79. P. decisa, SAY, Scioto and Ohio Canal, common.
80. " genicula, CONRAD, Scioto and Ohio Canal, very common.
81. " integra, SAY, Scioto and Ohio Canal, very common. Pal. heterostropha, KIRTLAND, appears to be the reversed shell of this species. All the Paludina of this vicinity are found occasionally reversed. An examination of many specimens of Pal. integra, when charged with young, prove the proportion of reversed specimens to be two in every hundred young. The reversed shell does not appear to reproduce, although it occasionally is found of a large size. The average number of young which the Pal. integra produces is about 60.
82. " rufa, HALD, Scioto and canal, rare.

AMNICOLA—*Haldeman.*

83. A. limosa, SAY, Ohio canal, very common.
84. " lapidaria, SAY, moist places, comm.
85. " Sayana, ANTHONY, moist places, common; this species and the preceding one are found near springy places in connection with several species of Pupa, Helix and Succinea vermetus—SAY.

VALVATA—*Muller.*

86. V. tricarinata, SAY, Ohio canal, very common.

MELANIA—*Lamarck.*

87. M. depygis, SAY, Scioto, common.
88. " inornata, ANTHONY, Scioto and Ohio canal, common;
89. " gracilor, ANTHONY, Scioto, common.
90. " exilis, HALD, Scioto, common.
91. " Kirtlandiana, LEA, Scioto, common.
92. " regularis, LEA, Scioto, common.
93. " pulchella, ANTHONY, Scioto, common.
94. " Sayii, WARD, Scioto, very rare.

ANCULOSA—*Say.*

95. A. isogonia, SAY, Ohio canal, common.

ZUA—*Leach.*

96. Z. lubricus, rocky places, rare.

SUCCINEA—*Draparnaud.*

97. S avara, SAY, moist places, common.
98. " ovalis, SAY, rare.
99. " obliqua, SAY, extinct.
100. " vermetus, SAY, common.

PUPA—*Lamarck.*

101. P. armifera SAY, common.
102. " contracta, SAY, moist places, common.
103. " exigua, SAX, moist places, common.
104. " fallax, SAY, rocky places, rare.
105. " vata, SAY, moist places, rare.
106. " pentodon, SAY, moist places, common.
107. " rupicola, GOULD, moist places, rare.

HELIX—*Linnæus.*

108. H. albolabris, SAY, dry ridges and rocky places, rare.
109. " alternata, SAY, ranges from dry ridges to heavy wooded river bottoms, very common, a variety is sometimes found with spire quite elevated and suture deeply indented; also a peculiar variety is sometimes found with spire sunk or flattened, the upper surface of the whorls presenting a plane like the Polygara.
110. " arborea, SAY, dry wood lands, common.
111. " chersina, SAY, moist places, rare.
112. " clausa, SAY, hill sides and river bottoms, common, reversed variety very rare, variety H. Mitcheliana—LEA, rare, sometimes of a pink color.
113. " concava, SAY, dry ridges and river bottoms, and with H. multilineata, and H. LEA in swamp prairies, common. This species resembles the H. multilineata—SAY; in collecting together in considerable numbers during the winter, 220 specimens have been found in the same burrow or nest. Such appears to be their habit only in swamp prairies. This species attains a large size in the heavy timbered river bottoms, those of the swamp prairies are much smaller.
114. " electrina, GOULD, moist places, common.
115. H fallax, SAY, hill-sides and river bottoms, occasionally found with white epidermis, very common.
116. " fraterna, SAY, hill sides and river bottoms, common, occasionally found with spire much elevated.

117 " fuliginosa, Griffith, rocky places and dry wood lands. This rare shell has of late been found in this vicinity in considerable numbers; from the peculiar and secluded habits of the animal, living, specimens are rare. The shell is generally of a dark brown or black, but is occasionally of a straw color. The animal is a leadish blue on the upper surface, and beneath white, running into a cream yellow in the centre

118. " hirsuta, Say, river bottoms and swamp prairies, occasionally white, rarely smooth.

119. " hydrophilia, Ingalls, swamp prairies, rare.

120. " inflecta, Say, hill sides and river bottoms, very common, often white.

121. " inornata, Say, extinct.

122. " intertexta, Say, dry woodlands, rare.

123. " indentata, Say, woodlands, common, sometimes pink.

124. " lineata, Say, moist woodlands, rare.

125. " Leaii, Ward, swamp prairies only, common. This shell has often been considered a variety of Helix monodon—Rackett, but as thorough acquaintance with the shell and the habits of the animal will place it among true species. It is found on a peculiar locality, very different from that of H. monodon, it never appears to extend its range and does not vary in color of shell or animal. It is the most consistent species as to general features of the shell and habits of the animal with which I am acquainted.

126. " labyrinthica, Say, moist places, rare.

127. " liamatula, Ward, moist woodlands, rare.

128. " ligera, Say, moist woodlands, rare; variety H. Wardiana—Lea, rare.

129. " minutessima, Lea, moist places, very rare.

130. " miniscula. Binney, moist places, rare.

131. " monodon, Rackett, hill sides, rare.

132. " multilineata, Say, swamp prairies, very common, a variety without bands, rare, variety rufous without bands, very rare. This species congregates in vast numbers during the winter season under the sod, hummocks or under old logs; a gallon and a half have been taken from one nest.

133. " palliata, Say, river bottoms, common, a white variety is sometimes found.

134. " perspectiva, Say, woodlands generally, and dry ridges, very common in clusters under old bark.

135. " profunda, Say, hill sides and river bottoms, very common. Varieties: *a.*, with one broad rufous band; *b.*, with many broad rufous bands; *c.*, white without bands; *d.*, rufous without bands.

136. " Pennsylvanica, Green, hill sides and river bottoms, rare; the shell varies very much as to color, sometimes brown, straw, pink and white, and occasionally bi-colored.

137. " pulchella, Multa, gardens in the city, very common.

138 " solitaria, Say, ranges from dry ridges to moist river bottoms, common, very rarely reversed; a variety is occasionally found with sutures distinct and deeply indented.

139. " striatella, Anthony, moist places, very common.

140. " suppressa, Say, extinct.

141. " tridentata, Say, rocky places only, common.

142. " thyroidea, Say, ranges from dry ridges to moist river bottoms, very common, varies considerably as to color, size and habits, is often destitute of the tooth.

143. zaleta, Say, hill sides and moist woodlands, very common, the tooth is often wanting, shell sometimes white.

Helicina—*Lamarck.*

144 " orbiculata, Say, swamp prairies, extinct.

SUGGESTIONS ABOUT THE CLIMATE OF OHIO.

BY C. REEMELIN.

To J. H. Klippart, Corresponding Secretary O. S. B. A.:

SIR: In a private conversation between you and myself, I expressed certain views upon the climate of Ohio, and gave some reasons why it is colder than that of corresponding latitudes in Europe; why, for instance, Cincinnati, being four and a half degrees farther south than Turin, should have the same mean temperature; and you were pleased to request me to write them out, and furnish them to you for your forthcoming Agricultural report. I hereby comply with your wishes, not however without some fears that others may not agree with you, either as to their value or correctness.

Humboldt mentions as among the cold-creating causes, the following: "A range of mountains, whose wall-like form, and peculiar direction, prevents the access of warmer winds;"—"the unbroken extension of a land in a continent towards the pole to the region of perpetual ice;"—"the massive formation of a continent, without indented coasts and extensive bays;"—"large bodies of forests, which obstruct the exposure of the soil to the sun, and which through the vital action of their foliage, produce great evaporation of watery fluids, and by means of the extensiveness of these organs, increase the surface that is cooled through radiation, and therefore operate three-fold through shade, evaporation, and radiation;"—"a country not having between it and its equatorial region a large tropical body of land, such as warms up strongly, and radiates heats largely;" and he closes the list with "very clear winter skies, through which the radiation of heat is promoted." We thus have the prominent causes, which if they exist in reference to Ohio, explain the difference of climate above indicated, and it only remains to be seen, whether, and to what extent, they prevail.

By looking at the map of the United States, we find that several large and long rivers fall into the Ohio from a southerly direction, which indicates that the ground must be gradually rising, both in Kentucky and Virginia; and this is true from the Monongahela on the east, to the Tennessee on the west, all having their rise in the mountain system commonly called the Cumberland and Allegheny mountains, which, extending from Alabama and Tennessee to beyond Maryland, presents along its crests a connected mountain range, elevated some three thousand feet above the plateau of our State, some points of it being as high as six thousand feet, showing the existence of one of the causes enumerated by Humboldt. Now, it is well known that the greatest density of the atmosphere is nearest the surface of the earth, and that most of the atmospheric processes are performed within the first three thousand feet immediately above the earth; a fact which shows the important bearing this mountain range must have upon our climate. It lies immediately south and southeast of us, and presents a "wall-like" barrier against the warm winds coming from the Southern States, and our equatorial region, and explaining to a great extent, why our winters hold on with such tenacity—why we have such late springs—and why the solar heat, imparted to the surface of our soil during many warm spring days, does not have the effect which it has in other climes—because the temperature of our atmosphere is not raised through the agency of winds from the south; its only means of resisting cold currents being the amount of solar heat thrown directly upon the surface of our soil, and retained during the day, which affords but a feeble defence against those cold north and northwest winds which so frequently occur towards evening.

This brings us to another of the causes above specified. Ohio is a part of the "*massive*" North American Continent, being nearer its eastern coast than its western; is a rather open country towards the region of perpetual ice, and the temperature of our atmosphere is thus lowered from two causes: the obstruction to the passage of warm winds, and the free access which our surface opens to cold northern currents. The extreme changes of our atmosphere have become proverbial; they should cease to be a marvel when we reflect upon the two facts just stated. We have all felt, how, after a warm sunny day, the wind would suddenly veer to the north late in the afternoon, and be followed by a heavy frost next morning. The process gone through within the twenty-four hours being simply that the solar heat thrown upon the surface of our soil, according to latitude, is but little augmented by breezes from the south, and is swept away in a very few hours by a cold northern wind, and that the genial warmth of the previous day is followed next morning by a wintery scene.

In connection herewith, are those splendid clear winter skies, which so frequently prevail with us from the cause just adverted to, as they follow so rapidly a change of wind to the north; they promote radiation, and produce a loss of heat. An old weather prophet, a friend of mine, uses this remark frequently: "The climate of Ohio is like that of a room with a good fire in it, but closed to the access of any warmth from adjoining rooms, and with a large door constantly open to the outer air." This homely view of the subject may be illustrated still further by our imagining the topography of our country totally changed; place the Cumberland and Allegheny mountains where the lakes are now, and let us have in their present locality an open country south of us, and we should at once have the climate of southern Italy. By examining the topography of northern Italy, and comparing it in the light of the views just presented, with ours, its beautiful climate and great fertility, and its adaptation to the cultivation of the olive and other tropical fruits, is at once explained. The Swiss and Tyrolian Alps protect it on the north, while south of it lies Africa, and between them the Mediterranean, an immense reservoir of the heat wafted across it from the plains of Africa. And still more evident will this matter become to us, when we again cast a glance at another portion of the earth's surface—to that portion of Russia lying along the Wolga, north of the Caucasian mountains, and north and northeast of the Crimea. We there find again our climate nearly reproduced, and from very nearly the same causes.

The effect of the mountain ranges south of our State would be far greater if they extended farther westward, and if their altitude did not diminish as they extended in the same direction. As it is, they obstruct but little the winds from the southwest, and accordingly we find western Ohio warmer than eastern, a fact which is in part, however, caused by the greater altitude of the latter. I am here speaking of the general climate of our State, being well aware that it is again modified by special local causes, as for instance, along the principal rivers, and where there are special topographical protections against northern winds.

We share in Ohio the general climate of the Mississippi valley, and if it were not for other causes, to which we will advert hereafter, our State should be sensibly colder than Indiana and Illinois, because we are further east than these States, whereby the warm southwest winds reach us only after their warmth has been well extracted; and for the further reason that it occupies a higher altitude, and being in and of itself, as already explained, in a greater degree barred of southern winds. By examining the isothermal lines, as determined by the Smithsonian Institute, we find that the climate of the States, and the country west of us, grow slightly warmer as we go westward, and as they are less affected by the mountain ranges aforesaid, the warm genial winds that we have in Ohio, come from the southwest, and these would be decidedly warmer if they came to us over a country like Africa, instead of an elevated country like New and Old Mexico, and over the Rocky Mountains and the Sierra Nevada, and if the land west of us did not precede us, and take from them most of their warmth.

Here it is important to remind the reader that the continent of South America is not, so far as it affects us, immediately south of North America; our line of longitude in Ohio, for instance, passes the equator some four degrees west of the most westerly coast of South America, so that while Europe receives much of the solar heat thrown on the soil of Africa through direct southerly winds, and also much of that of South America through the peculiar currents of the gulf stream, we do not enjoy the heat deposited in our southern continent.

Owing to the Alleghenian range south of us, and the still higher range of the Rocky mountains west of us, over whose crests heat passes into space, and to a very reduced degree only into the valleys and slopes east and north of them, we get warmth wafted to us from one quarter only, the southwest. These southwest winds are to us colder winds than they otherwise would be, because by the time they reach us, they are, in the language of Humboldt, "*land winds*," being constantly deprived of their warmth, as they pass from Louisiana and Mississippi, over Arkansas, Kentucky, Illinois and Indiana, to us—just as the warm winds, which give western Europe its genial climate, become colder as they travel eastward, eventually losing their warmth beyond eastern Germany and Poland. The countries west of the Rocky mountains, are, as compared with those in the Mississippi valley, more open to heat, and not as open to cold, and were there a large warm continent south of it, as is the case with Europe, through Africa—if, for instance, South America lay six or seven degrees farther west, and if Mexico and California did not interpose their Sierra Nevada—there would be a great deal less difference in the climates between the Pacific and Atlantic portions of the United States than there now is.

I hope, however, that I am not understood as contending that Ohio is a *cold* climate; the whole scope of this article being only a comparative view, between our climate and that of other lands. Perhaps it would have been better to have made the comparison with countries similarly formed, rather than by latitudes, and in that case we should find that the climate of our State is not much, if any, colder, than others similarly situated. The extensive forests which cover its surface, are undeniable proofs, that our soil is a good depository and secreter of heat, and that it has peculiar faculties for storing that heat away, and then reproducing it in a useful shape on its surface. The wavy, undulating surface of our State, is the great agent in this process. Through it, it happens that the solar heat thrown upon our State each year, is carefully treasured away in our soil, and very little of it lost. Ohio may get little heat from neighboring countries, but it adopts all of its own, and our great forests are the tall witnesses of this geniality of our soil; while the grass of Illinois prairies are the dwarfy tale-bearers of a country whose surface fails to adopt and house properly its own solar heat.

In considering the climate of Ohio, Indiana, and Illinois, we must not forget to give due weight to the fact that these three States form the ridge over which the warm southwest winds pass into the valley of the St. Lawrence, and again the cold northeast winds from Lower Canada and Labrador into the Mississippi valley. The surface of Ohio is considerably protected by the highlands of western New York and Pennsylvania, which continue in a gradual slope throughout our State, especially its eastern counties, wherefrom northeastern winds get their principal direction along Lake Erie, and into and along the Maumee and Wabash valley.

There is in Ohio a high ridge of land, averaging some 650 feet above the level of the Lake, extending from Ashtabula the headwaters of the Muskingum, Scioto, and the Miamis, to Darke county, and forming the dividing ridge between the valley of the Ohio and that of the St. Lawrence, which wards off and modifies considerably, both through its northeasterly direction, and its north and south ridges, the cold currents from Lower Canada and Labrador, and it is very evident that Indiana and Illinois have no such protection: a fact, which to my mind at least, explains to a great extent why so many portions are timberless. Here I must again introduce a quaint remark, often made by the old friend above alluded to. When asked for the cause of western prairies, he says, "The land stands too much in the draft, and is catching cold too often."

The fact that Hudson's Bay, a sea constantly open, penetrates our North American continent till very near the fiftieth degree northern latitude, must also be mentioned in this connection, as it undoubtedly has a moderating influence on the climate of the whole country around it, and is not without its effects as far as our State. The lakes, too, especially for us, Lake Erie, tempers for all the country along its shore, the heat in summer and the cold in winter, as long as it remains unfrozen.

I have thus enumerated the more general permanent elementary causes which make up our climate, and which have, and will continue to exist for centuries. There are points, however, through which our climate will be considerably changed, and rendered more agreeable and healthy; among these, are the clearing of the forests in our own and adjoining States, and most especially the draining of the swampy lands, and gradually the great body of our soil.

I reserve, however, a discussion of these subjects for another article, for which I may obtain the privilege accorded to this, unless indeed some savage critic should frighten me away. I feel most timidly alive to the risk a person runs who presumes to write articles on meteorology and climate, when he is not familiar with its technical terms, and where his knowledge of the subject is as superficial as mine, and how peculiarly open it leaves such a one to severe criticism from those whose sensitiveness he may unluckily have awakened. I hope that I will escape from all such, and that the preceding lines will be accepted by the public, as the humble contribution of one who desires only to be useful to his fellow-men, by communicating facts and conclusions, drawn, as he believes, from correct sources, and of which he hopes to have made a true application.

AN ESSAY

ON THE

ORIGIN, GROWTH, DISEASES, VARIETIES, &c., OF THE WHEAT PLANT.

BY JOHN H. KLIPPART.

ORIGIN OF THE WHEAT PLANT.

CHAPTER I.

As barbarism and ignorance gave place to civilization and enlightenment, new fields of investigation, and consequently new sources of enjoyment presented themselves, and attracted the attention of the learned in all ages. Prominently among the most interesting of these fields of research and investigation, were natural phenomena, and at a very early period in the history of mankind do we find great attention paid them. From the many ferocious and at that time uncontrollable wild beasts, the study of the animal kingdom engaged the attention of the learned. In the ages of greater comparative refinement in the history of civilization, we find the greatest attention bestowed on the vegetable kingdom; it has attracted the attention of all classes; as much, perhaps, from the beautiful, variously tinted and fragrant flowers with which it fascinates, as from the more substantial elements of food which it furnishes.

In the enlightened, or present scientific age—the age of scrutinous investigation—the age in which the microscope has revealed to us the wonders of the miniature world, as did the telescope, in a former age, the Planetary world—the age which, when future historians record its events, may truthfully say, that during this period, every organic and inorganic substance within the reach of man were submitted to chemical analysis, and the elements composing them determined even in almost infinitesimal detail—this age was the first to devote any special attention to the mineral kingdom.

Among the various and manifestly distinct races of animals, naturalists observed that many analogous characteristics existed between individuals, which evidently were the offspring of separate and widely distinct progenitors. A very strong resemblance in external conformation—the structure of the hoof as well as the shape of it—the tail—head—hair or covering, &c., were observed in the Horse, Ass, Zebra, and Quagga. Because of this resemblance, naturalists at a very early day placed all these animals just mentioned into one group, and called it the *Horse* group, or genera, and every animal belonging to this group is said to be of the Horse kind or *genus*. The Lion, Tiger, Leopard, Cat, and other animals with long stiff hairs on the upper lip—the foot divided into toes, and that crouch and spring upon their prey, are said to be of the Cat kind, or genus. In this manner have naturalists arranged in groups all the known animals in the world. The groups like the Horse group or Cat group are named GENERA, and the individual varieties or kinds composing the group are named *species*. In cases where several genera have analogous characteristics, they form a grand group which is named *Order* or *Family;* then analogous Orders are arranged into CLASSES.

In the vegetable kingdom a similar arrangement into classes, orders, genera and species has obtained, founded, however, on qualities and characteristics differing in kind only from those of the animal kingdom. Botanists make two grand divisions of the entire vegetable kingdom:—the one is composed of all the flowering or Phænogamous plants, and the other of the flowerless or Cryptogamous ones. The flowers of the flowering plants serve as the basis of a system of classification into genera and species. No one who has observed can have failed to notice the great similarity that is presented by the flowers of the radish, cabbage, mustard, turnip, candy tuft, pepper grass, and horse radish; all these and many more are called the Turnip Family, or CRUCIFERÆ. Not only is there a great resemblance between the flowers of the pea, the bean, vetch and lupine, but the fruit of each of these is encased in a similar legume;—hence these plants are by botanists placed in the same group, and are called the Pea Family, or Leguminosæ. In a similar manner have all the known plants been classified by Linnaeus and other botanists.

The vegetable kingdom is further divided, or rather subdivided into Exogens and Endogens, or those plants which increase by annual layers between the bark and heart wood, as the oak, hickory, &c., and those which do not so increase, as the Indian corn, wheat, oats, &c. These two divisions are further subdivided into Monocotyledonous, or plants whose seed is an entirely solid mass, as a grain of wheat, rye, or corn; and Dicotyledonous, or plants whose seeds are composed of two portions, as the bean, acorn, chestnut, &c.

So, also, has the mineral kingdom been analyzed and classified; the distinguishing feature of the groups being a predominance of a certain mineral, metal or earth in the composition of any individual of the group. Alabaster, Plaster of Paris, Epsom Salts, Satin Spar, Marl, &c., belong to the Lime Family, because lime predominates in their composition; the Topaz, Ruby, Emerald and Alum are arranged under the head of Alumina, on account of the predominance of the last named mineral in the composition; and Quartz, Agate, Jasper, Amethyst, Sand and Onyx under that of Silica, because *Flint* is the basis of these gems.

It is now claimed by one set of theorists, that including the fossils of the animal and vegetable kingdoms, there may be traced a series of progressive forms of development, commencing with the simplest crystal on the one hand, and becoming thenceforward not only more complex but more highly organized as the series progresses, until man is produced, who at once is the most complex, most highly organized, and the crown of the series of organic creations.

It is by no means difficult to demonstrate where the mineral kingdom terminates, and the vegetable or animal kingdom commences, because the transition from inorganic to organic forms must necessarily be very abrupt; but naturalists assert that it is an exceedingly difficult task to draw the line of demarcation between the vegetable and animal kingdoms. Many species of the Radiata now classed as *Anthozoa*, especially the *campanularia* and *alcyonium*, and more recently the entire class of Porifera, have been regarded as belonging to the vegetable kingdom. If the series of progression are as regular and as perfect as theorists assert, then must all the intermediate links between any specified points in the series also be perfect; and upon this hypothesis of perfection in the series it is claimed that nature endeavors to prevent the propagation of mules or hybrids, in the animal kingdom, by regarding them as excrescences, and withholding from the reproductive organs the performance of their proper functions.

In the vegetable kingdom, although there is considerable conflict between the different systems of classification, so far as genera and species are concerned, yet, as a whole, it is claimed that there exists as perfect a chain of progressive development as in the animal;—from the simple cell of the Red Snow or Protococcus up to the most elegantly and highly organized Phænogamia. Hence it is confidently asserted, that although the vitality in plants is very distinct from, and lower in the scale of organization than that of the animal kingdom; and although in their most highly organized forms, plants are susceptible of being wrought upon and greatly changed by man's interference, such as inarching, budding, and grafting not only different varieties of the same species upon each other, but upon widely different species themselves, have these operations proved successful; yet notwithstanding the tenacity of life in the lowest orders of the animal kingdom, success has never crowned any experiments where different species have been attempted to be engrafted on each other.

Much has been accomplished as man has become more familiar with the laws of nature, but more especially with physiological laws, in the improvement and more perfect development of individuals, by special care and attention to the natural wants and habits of plants and animals, and by modifying conditions of temperature, climate and nutriment, in accordance with the laws governing the respective kingdoms. In the natural state the ox measures in girth from five to six feet, and weighs from ten to twelve hundred pounds; but, by attention and conformity to physiological laws he has been so improved (?) as to measure from nine to ten feet in girth and to weigh upwards of three thousand pounds. By a strict adherence and obedience of these laws, certain desirable characteristics have been obtained and perpetuated, insomuch so that these qualities obtained by cultivation have given rise to artificial varieties in the horse, ox, sheep and hog. The fleetest racer, as "*Flora Temple*" or "*Lady Suffolk*," as well as the heavy and uncouth Norman draft horse, may trace their parentage through many lapses of time perhaps, and countries, until it centers in one and the same progenitor: but they owe their distinctness and modification of form to climate, care and conformation, to natural and physiological laws. So the Shorthorns, Longhorns, Hereford's, Devon's, &c., are the offspring of one and the identical progenitor; but climate, locality, and attention, have modified and moulded them into remarkably distinct artificial varieties.

There is no difficulty in proving that the original Saxony sheep was a very coarse wooled and uncouthly formed animal, and now owes its present fineness of wool, entirely to man's agency; and to the same cause are due the various qualities of wool and artificial varieties of sheep. The China, Berkshire, Essex, Suffolk, Grass Breed and other varieties of the hog, owe their peculiarities to man's instrumentality, and are undoubtedly the modified offspring of one common pair of parents.

The improvements named above may with great propriety be termed "*developments*," for there is no doubt each individual in the animal kingdom above mentioned was innately susceptible of these improvements and all that was necessaay to make them manifest was to be surrounded by the proper condition and influences.

But man has in some instances endeavored to make an improvement in another direction. He observed that the product of the symmetric thorough bred horse upon the massive draft or Norman horse, was an animal less symmetric than the one, yet lighter than the other; slower than the one, yet fleeter than the other; in a word, the characteristics of both were blended and united in this offspring. This new animal then became the progenitor of a new sub-variety of horses. Finding that the cross thus produced realized the most sanguine anticipations, a cross was determined on between the horse and the ass, the result was the mule; but it could not propogate its species. In the many attempted improvements by crossing, the following law was discovered: That a cross between two individuals of the same zoologic circle is a MONGREL, partaking of the form and characteristics of both progenitors, and is capable of reproduction, as in the case of the cross of the turf and draft horse just stated; but the product of two animals of different species or zoologic circles is a MULE, partaking in a greater or less degree of the paternal or maternal type, but entirely deprived of reproductive powers.

In the vegetable kingdom the results are precisely analagous to those in the animal. The individual plants which participated in the crossing may be distinctly traced in the hybrid. The varieties obtained by crossing affiliated plants or flowers produce fruits which have fecundating powers, familiar instances of which may be found in corn, portulaccas, convolvulus or Morning glory; whilst the hybrids produced by the artificial impregnation of flowers produce no fruit, or at most if fruit is produced the seeds are sterile. Flowers appear to possess a much stronger attraction for the pollen of their own varieties than for that of different species; hence, in order to be successful in hybridizing it is not only very essential that a large quantity of the pollen be employed, but it is also necessary that the flowers be closely allied; crosses between individuals or different genera, or different species although of the same germs, produce no result. It is also useless to attempt to produce crosses with those plants whose seeds never mature in this climate.

It may not, in this place be irrelevant to say a few words in detail of the hybridization of plants. The earliest record we can find of hybrids is in the writings of Camerarius in 1694. Linnæus wrote his "*Dissertation de plantis* hybridis in 1751, and eight years later Kolreuter commenced and succeeded in producing hybrids by artificial fecundation; from this last named period to the present time numberless species and genera of plants have been submitted to the process of hybridization, which in itself is exceedingly simple.

This process consists in bringing the pollen which is contained in the anthers of the one flower into contact with the stigma of the pistil of the flower intended to be impregnated. There are certain conditions, however, which must be strictly observed, otherwise there can be no succesful impregnation: the flowers with which it is proposed to operate, must have obtained the same degree of advancement, because impregnation cannot be effected on others than those flowers which expand or bloom at about the same time. All who are familiar with the anatomy of flowers know that the stamens are the male organs, and the pistils the female organs of reproduction. The pollen grains are a very fine dust contained in a very delicate envelop in the anther of a stamen—the color of the pollen varies with the species but as a general thing is of a pale yellow color—those of the convolvulus are pearly white, while those of the cucurbitaceæ are a deep yellow. Each pollen grain contains within an exceedingly delicate, transparent membrane, a mucilaginous materia, which is oderous, and is the fecundating substance of the male organ. The pistil ordinarily has a small spongelet surrounding the center of the style, called the stigma which is lubricated by a serous liquid, which has in an eminent degree the power of absorption. If upon the extremity of this stigma, a small drop of colored liquid—for example in the convolvulus the pistil is white, use a liquid colored with carmine—the absorbing powers manifest themselves very strikingly, for the style will be colored down to its base. Now the passage which thus becomes colored, is the duct which the pollen enters and traverses in the phenomenon of fecundation.

When it is desired to obtain a hybrid from hermaphrodite flowers, the first thing to be done is to remove the anthers; this is best performed early in the morning, because the dew has swollen the anthers and prevents the opening of the little sac, which contains the pollen; the simplest method of removing the anthers is to use a pair of very small scissors or forceps. Then at, or towards noon, carefully remove the anthers from the flower with whose pollen we wish to impregnate, and shake them gently so that the pollen dust may fall upon and adhere to the stigma of the flower from which the anthers had been removed in the morning. The heat of the day produces a dilatation of the pollen and thus facilitates its dispersion.

Hybridization is an operation requiring dexterity, a light and steady hand, and it has been frequently remarked that the operation is more uniformly successful when performed by a female. Many singular facts with regard to the structure of flowers have been discovered through attempts to hybridize. In the common nettle the stamens have elastic filiments which are at first bent down so as to be obscured by the calyx; but when the pollen is ripe, the filaments jerk out, and thus scatter the powder on the pistils which occupy separate flowers. In the common

Barberry the lower part of filament is very irritable; and whenever it is touched the stamen moves forward to the pistil. In the style wort the stamens and pistils are united in a common column which projects from the flower; this column is very irritable at the angle where it leaves the flower, and when touched it passes with a sudden jerk from one side to the other and thus scatters the pollen.

It frequently happens in gardens that there are accidental crosses, which may be attributed to divers causes, but as a general thing owe their origin to the agency of insects, bees, bugs, &c. These accidental crosses happen most frequently in the cabbage tribe. Double flowers like the chrysanthemums are always sterile and the hybrids as a matter of course cannot reproduce, but Mons. Gallesia has produced double flowers by crossing semi-double, with semi-double ones, and has succeeded in obtaining fertile seed from semi-double and even double Ranunculus! Hybrids have been produced by horticulturists between the *ox-heart* and the Morello cherry, also between the Damson plum and the wild Bullace tree. Annexed is a list of plants which have been found to produce hybrids in their wild or uncultivated state, and without the agency of man:

MALE PARENT.	FEMALE PARENT.	HYBRID.
1. Festuca Elongata, (spiked fescue,)	Lolium Perenne, (Rye grass or Darnel)	Festuca Loliacæ,*
2. Scirpus Lacustris, (Lake Bull-rush, round stem)	Scirpus Triqueter, (Triangular Rush)	Scirpus Duvallii,
3. Nigritella angustifolia, (orchid)	Gymnadenia odoratissima,	Nigritella suaveolens,
4. Ophrys muscifera,	Ophrys aranifera,	Ophrys hybrida,
5. Salix fragilis, (willow with smooth ovaries)	Salix alba,—(White willow with glaborous ovaries,)	Salix Russelliana,
6. Salix fragilis,	Salix triandra,	Salix speciosa,
7. Salix purpureo,	Salix viminalis, (Basket willow)	Salix rubra,
8. Salix purpureo,	Salix cinerea,	Salix Pontederana,
9. Salix purpureo,	Salix repens,	Salix Doniana
10. Salix viminalis,	Salix caprea,	Many hybrids,
11. Populus alba, (silver leaf poplar)	Populus tremula, (Aspen)	Populus canescens,
12. Rumex palustris, (Dock)	Rumex obtusifolia, (Broad leaved)	Rumex Steinii,
13. Inula Germanica, (Elecampane)	Inula ensifolia,	Inula hybrida,
14. Carduus nutans, (Thistle)	Carduus acanthoides,	
15. Cirsium arvensi, (Canada Thistle)	Cirsium palustre,	Cirsium chailleti,

* The seeds of this plant are invariably imperfect—this fact led botanists to suspect that it was a hybrid.

MALE PARENT.	FEMALE PARENT.	HYBRID.
16. Cirsium cano,	Cirsium oleraceum,	Cirsium tataricum,
17. Hieracium præalto, (Hawk weed)	Hieracium pilosella,	Hieracium bifurcum,
18. Hieracium villoso,	Hieracium murorum,	Hieracium villoso-murorum,
19. Hieracium alpinum,	Hieracium murorum,	Hieracium alpino murorum,
20. Galium verum, (Madderwort)	Galium mollugo,	Galium ochroleucum,
21. Mentha sylvatica, (Mint)	Mentha aquatica,	Mentha nepetoides,
22. Verbascum Thapsus, (Mullein)	Verbascum phlomoides,	
23. Verbascum nigra,	Verbascum austriacum,	
24. Verbascum specioso,	Verbascum orientale,	
25. Verbascum specioso,	Verbascum phœniceum,	
26. Veronica anagallis, (Brooklime)	Veronica Beccabunga,	
27. Primula integrifolia, (Primrose)	Primula minima,	Primula Florkenna,
28. Erysimum hieracifolium, (Phlox wall-flower)	Erysimum canescens,	Erysimum virgatum,
29. Nasturtium amphibium,	Nasturtium sylvestre,	Nasturtium austriacum,
30. Rosa canina,	Rosa rubiginosa,	Rosa sepium,
31. Geum urbana, (Avens)	Geum rivale,	Geum intermedium,
32. Medicago Sativum,	Medicago falcata,	Medicago media.

Professor Gærtner, of Stuttgardt, and A. Neilreich, of Vienna, have devoted much time to the study of this subject, state that the cereals are among the plants least favorable to hybridization. Professor John Lindley, professor of Botany in the University College, London, does not regard the process by any means as impracticable, but merely difficult in manipulation—in removing the unexpanded anthers and then applying the pollen of another. Mr. Maund of Bromsgrove, Warwickshire, (England,) obtained a prize medal at the industrial exhibition in London, in 1851, for hybrid specimens produced from the annexed varieties of wheat:

MALE.	FEMALE.	HYBRID.
1. Old Lammas,	Donna Maria,	An ear larger than either parents,
2. Pearl White,	Oxford Red,	do do do
3. Clustered Red,	Satin White,	Coarse, rough, short ear,
4. Old Lammas,	Kings' White,	Very large, long ear,
5. Boston Red,	Donna Maria,	Large ear, very strong straw,
6. White Cone, (hairy,)	Northumberland Red (smooth,)	Long beardless ear, rather downy
7. Dark Cone,	Pearl,	Small deformed white ear.

Mr. Maund found as a general rule in hybridizing wheat, that a strong male and weak female produced a better result than a weak male and a strong female.

In 1848 Mr. Raynbird, of Laverstake, obtained a gold medal from the Highland (Scotland) Society, for experiments of this kind. Mr. R. commenced his experiments in 1846, with the "*Hopetoun*," a white wheat, of long ear and straw, and fine grain, and "*Pipers Thickset*," a coarse red wheat, with thick clustered ears, a stiff straw and very prolific, but liable to mildew. The hybrids thus obtained, were intermediate between the two parents, the ears are shorter than in the "*Hopetoun*," and larger than in the "*Thickset*."

The wheat plant is at least co-extensive with civilization, and its fruit beyond a doubt, was used as food by the human race for ages anterior to any historical records. So far back into the dark vistas of time, as authentic history consents to be our guide, do we find that wheat has been cultivated, and aside from animal food, formed the chief alimentary article of all civilized nations; but as the wheat plant has no where been found wild, or in a state of nature, the inference has been drawn by men of unquestionable scientific attainment, that the original plant from which wheat has been derived, was either totally annihilated, or else cultivation has wrought so great a change that the original is by no means obvious, or manifest to botanists.

There are many circumstances, both in history and in science, more especially in botany, which would indicate that we are indebted to Persia for the wheat plant; it is yet found springing up in spots not only at very great distances from human habitations, but out of the usual routes of traffic employed by the natives. It is a well known fact that wheat does not reproduce spontaneously in any place where the grain is cultivated. According to a rule adopted both by Robt. Brown, and Baron Humboldt, to determine the native country of a cultivated species, when that country is unknown, it is within proper bounds to regard that as the probable place of nativity where the greatest number of known species, belonging to the same genus are found indigenous. This rule would indicate Persia, as well as some portions of India, as the place of nativity, "Isis and Osiris discovered wheat, barley, and the vine, wild in the valley of the Jordan, and transported them into Egypt, and taught the culture of them. It was at Nysa, also, that Isis discovered wheat and barley previously, growing wild in the country among the other plants unknown to man." * Strabo, whose writings are, perhaps, the most precise of any of antiquity asserts that wheat was found growing spontaneously in the Persian province of Mazenderan,† and in the country of the Musicans, to the north of India,

* Diod. Sic. *l* 1 *c* 14 and 27.

† Michaux found *Triticum Spelta* growing wild on a mountain four days travel distant from Hamadan, in Persia.

as well as on the banks of the Indus. Some writers, whose opinions are entitled to the greatest respect, assert very confidently, that to India, and not to Persia, are we indebted for the wheat plant; modern botanists, however, know so little comparatively, of the region of India indicated, as to be unable either to corroborate or successfully controvert the statement. There is no doubt that the genus *Triticum* is sufficiently spread over the whole of Asia, as to render Strabo's statement highly probable, according to the rule adopted by Humboldt in such cases, which has just been cited.

In a paper addressed by Sir Joseph Banks to the Horticultural Society, in the year 1805, he speaks of having received some packets of seeds from a lady, among them was one labeled "Hill Wheat," the grains of which were hardly larger than those of our wild grasses, but which, when viewed through a magnifying glass or lens, were found exactly to resemble wheat, he sowed these grains in his garden and was much surprised on obtaining as their produce, a good crop of spring wheat, the grains of which were of the ordinary size. Every inquiry that was made to ascertain the history of these seeds proved fruitless; all that could be established with regard to the place of their production, was that they came from India, but as to the particular locality, or the amount of cultivation they had received, or whether the grain was indeed in that instance a spontaneous offering of nature could not be ascertained.

The explorations of modern travelers, are conducted much more systematically, as well as scientifically, than those of by-gone centuries, have in consequence, brought to light many important facts, which, for ages, were among the things unrecorded by previous generations, and unknown to the present, relative to the state of perfection to which many of the sciences and arts had been brought by the Egyptians and other Eastern nations. In the Sarcophagi of many of the Egyptian kings or nobles were found in vessels perfectly closed, good specimens of common wheat, so perfect indeed that not only the form, but even the color was not impaired, although it must have been enclosed many thousands of years. It is well known to every one conversant with the history of Egypt, that the culture of wheat has long since been abandoned, and no wild plant in any respect resembling the wheat plant is there to be found, but from the illustrations on ancient tombs at Thebes of the details of plowing, sowing, harvesting and garnering this grain, there is no good reason to suppose it has not been cultivated in Egypt from the earliest dawn of this nation's civilization. After wheat was grown in Egypt, it would readily find its way into Persia, and vice versa, and might there have been cultivated for centuries and then abandoned, whilst in some secluded spots it has continued to reproduce itself unaided by human intervention, and thus we find it growing there spontaneously at the present day. But this circumstance alone does not prove that wheat is indigenous either in Persia or Egypt.

It has been claimed that wheat is indigenous on the island of Sicily, and that from here it spread along the northern shores of the Mediterranean into Asia Minor and Egypt, and as communities advanced it was cultivated not only to a greater extent, but with greater success.

The goddess of agriculture, more especially of *grains*, who by the Greeks was called *Demeter*, and by the Romans *Ceres*, was said to have her native place at Enna, which was situated in a fertile region of Sicily, thus indicating the source from which the Greeks and Romans derived their Ceralia. Homer mentions wheat and spelt as bread—also corn and barley, and describes his heroes as using them for fodder for their horses, as the people in the south of Europe do at present. Rye was introduced into Greece from Thrace, or by way of Thrace, in the time of Galen.

In Cæsar's time the Romans grew a species of wheat which was enveloped in a husk, similar to our barley, and which was by them called "*Far*," and appears to have been best adapted to moist and lowlands, whilst the true wheat was grown on the dry or uplands.

During the process of excavation in Herculaneum and Pompeii, were found in numerous places charred grains of genuine wheat.

Hon. Anson Dart, superintendent of Indian affairs in Oregon, states that he found wheat and flax growing spontaneously in the Yackemas country in Upper Oregon, about eighty miles north of the Columbia river; he found it in patches varying in size from a few rods to an acre or more. The straw and head he found to be generally very large, and the berry unusually so: the berry is very plump, and weighs from 65 to 70 pounds per bushel. There is no doubt that both the wheat and flax was introduced at a very early period into Oregon by the Hudson's Bay, or other Fur Companies.

Dr. Boyle, of Columbus, O., informed the writer, that when in California he found wheat growing spontaneously in the Carson valley. He is confident that the wheat he found there growing had no attention from the hand of man, because the grain was not so well developed as the cultivated grain—because for miles it was scattered in "patches" too thin to have been the work of any one attempting the cultivation of the plant. (See Note 1 at the end of this Essay.)

When the Spaniards visited Mexico, in the sixteenth century, the cereal grasses proper were in cultivation among the Mexicans. In 1530 one of Cortez's slaves found several wheat grains, which had accidentally been mixed with some rice. The careful negro planted these few seeds and their produce for several successive years, and from this small commencement have sprung all the subsequent wheat crops of Mexico, and most undoubtedly to this source may be traced that growing spontaneously in Carson valley.

Turn to whatever quarter of the globe we may, we find wherever the foot of civilization has trod, that the wheat plant has as a monument perpetuated the memory of the event; but nowhere do we find the plant growing "*wild.*"

One class of theorists assert that the character of any plant cannot be permanently changed by the agency of man, and they further assert that in cases wherein changes have been produced, except the exciting cause of the change be unremitted in its application, that the plant would degenerate and revert to the original type. This class of theorists advocate the permanency of species in nature. Hence it is by no means surprising that they should insist that wheat is a permanent species, and point for corroboration of their position to the fact that wherever it has been found growing spontaneously that it preserves all the characteristics of the cultivated varieties.

The opposing class of theorists assert that it is a well established fact that from a veritable pigmy—a small plant with scanty leaves, weighing altogether scarcely half an ounce, has been produced the monstrous cabbage; a diminutive little root growing wild in Chili has been metamorphosed into the inestimable potato; the sweet juicy Altringham carrot, weighing from five to six pounds, is, in a wild condition, a dry slender root, unfit to eat; the delicate well flavored Vienna Glass Cauli Rapi, as large as a man's fist, is, when wild, a slender woody dry stem; the cauliflower in its natural locality is a thin branched flowering stem, with little green bitter flower buds; that the luscious peach has been derived from the hard shelled almond can no longer be successfully denied; and that the small black sloe has been transformed into the juicy and golden yellow Gage is equally indisputable. The most delicious Spitzenbergs and Pippins owe their origin to the diminutive, acrid crab-apple.

Professor Henslow's experiments rather confirm the doctrine held by the advocates of the "*progressive development*" theory, or rather those who hold that species are not immutable, but are susceptible of being changed and more fully developed by man's agency, climate, soil, and position. In a paper which he read before the British Association, he proved that the

Centaurea nigra, and C. nigrescens could be so cultivated as to pass completely into one another. He cited instances also proving that the species of Rosa, Primula and Anagallis passed completely one into the other; so that instead of three *species*, there should be three *varieties* of ONE species. It is now a demonstrable fact that the garden daisy is none other than the wild or woodland daisy cultivated; although botanists yet retain the specific terms of *Bellis perennis* and *B. sylvestris*, as though there really were (as was formerly supposed) two species. Future botanists will in all probability demonstrate that raspberries, blackberries and dewberries are after all not three distinct species, but merely three varieties of one and the same species.

If, then, such astonishing results, as the changes just enumerated certainly are, have been effected through the agency of man, climate, and locality, is there any good reason for supposing that wheat, through cultivation and consequent influences, may not have become so transformed, and yet so permanent and characteristic in its transformation as to render it exceedingly difficult, even to the skillful and accomplished botanist, to distinguish it on the same soil as the legitimate offspring of those plants which formerly grew there spontaneously?

It is not claimed by either party of the theorists alluded to in the foregoing paragraph, that an onion, by any means now known, can be changed into an apple tree; or that cherries can be grown on current bushes; but whilst the one party denies that soil, climate, position or culture, or all these combined, can produce anything more than temporary alterations in form, the opposing party unhesitatingly declare that soil, climate, position and culture are capable of producing permanent changes, and that the plants so changed have the power of transmitting the acquired characteristics.

In Sicily, there is a wild grass known to botanists by the name of *Ægilops ovata*. It has been asserted that the seeds of this plant may be changed into wheat by cultivation; and that the ancient worship of Ceres, which considered the fields of Enna and of Trinacoria as the cradles of agriculture, had its origin in this transformation of the native grass.

The Ægilops are *hard* rough looking grasses, and there are several species of them.

The rough spiked Ægilops is a native of the Levant, and is the only perennial one.

The Cretan Ægilops is a native of Candia.

The cylindrical Ægilops is a native of Hungary, while the oval spiked and long spiked are natives of Southern Europe—mostly, however, from the northern shores of the Mediterranean—the oval spiked abounds in

Italy. The seeds of the oval spiked or Æ. ovata very strongly resemble the seeds or grains of wheat, but are much smaller. In the Levant the Ægilops is gathered in bunches and burnt, and the roasted seeds are used as an article of food.

It had frequently been asserted that wheat and Ægilops were identical *species*, but no botanist of any respectability, for a moment entertained the belief, from the fact that the latter is a miserable grass growing to the height of nine or ten inches only, and in its general appearance, leaves so little resemblance to the former, that botanists have unhesitatingly classified them as belonging not only to different species, but to different genera! Pal de Beauvois, in 1812, in his valuable work on the genera of grasses, said that he could discover no difference between Tritican (wheat) and the Ægilops.

Mons. Esprit Fabre, of the town of Agae, (France,) made a very important discovery, alone, unaided by books, and entirely without any knowledge of researches or investigations in this direction, other than his own. He brought to the notice of scientific men a fact which goes far to establish not only the mutability of vegetable forms, but the more important fact that *wheat* is derived from the Ægilops mentioned in a preceding paragraph. There is no fact in Natural History more pregnant in its consequences to the civilized world than this one. The following details of his experiment are condensed from the Journal of the Royal Agricultural Society:

"In 1838 he found the grasses *Ægilops ovata* and the *Æ. irianstata* growing wild in his immediate neighborhood, and sowed the seed of the *ovata* in the fall of the same year. In 1839 the plants attained a height of two to two and a half feet; they, the plants, ripened from the 15th to the 20th of July. There were very few fertile spikelets—each having one or two grains only, which ripened late, the remaining spikelets were sterile by abortion. The entire crop did not produce to exceed in a five fold proportion; the grains were close, concave and very hairy at the top. The straw was very thin and brittle; the ears deciduous; they broke and fell as soon as ripe. Each valve of the glume had two arms only, one shorter than the other. In one plant one of the arms became abortive, and there only remained one to each valve of the glume. On others there were some glumes with a long, and others with a short beard. These plants had exactly the appearance of Touzelle wheat. In some the angles of the rachis were strongly ciliated. Sowed seeds obtained from these plants, and

In 1840, at harvest, the spikelets were more numerous, and contained two grains. The valves of the glumes terminated in two awns, of which one was four or five times shorter than the other—sometimes reduced to a mere tooth only. Fruit—the grains—less compact, less concave and less hairy at the end; angles of rachis were less ciliated, and the ears were somewhat less deciduous. The grains contained more flour than those of the preceding year. Sowed the seeds of these plants, which

In 1841 produced ears like those of Triticum (true wheat.) A very remarkable and important change occurred in this crop. There were no barren spikelets, and all them were like wheat in every respect, each one bearing two or three perfectly developed seeds. The contour of the entire plant more strongly resembled that of wheat. The seeds were less concave and hairy than the preceding year. The valves of the glumes had each two arms, one of which was very long, whilst the other was so completely abortive as almost to justify the statement that the arms were single. These seeds were planted and

In 1842 the plants were attacked by rust. Less progress was made than in the preceding year; the stalks retained much of the bitterness peculiar to the Ægilops, the ears were remarkable for the small development of awn and had exactly the appearance of the beardless Touzelle wheat. Twenty of the ears were entirely sterile. The plants which were not affected by the rust had deciduous ears the arms of which were less abortive. Many of the spikelets had three flowers, and yielded two or three good grains, which were slightly heavy at the apex. These seeds were sown, and

In 1843 the plants attained the height of three feet; the straw assumed a more firm and less brittle texture. One of the two arms was so short and rudimentary that these valves may, with propriety, be considered as having one awn only. Each spikelet had two and sometimes three fertile flowers. The grains were so well developed that they were exposed through the valves of the florets; the ears were less fragile and exactly like wheat in appearance. One of these plants yielded 380 grains for the one sown, and another yielded 450 for one; these grains protruded through their covering. The crop had

In 1844 all the spikelets fertile and a quantity of them contained three grains. These grains were visible through their envelopes, and were concave on one side; the spikes or ears were deciduous. The valves of the glume had one long awn with an exceeding short rudiment of another.

In 1845 the crop was adjudged by all to be true wheat; the valves of the glumes had one awn only with a mere tooth of another. The glumes had 4 or 5 flowers each, three of which were fertile. It was now regarded by Mons. Fabre as being true wheat, or rather that the Ægilops had been brought to its highest state of perfection; therefore,

In 1846 the crop grew in an open field. The field selected was one near the road leading to Marseillan; the soil of which was called *souberbe.* The field was inclosed on all sides by vineyards. Care was taken to prevent any pollen from Ægilops from falling on it. During the four succeeding years the yield was 6 to 8 times the seed sown.

The character of these plants in 1850 were briefly as follows: stems straight, having attained a hight of about 30 inches and *full of pith.* The valves of the glumes terminated in a single awn, the rudiment of the other scarcely visible, slightly striated and almost hairless. The two valves of the florets were membranous as in Ægilops, but the exterior one had a single awn only, whilst the other had none. The ears had from 8 to 12 spikelets, having 2 or 3 fertile flowers, and each producing 2 or 3 grains; these grains were very floury and very little concave. The yield of 1850 was less than that of the three preceding years; this diminished product was undoubtedly owing to the drought which prevailed that year in France.

After having cultivated it for twelve successive years, Mr. Fabre says that it has become perfect wheat, and that not a single plant has ever reverted to its former character as Ægilops. The entire series of this experiment were conducted by Mr. Fabre (who is a "simple gardener") in person; they were therefore conducted by one who was not only skilful but eminently a practical man; one who had a practical knowledge of the culture of plants, and not by a theorist or amateur deeply interested in obtaining a special result, and whose desire of success would induce him to hybridize with genuine wheat annually until the Ægilops element would be entirely absorbed. Mr. Fabre had the precaution to conduct all these experiments in an enclosure surrounded by high walls, where was no grain grown anywhere near the enclosure, and Mr. F.'s industry would permit no grass to grow on the inside of the enclosure. It would be gratuitous to suppose that the pollen of wheat in the vicinity could exert any influence on these plants,* because the wild Ægilops growing all about

* In Abels "*Aus der Natur,*" vol. 8, page 271, speaking of Fabre's experiment the writer remarks, "what is more probable than that these plants were fertilized by the pollen from true wheat plants in the immediate vicinity, especially when it is a well known fact that when the wheat is in bloom, that entire clouds of pollen grains may be seen rising from the wheat fields on a clear day!" Those who have undertaken to hybridize wheat will at once know how much reliance may be placed on this statement, especially after Gærtner has testified that the cereals are the least favorable of all plants to hybridization.—[*Klippart.*]

the edges of the fields, has never had its character changed in consequence of the proximity.

In proof that Mr. Fabre's experiments were real and beyond all cavil of being an imposition, Mons. Dunal, professor of Science at Montpelier, one of the most competent men to decide such a question, has preserved dried specimens of Fabre's Ægilops, at very stage of its transformation to wheat, and offers them as substantial evidences of the fact.

In whatever light, and from whatever stand-point we may view this series of experiments, the result certainly is pregnant with the most important consequences. If wheat is to be regarded only as Ægilops, fully and perfectly developed by cultivation, then is *one* position assumed by a party of disputants or rather theorists fully affirmed, namely: that plants by and through climate, soil, position and cultivation, may permanently change their characteristics. It may however be claimed that no observations have been made of the degeneracy of the wheat plant, and for aught that is known to the contrary that it in many instances *may have* reverted to its original type and character of Ægilops; but on the other hand we have generally received and accredited records which contain sufficient accounts of the wheat plant to justify the assertion that it has been cultivated upwards of five thousand consecutive years, and in all this time there is no instance on record of its degeneracy, other than its increased liability to disease. An uninterrupted transmission of qualities or characteristics for the consecutive number of years just mentioned must be regarded as *approximating* permanency—at least for all practical purposes. But if on the other hand, wheat must be regarded as of an allied genera of the Ægilops, it proves that Botanists were not sufficiently familiar with the character of the plants when the classification was made.

Mons. Godron, a French Botanist, and Mr. Buchinger, a German Botanist, have both been surprised by, and mortified at the result of the "simple minded" gardener's experiments. It appears that in a wild state the *Ægilops ovata* gives rise to a variety known by Botanists as *Æ. triticoides*, which the *Æ. ovata* in one of its transformations towards wheat very much resembles. Upon this *resemblance* Mons. Godron undertakes to impeach the integrity of Mr. Fabre in a lengthy paper which he has published and in which he maintains that Æ. triticoides is *not* a condition or variety of *Æ. ovata*, but that it is a hybrid between the ordinary wheat and the latter plant! Buchinger (vide FLORA, vol. 13, page 31,) endorses Godron, and directly charges Fabre with hybridizing with wheat pollen. In their anxiety to disprove the truth of the experiment, all these old school Botanists forget that they are acknowledging that wheat and Ægilops will hybridize, and the hybrid propagate its kind in direct conflict with the generally received opinion on this subject, thus admitting that *Æ. ovata* is more closely related to *Triticum sativum* than *T. caninum* or *T. cristatum* are, because neither of these latter two will hybridize with *T. sativum.* They forget also that they are paying Mr. F. the highest compliment possible in acknowledging that by his skill he could produce a hybrid between two widely distinct genera of plants, and that this hybrid would perpetuate itself. It may be making an assertion which may perhaps not ultimately be borne out by the facts, but there are many indications in the recent developments of physiological science, that there can be no fertile hybrids except those produced by varieties of the same species of plants upon each other. If then this position is found to be a teneble one it follows that in future either the genera TRITICUM, or that of Ægilops must be stricken from systematic Botany.

It may be well to recapitulate in detail the changes produced in the plant itself by Mr. Fabre's culture. In its natural state the *Æ. ovata* is glaucous in all its parts; its flowering stems never exceed nine to ten inches in height; the upper leaves never reach the first tooth of the rachis of the ear; the last is short and oval, has four spikelets only, and of these the two lower ones alone are fertile. A *variety* of the *Æ. ovata* is called *Æ. triticoides*, in which one or two of the awns of the *ovata* disappear, so that the valves of the glume of the greater part of the spikelets have only two long awns instead of four in the lower spikelets. The outer membranous valve of the floret, instead of terminating in three awns, has only one, at the base of which may be seen the two rudiments of those which are wanting. The other membranous valve is without a beard, and is ciliated at its apex. The ears are formed like those of the ovata of three or from spikelets, generally sterile, rarely fertile. The florets are hermaphrodite, and enclose three stamens around a pistil ending in two long silky stigmas. These florets are often sterile in consequence of the abortion of the pistil. The grains of the fertile ones are elongated, angular, very concave and sometimes flattened on one side; color yellow, approaching blackness like that of the *ovata*, but is longer and is silky at the top. When these grains were sown and cultivated for the first time they yielded plants three or four times as high; ears were cylindrical and much more elongated than those of the parent plant—the valves of the glumes had only two awns, one was shorter than the other, occasionally one was almost entirely absent, so that each glume had but one awn. The awns of some plants were very long, while others were very short; the plants assumed the appearance and characters of Triticum more and more. The spikelets more numerous than in the parent plant, were often sterile, and the few which were not had one or two fertile flowers only, so that the fertile spikelets had no more than one or two grains. These grains, the next year, produced more perfect plants—their spikelets were more numerous than before, and almost all of them contained two fertile flowers and yielded two grains. The awns were always two in number, but the abortion of one was in every case carried further than previously, and often was complete. The grains were less compact, less concave, less hairy at their extremity. The ears when ripe separated less easily from the axis and the grains were each successive year more flowery. The third year produced plants more perfect than the second—scarcely any sterile spikelets, each of which yielded two and sometimes three grains, more developed, less concave and less hairy. The fourth year produced no notable change. The fifth year produced plants a yard in length; grains sufficiently developed to separate the valves of the floret and to be wholly exposed when ripe—mature ears less deciduous. The following year all the spikelets were fertile, although the ears separated with ease. The next year the ears did not break off easily; all the spikelets were fertile and occasionally enclosed three well developed grains, a true Triticum was produced, for cultivation in the open field for four successive years did not cause any change in form, and the product was similar to that of other wheat.

The changes in the form and character of the plant are by no means accidental, but are in accordance with a law which although but little known, is daily being more and more observed and acknowledged. The celebrated Dr. Arnott affirms that in all the numerous instances of abnormal structures that had come under his observation, on at least thirty different genera of grasses, the universal tendency of the spikelet was to elongate its axis, and increase its number of flowers;* but he never in one solitary instance observed them to become fewer flowered than in the normal state.

Assuming that Fabre's experiment was successful, the legitimate inference will be that some at least, if not all of the cultivated Tritici are peculiar forms of Ægilops and should be regarded as races of this species. This will reconcile the traditions, the vague and disconnected accounts of the origin of wheat, which in ancient as well as in modern times, was

* It is well known that the Dahlia, Rose, Chrysanthemum and other flowers, all have a tendency to increase not only the number of their flowers, but also the petals in each flower by cultivation.—[*Klippart.*]

claimed to be found wild in Babylonia, Persia, and Sicily. In all these countries the Ægilops is a very common plant, and some of its species may have accidentally acquired a wheat like appearance.

The following appears somewhat to corroborate the statement that wheat is derived from the Agilops: (See page 577, ninth line from top.)

SOLID STEM WHEAT.

We had an opportunity a few days since, of seeing a lot of wheat upon the farm of Dr. Wilson Waters, of Rhoderiver, from which, we presume, upwards of a bushel will be reaped—that if we mistake not, will be a valuable acquisition: it is the third produce of a few grains of seed brought home by our fellow citizen Lieut. Mayo, of the United States Navy, and obtained by him upon the Plains of Troy, in Asia Minor, which he spent some time in visiting a few years ago, when the ship on board of which he then served, was in the Archipelago. The grains of this wheat are somewhat larger than those of wheat common to this country, though perhaps not quite as large as the wheat from the mountains of Chili. The stalk is peculiar for being nearly solid, instead of hollow, and more tapering than other wheat; the first joints being large, and forming a more substantial base. The head has a thick stiff beard, not less than six inches in length. It averages about forty grains to each head. Forty grains of the former weighed thirty-one grains—the same number of the latter weighed but nineteen grains. This being the third year that this wheat has vegetated in our climate and upon our soil, although but in specimen, we may fairly assure that it has been tested and found to answer well.

It is said to be valuable, more especially from the protection which the solidity of its stalk affords from the depredations of the fly, so destructive to other descriptions of wheat. It will also be much less liable to fall, we presume, for the same reason.—*From the American Farmer, vol.* 13, *July* 22*d*, 1831.

STRUCTURE AND COMPOSITION OF THE WHEAT GRAIN.

Scarcely any plant has been so frequently made the subject of analysis as the wheat plant, and no cereal has been analyzed by so many chemists as has the wheat grain. The grain consists, for all practical purposes, of two parts—the husk and the flour. The husk, in grinding, is separated from the body of the grain, and is called "*bran*," meaning that which is torn off or rent from the main body. The body of the grain after the husk has been removed, consists of a white, opaque, inodorous and tasteless mass, and may be regarded as a mass of starch.

If a grain of wheat is cut across through the middle the "*husk*," "*bran*" or *outer skin* will appear as a narrow brownish line enclosing the entire mass—this skin bending inwards forms the furrow which runs lengthwise on the grain. The hairy or tufted end of the grain is the upper or end opposite to that in which the embryo is enveloped. After having cut the grain across, if now a very thin slice cut in the same direction be placed under the microscope, the thin brownish skin will be found to consist of three layers or rinds, like peels of an onion; the first of which is the outer skin (Fig. 1,) *a a*, consists of two layers of thick walled, porous cells, whose shortest diameter is thus exposed to view, the walls of which contain slight hollows or little canals. The middle layer *b* consists of cells similar to those of the first layer, but with this difference, namely: the cell walls are not so thick and the pores are much more distinct than in the first; this layer has its longest axis at right angles to that of the first. The third layer is an exceedingly delicate and soft layer *c*, difficul to be properly defined with our ordinary microscopes, or described because of its indistinct definition. Immediately beneath this last described layer are the gluten cells, (Fig. 1,) *d*. The gluten in the cells appears to be a faint yellowish substance, very small grained, oily to the touch and smell. The cells in which it is formed are rather larger than any of the cells of the three layers just described the walls of which are perhaps more delicate than of any others in the entire grain.

The entire portions just mentioned, and figured at *a. a.*, *b*, *c* and *d*, are the portions which before the recent inventions in milling machinery were considered as "*bran.*"

Directly under the gluten cells *d*, lies the albuminous portion of the seed. This consists of hexagonal prismatic cells, which are filled with ovoid granules of starch "*e.*" These starch granules *f*, Fig. 1, are enveloped in several layers of cellulose or cell membrane, which when heated to excess in water, bursts and exude the starch contained in them.

If 100 pounds of wheat are burned, from one and a half to two pounds of ashes are obtained, from which the chemist obtains:

Potash	29 97	per cent.
Soda	3 90	"
Magnesia	12 30	"
Lime	3 40	"
Phosphoric acid	46 00	"
Sulphuric acid	0.33	"

Silica	3.35	per cent.
Peroxide of iron	0.79	"
Chloride of sodium	0.09	"
	100	

From this it will be seen that the ash of wheat is rich in phosphoric acid, magnesia and potash.

From the wheat grain, without burning, we obtain by chemical analysis:

	Wheat.	Flour.	Bran.
Water	14.83		
Gluten	19.64 }	13.04	20.0
Albumen	0.95 }		
Starch	45.99	73 20	
Gum	1.52	4.20	28 8
Sugar	1.50	5.6	
Oil	0.87	2.1	5.5
Vegetable fibre	12.34		45.7

These substances may be yet farther resolved until we arrive at an approximation of the organic elements which enter into their composition namely:

	Gluten.	Albumen.	Starch.	Gum.	Sugar.	Vegetable Fibre.
Carbon	53.27	53.74	42.80	42.68	36.1	53.23
Hydrogen	7.17	7.11	6.35	6.38	7.0	7.01
Nitrogen	15.94	15.66				
Oxygen }			50.85	50.94	56.9	16.41
Sulphur }	23.62	23.50				23.35
Phosphoros }						

The oil for the greater part consists of carbon. The gluten, and consequently starch, is found to vary considerable in different varieties of wheat, as well as in wheat grown in different latitudes.

The analyses by Peligot are referred to by Morton, in the Encyclopedia of Agriculture:

	White Flemish.	Hardy White.	Odessa.	Polish.	Banat.	Egyptian.	Spanish.	Taganrog.	Average.
Water	14.6	13.6	15.2	13.2	14.5	13.5	15.2	14.8	14.0
Gluten and albumen	10.7	12.5	14.3	21.5	13.4	20.6	10.7	13.6	{12.8 1.8
Starch	61.0	59.1	59.6	53.4	62.2	55.4	61.9	57.9	59.7
Gum and sugar	9.2	10.5	6.3	06.8	5.4	6.0	7.3	7.9	7.2
Cellular fibre	1.8	1.5	1.7	1.7	1.7	1.7	1.7	2.3	1.7
Oil	1.0	1.1	1.5	1.5	1.1	1.1	1.8	1.9	1.2
Mineral matters	1 7	1.7	1.4	1.9	1.7	1.7	1.4	1.6	1.6
	100	100	100	100	100	100	100	100	100

From this it will be seen that of the above varieties grown in England, the White Flemish yields a minimum amount of gluten, the Polish yields the maximum; but at the same time it yields a minimum of starch, while the Banat, which yields a medium proportion only of gluten, yields the largest amonnt of starch.

Mr. Lewis C. Beck, of Rutger's College, N. Y., in 1848–9, made analyses of wheat and flour from Europe as well as many from samples grown in the U. S., with direct reference to their "relative value and the injury which they sustain by transport, warehousing, &c.," analyzed specimens of wheat and flour from Russia, Poland and Holland—the specimens were forwarded to him from Amsterdam; the analyses from these specimens as well as some of those from wheat and flour the product of the U. S., will be found in the annexed table:

	Water.	Gluten and albumen.	Starch	Glucose, Dextrin, &c.	Bran.
New Brunswick, N. J	12.75	10.90	70.20	6.15	....
" " damaged	12.35	8.31	(79.34)		....
Genessee wheat, N. Y	12.40	11.46	70.20	5.20	....
Zanesville, O	12.85	14.25	67.06	5.98	....
Empire Mills, Roscoe, O	13.00	10.00	70.20	6.80	....
Venice Mills, O	12.36	12.60	(75.04)		....
Ohio wheat, fine	12.85	12.25	(73.90)		1.00
" " superfine	13.00	9.10	(77.80)		.10
" winter wheat	13.10	11.50	66.84	7.90	.60
" " " second grinding	13.05	12.69	(73.61)0		.65
Forest Mills, Logansport, Ind	12.85	11.90	67.00	8.25	....
" " (damaged)	13.00	7.00	67.80	11.30	....
Rock River, Ill	13.87	9.90	(75.88)		0.35
Bruce's Mills, Mich	13.20	11.85	65.60	8.60	0.45
Monroe, "	13.10	10.40	(76.30)		0.20
Wisconsin wheat	13.80	10.85	67.00	8.33	....
Georgia "	11.75	14.36	68.93	4.96	....
Turk's Island, W. I	12.60	12.70	66 —	8.50	....
Zealand wheat	13.40	10.25	69.65	6.70	....
Poland "	13.60	10.65	68.15	7.60	....
Soft Petersburg wheat	13.20	11.00	69.00	6.80	....
Friesland "	13.90	10.00	69.75	6.10	....
Kubauka "	12.35	16.00	59.65	9.00	2.90
Pennsylvania "	11.90	13.16	66.20	7.25	0.75
Missouri winter wheat	14.00	9.30	70.05	6.30	0.35
Maryland wheat	13.00	12.30	66.65	7.10	0.65
Virginia superfine	12.05	12.95	(74.50)		0.50
Chilian wheat	12.85	8.65	71.60	6.10	.60
Spanish "	13.50	10.30	68.90	7.00	.30

In addition to this statement, the following analyses may with propriety be here inserted:

	Vauguelin.		Dumas.		Beck.
	Flinty Wheat.	Soft Wheat.	Flinty Wheat.	Soft Wheat.	Flinty Wheat.
Water	12.00	10.00	12.00	10.00	12.40
Gluten	14.60	12.00	14.55	12.00	11.46
Starch	56.50	62.00	56.50	62.00	70.20
Sugar	8.50	7.40	8.48	7.36	5.20
Gum	4.90	5.80	4.90	5.81	
Bran	2.30	1.20	2.30	1.29	....

Wheat or flour is valuable just in proportion to the quantity of gluten it contains. In some varieties of wheat the gluten is more tough and fibrous than in others; flour dealers, but more particularly bakers, determine the quality of flour by making a paste of a small quantity of it, and from the tenacity of the dough, or the length of "*thread*" to which the dough may be drawn, determines with them the value of the flour.

Several of the organic constituents of wheat may be obtained as follows: "Moisten a handfull of wheat flour with sufficient water to form a stiff paste when triturated in a mortar; inclose it in a piece of thick linen, and knead it frequently, adding water as long as the liquid which runs through continues to have a milky appearance. After standing some time, a white powder will settle from the turbid water: this is *wheat starch.*"

Starch is one of the principal constituents of flour, as indeed of all sorts of meal; the second constituent remains behind in the cloth, mixed with vegetable fibre, and is a viscous, tough, gray substance, which has received the name of *gluten* (vegetable fibrine). The gluten swells up only in water without being completely dissolved; in its constitution it corresponds exactly with albumen, and, like it, contains nitrogen. When the water decanted from the starch is boiled, it becomes turbid, and when partially evaporated yields a flocculent precipitate; thus wheat meal contains also "*vegetable albumen.*" If this flocculent precipitate is separated by filtration, and the clear liquid running through the filter on which the albumen is collected, is now evaporated to a thick syrup, the addition of alcohol will separate this syrupy residue into two parts—into gum, which is left insoluble behind, and into sugar, which dissolves in alcohol, from which it can be obtained in a solid form by evaporation. Neither the gum nor sugar are thus obtained pure; both contain a small amount of saline matter, and the latter, besides, traces of fatty matters.

There is a certain interdiffusion of these organic substances—gluten, albumen, cellulose and starch—throughout the body of the seed, but are, notwithstanding, found greatly in excess in the parts indicated in Fig. 1.

The walls of the hexagonal prismatic cells are composed of a materia known to physiologists as cellulose; it is *always* an organic substance and is distinguished by its insolubility in water, alcohol, ether, dilute alkalies, and acids. Vegetable wool, the pith of plants, and bleached paper, may be regarded as pure cellulose. Its chemical composition is the same as that of starch, namely: carbon 12, hydrogen 10, oxygen 10.

Having thus briefly explained the composition and illustrated the structure of the several parts of the wheat grain, the next important subject to be considered is the

GERMINATION OF THE WHEAT PLANT.

In all seed bearing plants, germination is the first manifestation of vitality. This action invariably takes place whenever the necessary external conditions are sufficiently favorable; these conditions may be embraced in the following: a proper degree of heat or warmth, light, or rather *the effect* of light, or perhaps the vicinity of light, moisture, and access of atmospheric air. When seeds are so situated as to enjoy these four conditions in a proper degree, germination invariably takes place in the healthy seed, or seed in a normal condition. If a seed is so situated as to enjoy the proper effects of light, moisture and atmospheric air, but is yet deprived of all warmth, although it may not be really frozen, it will not—cannot germinate. Water congeals at 32° to 31° Fahr.; a few degrees more of cold will burst stout glass bottles filled with water; by the action of frost, rocks are very frequently rent asunder, and it is related that at an armory in England, a cannon filled with water and the muzzle planted into the earth, was burst asunder by the action of frost, although the metal of the cannon was two inches thick. Quicksilver freezes at 40° below zero, F., or 72° below the freezing point, being a degree of cold which is met with only in such regions as those visited by the youthful and hardy, and much lamented Dr. E. K. Kane. The organism of the human system would be seriously affected under the influence of such a degree of cold, were the person not well protected by furs, fire, and other means. But the small seed grain, less than a rain drop in size, which, judging from its delicate structure and tissues, as illustrated in figure 1, one would suppose that the first hard frost would burst the cell walls and decompose the grain, as is not unfrequently the case with the flesh of potatoes and apples. But not so the wheat grain, it is tenacious of life, and yields its vitality only to an (artificial cold of) 58° below zero, or 90° below the freezing point!

The wheat grain is much more sensitive to heat than it is to cold. Almost all cultivable plants require a warmth varying from 50° to 70° F. All require a heat between 32° and 100°—under 32° none will germinate, above 100° all are destroyed. There are, however, exceptions to this general rule. Carpenter mentions a hot spring in the Manilla islands which raises the thermometer to 187° and has plants flourishing in it and on its borders. In hot springs near a river of Louisiana, of the temperature of from 122° to 145°, have been seen growing not merely the lower and simpler plants, but shrubs and trees. In one of the Geysers of Iceland, which was hot enough to boil an egg in four minutes, a species of *chara* has been found growing and reproducing itself. One of the most remarkable facts on record, in reference to the power of vegetation to proceed under a high temperature, is related by Sir G. Staunton, in his account of Lord Macartneys embassy to China. At the island of Amsterdam a spring was found, the mud of which, far hotter than boiling water, gave birth to a species of Liverwort. A large squill bulb, which it was wished to dry and preserve, has been known to push up its stalk and leaves, when buried in sand kept up to a temperature much exceeding that of boiling water.

If a wheat grain be steeped during fifteen minutes only, in water having a temperature of 122° F.—a temperature but little above blood-heat—the germinating principle will be totally destroyed. In dry atmosphere the grain will, perhaps, endure a temperature of 170° F., without being seriously injured. This sensitiveness to heat may be the chief cause why wheat does not prove profitable as a crop in the tropics, where the heat of the soil frequently is found to be 190° F. Warmth, in a certain degree, is just as essential to the seed in the process of germination, as it is to the egg during incubation, yet if the other agents or external conditions are not supplied, warmth alone will not cause the act of germination to be called into activity. If seeds can be so placed as not to be affected by the moisture, elevation of temperature will not excite the germinating powers; it is necessary to bear this fact in mind when packing seeds to be sent to California, or other tropical regions. As a general thing seeds are packed in cases and these are stowed away in the hold of the ship, as soon as the tropics are reached the temperature of the cases is increased, this is attended by the formation of vapor from the moisture of the packages, and as a necessary consequence germination commences, but as there is nothing to maintain it, it ceases, and after germination once stops it cannot again be excited to activity. There will be no risk attending the transportation of seeds if they are put in sacks and kept in a place where the air can have free access to them.

Moisture is absolutely essential in germination, not only to promote it, but to maintain it when once called into action. The moisture penetrates the husk or outer covering of the wheat through pores or canals and ducts, (see figure 1,) and finds its way through the layers *a*, *b*, *c*, and *d*, when it reaches the starch cells *e*, it causes a great change to take place in the starch cells, which will be more fully explained. Although wheat and many other seeds will germinate when deposited on the surface of the soil; yet there is no doubt that they receive a better supply of moisture when covered with soil to the depth of about two inches. On the surface of the soil the seeds are not only more liable to be destroyed by insects, birds or small quadrupeds, but the direct rays of the sun seriously interferes with the supply of the requisite amount of moisture. Notwithstanding many eminent botanists declare that light is not only prejudicial, but that darkness is absolutely essential to consummate the act of germination, I have succeeded in germinating wheat and bunch beans on the surface of the soil covered with a pane of ordinary window glass, in about the same period that others germinated when regularly planted or sowed. Subsequent to these experiments I have learned that the Hon. Sidney Godolphin Osborne, of England, succeeded in growing the wheat plant to the length of two to three inches in glass jars on perforated plates of zinc suspended over water, in some cases with, and others without soil, from which the plants were transplanted to glass tanks on the stage of the microscope in order to examine the process of developement and growth.

Atmospheric air is absolutely necessary to germination; this air is composed of oxygen and nitrogen gas, whilst water is composed of oxygen and hydrogen gas. Notwithstanding almost all seeds will germinate in water, and none will germinate without it, yet they all require atmospheric air. No seeds will germinate in pure nitrogen, hydrogen, or carbonic gas; but all will readily do so in oxygen. The seeds of all aquatic plants germinate under water, and this circumstance might lead some to suppose that the presence of air was not indispensable; but it must be remembered that there is no water—except when artificially rendered so—that is free from atmospheric air. The seeds of aquatic plants therefore germinate just like fish live in water, even though it is covered with ice, by virtue of the oxygen dissolved in it. It is said that Saussure failed to cause seeds to germinate in water which was boiled long enough to expel all the air from

The conclusion then is irresistible that air is indispensable to germination.

Experience has taught that from two to three inches is the proper depth to sow wheat. At this depth, in a properly prepared soil, it receives an abundant supply of moisture; is secured against the depredations of birds and insects; it is sufficiently in contact with the atmosphere, and receives the necessary influence from solar light and warmth. The following statement may be found in almost every agricultural journal, or treatise on agriculture; it purports to be an experiment by Petri, made half a century since, with wheat; but as Petri's experiment was with *rye*, and not wheat, it is probable that the experiment stated may not have been made by him, or else may not apply to wheat; certain it is that it was made in Europe and not in America:

Seeds sown to the depth of	Came above ground in	No. of plants that came up.
1-2 inch.	11 days.	7-8
1 "	12 "	all.
2 "	18 "	7-8
3 "	20 "	6-8
4 "	21 "	4-8
5 "	22 "	3-8
6 "	23 "	1-8

but I cannot learn at what season of the year the experiment was made. This statement, then, is only of comparative value;—it teaches that no more than 1-6 of the plants germinate at six inches depth than do at three inches. On the 3d day of October, 1857, I sowed some wheat on the surface of the soil, some at the depth of 1, 3, 4, and 7 inches. That on the surface and at 1 inch germinated and came above ground in six days; at 3 inches in eight days; at 4 inches in ten days; at 7 inches in eighteen days. Unfortunately my arrangements to ascertain the proportion at each depth that came above ground of the whole number sowed, was interfered with, but there were two or three only out of a hundred at 7 inches that came above ground, and they perished during the few cold days in November. My impression is that about three-fourths of that sowed at four inches came up; all of that at three inches, and all at one inch; all that on the surface not destroyed by birds germinated.

A German writer states that wheat sowed from one to four inches deep germinated the deeper the better, but from four to seven inches the deeper, the less successful was germination; at eight inches the seed did not germinate at all. It is reasonable to suppose that at the depth of eight inches it was deprived of the proper supply of oxygen gas, or rather atmospheric air. The warmer the air and the soil are, the sooner will germination be consummated. In Sweden, wheat sown on the 28th of April required eighteen days to come above ground; that sown on the 21st of May required eight days only; whilst that sown on the 4th of June required no more than six days.

Light certainly is an indispensable agent in exciting into activity the germinating principle, as is abundantly proved by the following experiment and discovery of Mr. Robert Hunt, author of "*Researches on light.*" "Some seeds being placed in the soil, in every respect in their natural conditions, duly supplied with moisture, and a uniform and proper temperature maintained, we place above the soil a yellow colored glass, a cobalt blue glass, and a glass colored deep blood red, and allow one portion to be exposed to all the ordinary influences of the solar rays. The result will be, that the seeds under the blue glass will germinate long before those which are exposed to the combined influences of the sunshine; a few of the seeds will struggle into day under the red glass, but the process of germination is entirely choked under the yellow glass.

EDINBURGH, 1, GEORGE THE FOURTH'S BRIDGE,
Sept. 8, 1853.

My Dear Sir:—I am favored with yours of the 5th, relative to my practical experience in the effect of the chemical agency of colored media on the germination of seeds and the growth of plants.

I must first explain that it is our practice to test the germinating powers of all seeds which come into our warehouses before we send them out for sale; and, of course, it is an object to discover, with as little delay as possible, the extent that the vital principle is active, as the value comes to be depreciated in the ratio it is found to be dormant. For instance, if we sow 100 seeds of any sort, and the whole germinate, the seed will be the highest current value; but if only 90 germinate, its value is 10 per cent. less; if 80, then its value falls 20 per cent.

I merely give this detail to show the practical value of this test, and the influence it exerts on the fluctuation of prices.

Our usual plan formerly was to sow the seeds to be tested in a hot-bed or frame, and then watch the progress and note the results. It was usually from eight to fourteen days before we were in a condition to decide on the commercial value of the seed under trial.

My attention was, however, directed to your excellent work, "On the Practical Phenomena of Nature," about five years ago, and I resolved to put your theory to a practical test. I accordingly had a case made, the sides of which were formed of glass colored blue or indigo, which case I attached to a small gas stove for engendering heat; in the case shelves were fixed in the inside, on which were placed small pots wherein the seeds to be tested were sown.

The results were all that could be looked for: the seeds freely germinated in from two to five days only, instead of from eight to fourteen days as before.

I have not carried our experiments beyond the germination of seeds, so that I cannot afford practical information as to the effect of other rays on the after culture of plants.

I have, however, made some trials with the yellow ray in preventing the germination of seeds, which have been successful; and I have always found the violet ray prejudicial to the growth of the plant after germination.

I remain, my dear Sir,

Very faithfully yours,

CHARLES LAWSON.

If we place a grain of wheat on the table with the "*furrowed*" side down and the "*hairy*" end to the left we will find concealed under the two thin skins *a*, *a*, fig. 1, at the right end of the grain and under a little depression or shield, the embryo, *e*, *fig*. 2. The perisperm or albuminous body *a* is the store house containing the nourishment for the embryo; during the process of germination the roots proceed downward from the radicle "*c*," and the stalk or halm upward from the plumule or feather "*b*." A soon as moisture has found its way through the canals in the husks or skins (*a*, *a*, and layers *b*, *c*, and *d*, fig. 1,) so as to be in contact with the starch cells *e*, fig. 1, the moisture or water penetrates the cell walls of the seed and its embryo, and there forms a strong solution. The seed has now the power of decomposing water—the oxygen combines with some of the carbon of the seed and is expelled as carbonic acid. The presence of moisture and oxygen induces putrefaction of a portion of the albuminous matter in the cells; this putrescent matter becomes an actual ferment—exhales carbonic acid gas, generates heat and converts the insoluble starch stored up in the cells into soluble sugar—the whole remaining albuminous matter is speedily rendered soluble. The cells, instead of starch, are now filled with a strong solution of sugar, albumen and salts. The cells become more distended and those of the embryo having been stimulated into action are being developed according to the laws of vitality with which they were impressed at their formation.

The substances deposited within the seed, that is the starch, cell-walls or cell-membrane (cellulose,) were undoubtedly designed to furnish food to the young plant until it can provide for itself, for it is nevertheless true that the young plant like the young babe is dependent for its nourishment upon the bosom of the parent that bore it, and requires during childhood a different food from that in maturity. In wheat, starch is the most important ingredient of this food; but as starch is insoluble in cold water, it could not unaided attain the proper degree of fluidity, to be transferred from the albuminous body to the embryo. It has been observed that when moisture acts on the albuminous body of the seed, that carbonic acid is evolved; this evolution causes in some manner as yet unknown to scientific investigations, the formation of a substance known as *diastaste.* The diastaste is allied in its general properties to gluten, and converts the starch of seeds into gum and sugar for the nutrition of the embryo.

Most persons are familiar with the process of malting barley. Barley is soaked until it has absorbed about one-half its weight of water, the grain is then thrown upon the malt floor, where it is kept in a heap in a layer about a foot thick. While in this condition the process of germination soon commences, and much heat is developed, which in a short time would destroy the grain were it not now spread out into thinner layers. When the young shoot on these grains of barley has attained the length of the grain itself, then the germinating process is terminated by removing the barley to a kiln heated nearly to blood heat. Every one knows how sweet and mucilaginous malt is to the taste; in malt the starch of the barley has been changed into sugar by the formation of diastaste, which latter according to Persoz does not exceed the one five hundredth part of the malt, but notwithstanding this quantity, Liebig says that the amount of diastaste contained in one pound of malt is capable of converting five pounds of starch into sugar; and that one part of diastaste will convert 2000 parts of starch into dextrine and sugar. The experiments made by GUERIN, to determine the influence of temperature upon the action of diastaste are exceedingly interesting. He found that 77,64 per cent. of sugar, and 12,25 of diastaste were produced from 100 parts of starch paste at the temperature of 68°. The paste was liquified and 12 per cent. of sugar produced in it at 32° or freezing point; although the parts were liquified by diastaste at the temperature of 15 to 20°, dextrine only, and no sugar was the result. This fact offers one explanation why plants cannot grow at a low temperature, namely, the starch of the seed cannot be converted into sugar, and the plant is thus left destitute of the essential aliment of growth.

If a paste be made by boiling starch with water, and while it is yet hot we add (in a saucer,) say 20 drops of sulphuric acid, with constant stirring; then place the saucer on a steam bath until the paste has become semi-transparent and liquid; then add prepared chalk until there is no more acid reaction—this chalk has a great affinity for the acid, and with it forms gypsum—after having filtered the mass from the gypsum, leave the former to evaporate in a warm place. The residue is a GUM *perfectly soluble in water*. As starch digested with sulphuric acid forms dextrin or gum, and becomes soluble in water, may not the evolution of carbonic acid in germination perform the same office?

If we boil, say about two and a half ounces of water and add to it 20 drops of sulphuric acid, and then add one ounce of starch in the form of a paste, but in small quantities at a time so that the boiling may not be interrupted; when all the starch has been added let the mixture boil for some moments, then neutralize the acid by chalk as in the preceding experiment, and evaporate the liquid to a thiek syrup; this syrup is starch syrup, and consists of a solution of sugar and water from which a beautiful article of solid white sugar may be prepared. In neither of these experiments has any portion of the sulphuric acid been decomposed, neither has any of it combined with the organic substance, because, in the gypsum thus artificially formed we obtain precisely the same quantity of sulphuric acid that had originally been employed.

Make a paste of a quarter of an ounce of starch and two ounces of water, add to this (by rubbing) diastase equal to one fourth the paste, submit it to a temperature not exceeding 150° F., until the paste is formed into a thin transparent liquid—boil this mixture for some time—then strain through a cloth, and evaporate in a warm place. The mass is dextrin or gum, soluble in water like that formed in the first experiment, or like that formed in the germinating wheat grain.

Repeat this process, with this difference, that is, take three times the amount of diastase that was employed in the last experiment, but prolong the heating to several hours, but be careful that the heat does not exceed. 170° F. This process produces like the last, dextrine, but by boiling this is soon changed in starch syrup as in the second experiment, from which starch sugar may be obtained.

Notwithstanding we cannot observe the changes whilst they are taking place in the wheat grain, as well as we can in the artificial processes with starch just enumerated; yet there is no doubt that in its turn the imbibition of moisture and absorption of oxygen causes the liberation of carbonic acid gas, the formation of diastase which causes the convertion of starch into dextrine, and the dextrine in starch syrup. This starch syrup or sugar is what the young plant feeds upon. That this is really the case is proved by the following observation stated by Henfrey:

"The cell-walls are formed of a modification of the compound of which all vegetable cell-membranes are formed. Within the cells exists nitrogenous matter in the condition of protoplasm; that is, a tough mucilaginous fluid, colorless or with a yellow tinge, and frequently of more or less granular character, which increases with the age of the cell. The increase of the plant is dependent on the assimilation of substances requisite for the production of new cell-membranes, and of other substances to furnish new nitrogenous contents. When no material for forming cellulose exists, the plant cannot grow; but in solution of pure sugar, in the absence of any nitrogenous substance, the plant will multiply its cells for a certain time, the protoplasm of the old cells being transferred into the new ones as they are successively evolved. But under these latter circumstances the cells become gradually smaller, and at length cease to multiply; a portion of the nitrogenous matter being *wasted* in the reproduction, until it becomes insufficient to carry on the growth; but just as soon as nitrogenous matter is added which can be assimilated to form cell-membrane the growth (fermentation) goes on."

Diastase then converts the entire contents of the seed into a tough, mucilaginous syrupy mass which forms the food or cell contents and cell membrane for the young plant, until it can assimmilate nourishment from the soil. In germination diastase is formed in the neighborhood of the embryo, but not in the wheat.

I have no data from which to determine accurately how long the contents of a seed will nourish the young plant. On the twenty-fifth of December, 1857, I could find no trace of starch, or starch syrup in the wheat grains that were sown on the 3d of October, although it was tolerably abundant during November. Hermann Wagner states that on the first of July all the amylaceous (starch) substances had disappeared from a barley grain that was sown on the 15th of May.

I have mentioned gum and dextrin as being synonomous terms, I did so in order to convey to the non-scientific reader a clearer idea of the matter under discussion; but every chemist is well aware that the most important difference exists between vegetable gum and dextrine; namely: dextrine is susceptible of being converted into grape sugar by sulphuric acid or diastase, whilst gum is incapable of undergoing any such change. In the animal economy dextrine may very appropriately be classed with those substances which enter into the blood; the gastric juice converts all the starch received into the stomach into dextrine. Gum, on the other hand is not taken up into the circulation, and is apparently of very little importance as an article of food, although its chemical constitution is isomeric with that of starch and dextrine, namely:

	CARBON.	HYDROGEN.	OXYGEN.	
Starch..........................	12	10	10	Lœwig.
Dextrine..........................	12	10	10	"
Gum	12	10	10	"
Gluten	12	10	10	"
Cellulose	24	21	21	Encyclopedia.
Cane Sugar..........................	12	10	10 plus H. O.	Lœwig.
Grape Sugar..........................	12	12	12 plus 2 H. O.	

Having stated thus much of the chemical process of germination, it may not be inappropriate to mention that many physiologists regard the process of germination as being a process of combustion. They have been led to make such an inference from the fact that oxygen is absorbed and carbonic acid gas evolved or exhaled, but the experiments of De Saussure are direct evidence that the amount of carbonic acid given out is in proportion to the mass and not the number of seeds, proving that the carbonic acid is produced from the decomposition of the starch as a chemical process, and not from the growth of the embryo as a process of life. It is further proved that the relation between the oxygen consumed and the carbonic acid evolved is not the same in all plants, but these proportions should be constant if the theory of combustion is correct. Boussingalt discovered that the processes were in activity in the albuminous body after germination has taken place and the young plant capable by its development of radical and plumule of an independent existence, which were supposed to be peculiar to that process only.

On the 24th of June, 1856, Hon. Sidney Godolphin Osborne read a paper before the London Microscopical Society, on "Vegetable cell structure and its formations, as seen in the early stages of the growth of the wheat plant," from which the following on the germination of wheat is chiefly compiled. Mr. Osborne contrived to have wheat grains germinating on the stage of the microscope, and by this means was enabled to observe every change which took place.

The first symptom of germination in a seed of wheat consists in the liberating from its surface a species of filamentous network, somewhat similar to the mycelium of many of the fungi which infest vegetables; nearly at the same time the whole seed is seen to swell, and become as to its external covering transparent. At the germinating point of the seed there now appears a very small wart like projection of tough white matter; this puts forth one cone of the same substance, pointing upward—the future plumule; and several others projected in a straight line, soon to curve downwards and become the roots, Fig. 3. These cones of protruded substance soon burst their outer cell texture (*h.*) At this early stage a root cone becomes a very interesting object under a high power of the microscope. At its apex (E. E. E., Fig. 3,) there is what may with propriety be termed free capsules of cells, somewhat lozenge or diamond shaped at extremity, *b*, *c*, Fig. 65, but becoming longer and more narrow towards the base. This free capsule, envelopes the inner apex of the growing root, but there is a clear cell-less space between its base and the part of the apex which it there covers. Beneath this cellulated cone or capsule, the growth of the root takes place, by the development of cells at the extremity of the inner apex of the root. At a certain period of growth every root puts forth rootlets or suckers *e. e.* Fig. 3. These consist of long narrow, cell-like structures which put forth from the region of the fibro-vascular bundles of the main root.

In order to determine the function of the capsule (Fig. 65,) Mr. Osborn grew wheat roots in distilled water, in a solution of alum, in spring water colored with carmine, with vermillion and indigo. He treated the waters in which they were growing with various fertilizing matters; he succeeded in growing a wheat plant so as to produce a foliage of fourteen inches in length in a strong solution of prussic acid and cyanide of potassium. From these experiments he concludes that the epidermic plasm does absorb moisture from the soil; in fact it requires moisture to preserve its elasticity, combining in the formative matter it secretes some of the matters presented to it, in whatever medium it may grow, still the great sources of plant health and strength are obtained by means of the capsules or spongioles the *terminus* of every root and rootlet, and also by the absorbent cells ever found at the extremities of the numberless suckers; for it is at these points that he found the cell structure ever greedily taking in whatever of foreign matter he succeeded in introducing into the *media* in which the plants were grown.

There can be no doubt that the plant requires not only certain chemical constituents to secure its health, but that these must be offered to it, when growing in a medium, allowing the utmost freedom to the capsules of the roots, rootlets and suckers. There is no doubt that a highly pulverized poor soil would grow better plants than a close, hard, tenacious soil, however fertilized. When it is considered what a wheat root has to do, how it has to force its way and introduce its lateral branches through all manner of crevices, and among all kinds of material in the soil, we are struck with wonder at the beauty of the contrivances by which the spongioles or capsules, constructed of highly elastic material, can float their onward way; consolidating as they grow, and having within them the growing organism of a scaffolding sufficiently strong to bear up in its deposited order, all the necessary structure in any course it may be compelled to take, however tortuous.

There is a "circulation" in every one of the long suckers put forth from the roots, which can plainly be seen along the outer edge of each sucker, running from the root toward the blunt point, but no current has yet been traced returning toward the root.

In order to ascertain whether the roots of the wheat plant take in nourishment for the plant, from the medium in which they grow by means of their capsules and those on their rootlets, Mr. Osborn made the following experiment: "Wishing to make some experiments on the action of poisons, I grew a small crop in a strong solution of prussic acid with cyanuret of potash added to it—this gave a very vigorous growth to roots and leaves. Just as the root had acquired about four inches of length I applied my coloring matter to the fluid in which they grew; I wished to see whether this would be taken up any where but at the point of attachment of the capsules to the apex of the root. The result is that it was not; the parenchyma or outer cell texture is colorless; that the capsule cells are strongly painted; that as they have pushed on, nothing has been left in the natural cells colored but very small nuclei, excepting only along the whole course of the muscular bundle; here what I call the pith tubes were seen to have imbibed the pigment, and it can be traced along their whole course, *i. e.*, along the whole course of the growth made since the solution was colored."

There is a physiological phenomenon connected with the growth of roots, which I omitted to name in the proper place; namely, shortly after the radicle C., Fig. 3, has burst through, the integument lateral roots F. F., also developed themselves on both sides of the main root. The main root "C," Fig. 3, dies away soon after the lateral roots F. F., are developed sufficiently to elaborate nutriment from the soil, or media in which they are growing, and are developed from the protuberances *f*, *f*, Fig. 2, which may distinctly be traced in the embryo. They are in immediate connection or communication with the base of the first leaves. These lateral roots in their young state prove to be sheaths only, (*h*, *h*, *h*,) from which at a later period the true roots F, F, protrude. This method of root growth is characteristic of and peculiar to the cereal plants, and is by botanists designated as *endorrhizal.*

PLUMULE.

Having thus briefly described the process of germination and the formation and growth of the roots, the plumule or future stalk next merits attention. Osborn says, "A section made with care through the white substance, from which the plumule and roots protrude, gives a beautiful view of the early formation of the former. Several layers of an oval headed cell structure are seen, the one longer than the other, *i. e.* more advanced in growth, the shortest or youngest, being very small. When detached from each other their outline is that of a blunt spear head (Fig. 5, A,) at this stage their substance consists of a cellular texture of which the cells are very small as to their actual area, with rather thick walls of plasm. Toward their base, in the center of each, is the well defined indication of an upward line of spiral fibre—these are the embryo leaves. They have the same epidermic plasm as the roots, and into it are seen to project small points, the future hairs on the leaf of the plant. They have capsules, so far as yet can be determined, identical in structure with those of the root, although adhering more closely to the substance covered, and the component cells do not separate in the way they do in that part of the plant. As the young leaves prepare to enter the outer world they fold themselves longitudinally into a very small compass Fig. 5, A, and carry on with them, until they have obtained an inch or so of growth, a straw-colored cellular envelop of stout texture, Fig. 5, A. B., (Fig. 6, a portion of the same highly magnified,) this appears intended to protect them as they force their way through the soil and on their first exposure to the weather in the outer world." At this stage of growth chlorophyll or green coloring matter is found existing in the leaves.

There can be no reasonable doubt that the cellular envelop A, B, performs a similar function to the capsules of the roots Fig. 65, that is, it exerts a chemical influence on the soil which lies immediately above it, rendering the soil exceedingly pliable, so much so that the tender plumule can readily penetrate it. The writer remembers having seen the young wheat plant force its way from a depth of several inches, through a compact clay soil over which a farm wagon had passed so often as quite to obliterate all the traces left by the plow or harrow.

As soon as the plumule has penetrated through the soil an inch or more, it then gives birth to the first true leaves while the central bud is destined to become the future stalk. The first experiment of the young plant is to form a joint or knot immediately beneath the surface of the soil, and another one just above it. The upper one of these two joints or knots is the true commencement of the stalk; the joint immediately beneath the soil becomes the point from which emenate the so-called crown roots and which are the chief laboratory for the preparation and distribution of the future nourishment of the plant.

The plumule is of great importance to the existence of the plant, and by it may be readily demonstrated how dependent each organ of a plant is on the other, and how harmoniously the whole silently performs its destined function. If the "*heart*" or plumule of the wheat plant is pulled out, it will not be replaced by a new one, as is a spider's leg, or snail's head; but the plant will form a new shoot and put forth a new plumule. If, however, *all* the plumules are pulled out of a bunch or multiplied wheat stalk in the spring time, the plant will die, from the fact that the dotted cell-tissue, Fig. 3, *d* and *f*, from which both the roots and plumule grow, will have been severed; this cell-tissue appears to be as important to the vitality of the plant as is the spinal marrow in the animal kingdom. If a section is carefully made through this substance, in a direction which will include the lower part of the plumule and the commencement of the roots, we get a view of the basis of the whole vascular system. A large number of pitted cells are seen, some passing downwards to branch out into bundles, one to every root; others branching upward to the leaves.

Having thus briefly stated the composition and structure of the wheat grain, as well as both the chemical and mechanical changes which take place during the process of germination, it may not be irrelevant to recapitulate the principal phenomena.

The seed, when planted in the earth, was to all appearances an inert, inodorous, and tasteless mass. In a short time it presented unmistakable manifestations of vitality, in the development of plumule and radicle; as soon as the latter made their appearance, it was demonstrated that the starch, which is insoluble water, had become solvent, and was converted first into gum and then into sugar to feed the young germ; the cell walls of the hexagonal prisms were dissolved to form new cell walls in the plumule and radicle.

As cell after cell of starch was converted into sugar, or rather a step beyond, for the nourishment of the plumule in its immediate vicinity, the cells in the central and posterior portion of the grain were also undergoing the fermentative process, and as fast as required, the pabulum, undoubtedly impelled by chemical or electrical affinity, finds its way to the new plant. In the course of fifteen or twenty days the entire store of food contained in the starch will have disappeared, and the young plant is now ready to enter upon the "trials of life" upon its own account, and in the very outset the young roots find that like the genus homo, "they are obliged to labor for their bread."

It will now be necessary to give a brief description of the elements by which the rootlets are surrounded, and from what substances and in what manner they derive their nourishment. The nutrition of Plants involves within its province the entire field of Scientific Agriculture, but in this essay it is proposed to discuss that which relates to the cereals only, and taking wheat as the generic type.

NUTRITION OF PLANTS.

ORIGIN OF SOILS.

So long as the young plant had in store organic materia which was provided for its growth by the parent plant, so long were all its energies and capacities not fully called into action; but with the disappearance of the last granule of mother starch the plant finds itself compelled to elaborate and assimilate elements from the inorganic substances by which it is surrounded—or perish. The first inorganic substance with which it comes in contact in its first search for food, is in all probability clay. What qualities has inorganic clay in common with organic starch; what does it contain that the tender rootlet can elaborate and assimilate so as to form from it not only materials for new walls of cells, but materials to fill the cells, material to form the sharp leaf, the firm stalk, the circulating sap, the head with its wonderful structure of chaff, beards, and young grains of wheat? It may be argued that the wheat plant derives its nourishment from the organic manure which the prudent farmer has committed to the bosom of the earth; but suppose reference is made to a crop of wheat on new and virgin soil, on which no manure has been placed? In such a case, replies another, the nourishment may be derived from decaying vegetable matter. Were it not for the patient investigations of physiologists, the last named position might be assumed as the true one, but experiments have demonstrated that plants can be grown to full and perfect maturity without a single particle of organic matter. If plants did not assimilate inorganic matter, there would be no ashes left after burning them; these ashes, as was demonstrated on page 582–3, consist entirely of inorganic substances.

Much of the qualities, as well as of the constituents of clay may be determined by tracing it to its origin. Possibly it may cause a little surprise to state that the soft and plastic *clay* is derived from GRANITE, which is proverbial for its unyielding hardness and firmness.

Granite is composed of three distinct substances, namely: a very dark green mineral; a white lustrous mineral named feldspar; a white, generally opaque, one, known as quartz, and one whose lustre is more or less pearly, and color varying from a transparent white to a dark olive green, and is susceptible of being divided into thin flexible laminæ; this latter is known as mica, and a dark bottle-green mineral, known as hornblende. With the exception of quartz and oxide of iron, feldspar is the most generally diffused mineral. Klaproth made an analysis of it and found it to consist of—

Silica	64 50
Alumina	19.75
Potassa	11.50
Oxide of Iron	1.75
Water	.75
Lime	a trace.
	98.25

QUARTZ is nearly pure silicic acid. The fine white sand found in the beds of streams is quartz; that which is whitest is the purest; many sandstones are nearly pure quartz, but more generally are mixed with oxide of iron, lime, &c. Flint and rock crystal are quartz, the latter being pure silica, that is, silicon (the base) united with oxygen in the proportion of one of silicon to three of oxygen. Silicic acid combines with the bases of metals and minerals forming silicates; almost all rocks and minerals consist of these silicates, more especially those of alumina, lime, magnesia, oxide of iron, potash and soda, all of which, except those containing an excess of the stronger alkalies, are insoluble in water. The silica is rendered soluble by the action of potash and soda in the soil, so that it may be absorbed by the plant, as it is a necessary ingredient in forming the outer coat of the stalk of wheat and corn—in fact of all the cereals.

ALUMINA, or pure clay is everywhere found in great abundance. The sapphire and ruby are crystallized forms of alumina, and emery is a more massive as well as crystallizable form. Alumina forms the chief ingredient of all clays, and of most of the slaty rocks from which, through disintegration, the clays are chiefly derived. Pure alumina, however, is a fine white powder, quite unalterable in the fire. We frequently meet with it in chemical laboratories, precipitated from its solution in acids by alkalies; it forms in this condition a very bulky gelatinous hydrate, which when dried at a gentle temperature, is found to consist of aluminum 2 equivalents, oxygen 3, and water 6. When dry alumina is mixed with water, it forms a plastic mass which admits of being moulded. This plasticity is imparted to the clay by the alumina; but were it absent, no potter could produce earthenware or porcelain.

POTASSIUM is a metal of a bluish white color, and has a metallic lustre in a very high degree. If a portion of this metal is placed in a vessel and covered with naphtha (a transparent mineral fluid, containing no oxygen whatever), and then a gentle heat applied, it will be found that it melts at a temperature considerably less than that of boiling water; and whilst in this state it much resembles quicksilver or mercury. It is lighter than water, and consequently floats on it. Potassium has so great an affinity for oxygen that unless kept in a vessel under naphtha, it is in a short time converted into a white solid oxide, in which latter state we know it best. Every one is familiar with it under the name of Potash; combined with nitric acid, potash forms the saltpetre of commerce. In consequence of the strong affinity which Potassium has for oxygen, it readily decomposes the oxides or chlorides of aluminum, as well as silicic acid.

Oxide of Iron, or Iron Rust, is perhaps the most widely disseminated of all metals. There is scarcely a mineral, a soil, or a rock which does not contain, in a greater or less quantity, the oxide of Iron. Chalybeate waters are so called because they contain in solution the carbonate of Iron. Iron has a strong affinity for oxygen.

MICA occurs confusedly crystallized as one of the constituents of granite at other times it is found in large hexagonal plates in porphyry and primitive limestone. It is commonly called Isinglass, from its remarkable transparency. The analysis by Klaproth gives,

Alumina	20.00
Silica	47.00
Oxide of Iron	15.50
Oxide of Manganese	1.75
Potassa	14.50

All these ingredients have just been described with the exception of the manganese, which is not always found in soils and yet more rarely found in plants, so rarely as not to be indispensably necessary to the growth or luxuriance of the plant. It is always found in some compound form, never as a pure metal. When artificially produced the metal is hard, brittle, of a grayish white color; as a metal it is not applied to any useful purpose: but the various oxides are extensively used in chemical manufactures—one preparation of manganese, the sulphate, is extensively used in calico printing.

The remaining undescribed ingredient of the granite rock is hornblende—this occurs crystalized with the feldspar and quartz. The crystals are confused and aggregated; sometimes however, they are long flat and hexagonal and prismatic—exhibiting fibres which are tough and rather difficult to break. According to Klaproth it contains,

Silica	42.00
Alumina	12.00
Lime	11.00
Magnesia	2.25
Oxide of Iron	30.00
Ferruginous Manganese	25

In the hornblende we find two, Lime and Magnesia, which have not yet been noticed.

The metal mentioned by metallurgists and chemists as calcium or lime, is very little known, but is described as being a metal of a dark grey color. The metal rapidly oxidizes in the atmosphere; in this state it is known to all as quick lime. Lime in the form of a carbonate is very abundant, and in this form we recognize it as marble, common limestone, chalk, oyster and muscle shells. Sulphate of lime is gypsum or plaster of Paris, so also is alabaster—this latter is much finer however than the gypsum. Common limestone or marble, when burned, becomes quicklime. The phenomenon of slacking quicklime is familiar to all—in this process every ton of limestone absorbs one-fourth of a ton of water, which becomes a part of the stone itself. The action of lime in the soil is not yet thoroughly understood; but some writers assume that it promotes the decay of organic matters contained in the soil, hastening their conversion into carbonic acid and ammonia, from which they assert that plants derive their food. The probability is that the carbonate of lime is requisite to form a portion of the product itself, and that it assists in decomposing minerals containing potassa and converting it into a soluble form for the nourishment of the plant. When lime contains a certain proportion of clay it becomes a cement. Limestones containing 8 to 12 per cent. of clay, furnish a hydraulic lime which hardens under water in 15 to 20 days; when 18 per cent. of clay, it hardens in 8 days; if 25 per cent. it will harden in 3 or 4 days; Roman cement contains 35 to 40 per cent. of clay and hardens in an hour.

Sulphate of Lime is a compound containing one equivalent sulphuric acid less, and two equivalents of water more than gypsum and has recently been very successfully employed in the extraction of sugar from beet root; this substance prevents the pulp from changing color by exposure to the air and the loss of sugar by fermentation.

Sulphate of Lime or gypsum, if allowed to remain when in solution in a state of contact with organic matters is reduced to sulphide of lime, which under the influence of water and carbonic acid, is converted into carbonate of lime. Nearly all the plant-ashes contain this substance, it is therefore of great importance to the plant.

Phosphate of Lime, an ingredient so essential to the cereal plants as well as to the animal frame, is found in the mineral kingdom.

Magnesium is a silver white metal, but as a metal is rare and is not employed in any useful purpose. Like most of minerals and metals, it readily unites with oxygen, forming oxide of magnesia or common magnesia. In the drug shops it is sold as a white powder. When united with sulphuric acid it forms the ordinary epsom salts of commerce. Magnesia is found in the ashes of many plants, but what action it has upon other ingredients of the soil is not understood sufficiently to warrant an expression.

These ingredients, being the chief ones of the soil, are all derived from granite through disintegration by the incessant action of the elements, of rain, dew and frost during the lapse of untold ages. These have served to comminute and separate the original ingredients from each other and to re-combine them so as to form new compounds. Granite undoubtedly is the primary rock in the geological series, that is to say it is the base from which all other rocks are derived. The first *stratified* rock is *gneiss*, which is nothing more than granite, which always occurs in shapeless masses decomposed under great pressure, perhaps under some vast ocean—the gneiss strata became upheaved, the bed of the ocean changed and the gneiss now in its turn is decomposed and the particles separated—the feldspathic portion forming the various slates, the lime being held in solution, is deposited in separate strata—the mica forming the mica schists, and in combination with the feldspar forming the mica slates. These secondary or derivative rocks in turn undergoing decomposition, form in new combinations more recent rocks and strata, until at length the feldspar has been resolved into clay, the quartz into sand rock, the lime universally diffused, and in places deposited in ledges of rocks often measuring thousands of feet in thickness and many miles in extent. The action of the rains, frosts, &c., acting on granite and other rocks and disintegrating them, is called mechanical disintegration; but nature has adopted and employed yet another means of reducing rocks, which is recognized as chemical disintegration or decomposition. Those minerals which contain metallic sulphurets, become, by the gradual absorption of oxygen converted into sulphates which are not only soluble in water, but absorb moisture from the air, and thus crumble down. In the disintegration of silicious minerals the process is equally simple. Silica is insoluble in both hot and cold water; it unites with alkalies and forms the saline compounds known as silicates which have been previously mentioned; the silicates of potash, soda and lime, are neutral compounds, and as this property of neutralizing metallic oxides and alkalies belong to acids, only silica has received the name of silicic acid; this acid is, however, very feeble for all the soluble silicates can be decomposed by carbonic acid. The action of water containing carbonic acid becomes very manifest on quartz. Liebig mentions an experiment in which some white sand was thoroughly cleansed by boiling in nitro-muriatic acid, and after completely removing the acid by washing the sand with water, the sand thus purified was exposed to the action of water saturated with carbonic acid. After a lapse of thirty days this water was analyzed, and found to contain in solution silica, carbonate of potash, lime and magnesia; thus proving that the silicates contained in the sand were unable to withstand the continued action of water containing carbonic acid, although the same silicates had resisted the short action of the nitro-muriatic acid.

So also in nature, felspar as well as the minerals and rocks containing silicates of alkaline bases, cannot resist the continued solvent action of carbonic acid dissolved in water; and in this way, either in the form of soluble silicates or a hydrate of silica, this important ingredient, in some plant's is taken up by the roots. It may perhaps be objected by some that felspar could not furnish the amount of potash necessary for the growth of dense forests as well as the cereal and other cultivated crops. Liebig who is perhaps the best authority on all subjects connected with physiological chemistry says that a cubic foot of felspar will furnish the neces sary amount of potash to supply an oak copse covering a surface of nearly one acre, for five years. About ten per cent. of the heart wood, and 13 1-2 per cent. of the sap wood of oak is potash.

In addition to the mineral earth and metals already mentioned, there are other ingredients formed in soils; among these are

Sodium is a silver white metal having a very high lustre, and is perhaps more abundant than any other, for it constitutes two-fifths of all the sea salt existing in sea water, in the water of springs, rivers and lakes, in almost all soils, and in the form of rock salt. Sea salt is a compound of sodium with chlorine—sodium also occurs as oxide of sodium or soda in a good many minerals, and more especially in the forms of carbonate, nitrate and borate of soda; these forms of this metal are undoubtedly to be attributed to the process of chemical disintegration of primitive rocks.

Phosphoric acid is of equal if not more importance than silicic acid, is found in all rocks of primitive origin. In the animal kingdom is found as phosphate of lime, magnesia and ammonia; the fact that it is found in the ashes of all the cultivated plants, is sufficiently indicative of the part it performs in the vegetable economy—it contributes about 10 per cent. of the ashes of the roots of the red beet; about 40 per cent. of the ashes of the grain of Indian corn; about 50 per cent. of the ashes of buckwheat grains.

Sulphuric acid, or oil of vitriol occurs in large quantities in the mineral kingdom, in combination with various bases, such as the alkalies and alkaline earths. In New Granada, in South America this acid has been discovered in the uncombined state in a thermal spring.

The foregoing constitute the tangible *ponderable* bodies (that is the bodies that are considerably heavier than common air) which are contained in the soil and that are absorbed and assimilated by the plant. The soil not unfrequently contains other substances from which the plant can derive no nourishment, and which proves an injury rather than otherwise, to the plant; such are for example oxide of lead, copper, &c. There are four gasses, however, whose presence is as absolutely necessary to the successful growth of plants as that of any of the ingredients of the soil, these four gasses are named carbon, hydrogen, oxygen and nitrogen. All that portion of the plant not derived from the ponderable bodies of the soil, as well as the whole atmosphere of the globe, all the water and a very considerable portion of the solid rocks which compose this earth consist of one, two, three or all of these gasses combined in different proportions. Carbon is generally found as a solid, but the remaining three occur as pure gasses in nature.

Carbon, in its pure and crystalized state, is the most highly valued of all precious gems—the diamond. Incredible as it may appear, common charcoal and the diamond are composed of precisely the same elements. All the mineral or fossil bituminous coal, cannel coal, anthracite coal are chiefly carbon; it occurs in many minerals in combination with oxygen, and in this form is known as carbonic acid. As it forms nearly fifty per cent., or one half of all vegetables, it follows that it is one of the most important ingredients in vegetable economy. It possesses the peculiar property of absorbing several of the other gasses; hence its great utility in preparing or solving other ingredients for the benefit of the plant. It has a great affinity for oxygen, and combines with it in the proportion of one equivalent of carbon with two of oxygen; in this combined state it is known as carbonic acid, and is readily absorbed by water, to it imparts a lively, sparkling appearance, and a slightly sour taste. In the decomposition of animal and vegetable matter it is evolved or given out, and as it is heavier than the atmosphere, it not unfrequently collects in low places and is known as *choke damp*, in wells, which so often proves fatal to those who incautiously venture into such places.

When carbonic acid gas is combined with hydrogen, it forms the gas which is used in cities and towns for illuminating purposes. This combination is found in nature, and is the product of the decomposition of vegetable matter under water; hence it is almost always present in the vicinity of stagnant pools of water, and is known as "*marsh gas.*" In coal mines it frequently accumulates in large quantities, and is known by the miners as "*fire damp*," and when approached with an unprotected lighted candle or lamp, not unfrequently explodes, causing serious consequences.

Oxygen is a gas which is colorless, tasteless, and inodorous, and is the most extensively diffused element in nature. It constitutes about one-fifth of the entire atmosphere, the remaining four-fifths being nitrogen. It forms about eight-ninths of all the water on the globe; it enters as a constituent into nearly all the earths and rocks, and with few exceptions combines with all the metals. Oxygen is the acid or sour principle in nature; hence the German chemists have termed it "*sour stuff.*" It was called "oxygen" (meaning the sour principle) by Lavoisier (although it was discovered almost simultaneously in 1774 by several others), because all known acids at that time were supposed to contain this element. At the present time chemists enumerate quite a number of acids which are destitute of oxygen, and many circumstances tend to favor the view that hydrogen is the real acidifying principle. Oxygen is a restless, unconquerable element, and among the whole catalogue of simple bodies or elementary substances, there are none that seize, attack, change and destroy so much as it does. It unites with almost all other bodies with which it comes in contact, and changes or destroys them; and as it forms a portion of the air, and most of the water, what can escape its presence? When it combines with any body, the combination is called oxidation or rusting; when it combines with iron, as is the case when iron is wet or damp, or heated to a white heat, we say the iron is rusted—the chemist says it *oxidizes.* But notwithstanding the eagerness of oxygen to seize upon and destroy everything, there is an agent whose services are indispensable, and without whose aid oxygen entirely fails to accomplish anything. This agent is warmth. If we desire to secure any object against the destructiveness of oxygen, all that is necessary to be done is to deprive that object of all warmth, and the object is accomplished;—it is somewhat upon this principle that fruits put up in cans retain their freshness for a great length of time. The fruits so put up must be deprived of all contact with oxygen,—

sealed so tight as not to permit the admission of the least particle of air—then placed where the temperature is near 32° Fahr., and the fruit is safe. In proof of the necessity of the absence of warmth to secure against the attack of oxygen, one circumstance may be deemed sufficiently conclusive. There are portions, and in some cases entire bodies of elephants imbedded in the ice in the northern portion of Siberia, and have been thus imbedded for thousands of years. Several years since a scientific corps from France visited the mouth of the river Lena, where the imbedded elephants are, and removed several entire carcasses. They found the flesh in an excellent state of preservation, retaining even its color in a remarkable degree; and as soon as it became sufficiently thawed, the dogs that accompanied the corps ate it with great avidity. So long, then, as oxygen was kept at or below the freezing point, it could not with any success whatever attack the flesh, but as soon as warmth was added, all its energies were called into activity.

Napoleon III. conceived the idea that flour could be compressed into a smaller space than it generally is by millers. A series of experiments were instituted to determine whether any economic advantages could be gained. The result was a complete confirmation of the principles taught by chemistry, namely: the flour which underwent the greatest compression coutained the least atmosphere, and would consequently be in a better state of preservation for a greater length of time—other things being equal—than that put up in the ordinary manner. The pain from a fresh wound is chiefly to be attributed to the fact that oxygen insinuates itself into every part of the wounded surface. If, when a wound is first received, it is immediately covered with a piece of court plaster, it will heal without either pain or suppuration. The plaster does not heal the wound, but it keeps the wounded parts in juxtaposition, and at the same time excludes the oxygen, and prevents it from irritating the affected surfaces, thus affording nature, or the vital force of the system, an opportunity of uniting the severed portions, or supplying that which was torn away; hence the superiority of one salve, ointment or plaster over another is its better adaptation to exclude oxygen only. When oxygen combines with iron, the result is a harmless combination—one which may be handled with the nude fingers with impunity; but when oxygen combines with sulphur, the resultant combination is not quite so harmless, but is known as sulphuric acid, or oil of vitriol, which "*eats*" iron, copper, wood, and clothing of all descriptions.

When oxygen combines with metallic bases, the resultant compound is called an oxide, and are recognized by chemists as *alkaline* bases. But when oxygen combines with non-metallic bases, then the result is an acid; thus, when oxygen combines with sulphur, the product is sulphuric acid; with silicon, silicic acid; with carbon, carbonic acid, &c. When an oxide combines with an acid, the resultant compound is a salt, as for example when oxide of iron combines with sulphuric acid, the result is a green salt, known as green vitriol, or copperas; when oxide of copper combines with sulphuric acid, the result is sulphate of copper, or blue vitriol. Saltpetre is a combination of oxide of potassium and nitric acid; the elements of the same acid combined in a different proportion constitute our atmosphere. Acids are excellent agents to clean oxydized or "*rusted*" metallic surfaces, because the acid combines with the oxide and forms a salt which is readily removed.

Oxygen will combine with other bodies, as before stated, by the agency of heat only; but during the combination heat is evolved, which is a preparatory step towards forming a new combination. No oxygenized substance contains as much heat as the non-oxygenized. In every oxydation heat is evolved, and the greater the heat, the larger the amount of matter that combines with oxygen. Oxygen is a gas, and if the combining body is gaseous also, then the combination may take place instantly, and heat to such a degree be evolved, as to emit light; this preparatory combustion is called *burning*, and the light of the heat is called *fire;* hence it is evident that the combination of any body with oxygen is a combustion, because the combining body becomes changed and heat has been evolved, not at all times, and in some instances at no time to such a degree as to be lighted or ignited; but the process is nevertheless a *slow* burning. Oxydized iron is according to this view nothing more than iron slowly burned; decayed wood, is wood slowly burned; and decomposing flesh, is nothing more than flesh being slowly burned. Oxygen is the factor which returns all substances to the Earth whence they were taken, and the process by which materials are returned or converted into their original elements is combustion.

Oxygen is indispensably necessary for supporting respiration, animal heat and life being dependent upon a gradual combination in the system.

Nitrogen is a transparent gas, without color, odor or taste. It is distinguished for its negative properties: that is, it will neither support life nor combustion, but appears to act simply as a diluent to the oxygen of the atmosphere, of which latter it appears to constitute about four-fifths. It is not inflammable, but on the reverse, if a lighted taper be plunged into it, the taper will immediately be extinguished. It is a little lighter than atmospheric air. It will not support vegetation alone, and animals soon die when placed in it. It is, however, an essential ingredient of all animal tissues, and of all such vegetable products as can be converted into blood in the animal body; also of the vegetable bases and other vegetable compounds, such as indigo, &c. It cannot be made to unite directly with any element, and only forms combinations when one or both elements are in the nascent state. It is, therefore, unlike the other metalloids, in a high degree chemically indifferent or neutral. But under favorable circumstances, it does combine with most of the metalloids and with several metals. However, its most important compounds are those with oxygen, and with hydrogen. Among the latter, the most prominent is ammonia, a substance with which all are familiar, by smell at least, who have had occasion to go to stables or places where animals, more especially horses, are kept and littered at night. The smell arising from the urine of animals is peculiar, affecting the nostrils not only in a pungent, but in a pricking manner. Others are familiar with it under the name of spirits of hartshorn, or volatile alkali, which is ammonia combined with water. It possesses strongly alkaline or basic properties, and neutralizes the strongest acids; hence it is of great importance to the agriculturist.

Hydrogen is a gas, colorless, tasteless, and when quite pure, devoid of smell, but as it does not exist uncombined in a state of nature, it must be prepared from substances which contain it in considerable quantities. It forms 11 per cent. of water by weight, and is found in many minerals, all animals, and all vegetables. It is eminently combustible, but will not support either combustion or animal life. Hydrogen gas is not absorbed by water, neither does it combine so readily with other bodies as oxygen does. It may be made, however, to combine with most of the metalloids and with a few of the metals.

CHLORINE.

This brief description of inorganic substances, most all of which are invariably found in the ashes of the wheat plant and its fruit, has been deemed necessary, from the fact that those most deeply interested in the culture of the wheat plant, have the least opportunity to become familiar with elements whose operations they witness daily and whose individual functions cannot be determined by simply plowing and seeding.

A description has now been given of the constituents of the wheat plant, as well as hydrogen, nitrogen, and oxygen as organic elements, and silica, alumina, potash, soda, lime, magnesia, sulphuric acid, phosphoric acid and chlorine as inorganic elements. By what process has the plant extracted these different elements from the soil? By what intelligence or instinct is it guided in selecting the proper and rejecting the improper elements? These and similar questions are ever demanding our attention, but physiological chemistry is not sufficiently matured to furnish positive intelligence upon the points necessarily involved, notwithstanding great, nay, really giant strides have been made in this direction by Liebig and his co-laborers, yet in many cases conjecture is obliged to supply the place which should be occupied by certainty.

These conjectures may prove of great service to the agriculturist if he will accept them as conjectures only, and not regard them as ascertained facts upon which he may rely with certainty, in his practical operations. It may not be inappropriate to state what is known with certainty, and what methods have been adopted to ascertain not only the functions performed by the different portions of the plant, but the processes of growth and assimilation of the earthy, mineral, and other substances which constitute a part of the plant.

Every day observation teaches, and experience confirms, that in order to live and grow, plants must obtain nourishment. An opinion was long prevalent that plants existed and assimilated nutriment from the atmosphere, and that the inorganic elements found in the ashes of plants were purely accidental.

"Plants," says Berzelius (Handbuch, 1839, p. 77,) "obtain the material for their growth from the earth and the air, which are both alike indispensable to them. The earthy part appears to exert on plants no other influence except only a mechanical one."

"According to the doctrines founded by DeSaussure and Sprengle, and were prevalent up to 1840, vegetable and animal life depended on the circulation of organic matter, formerly endowed with vitality. When all the remains of dead plants and animals in cultivated land had been set in motion, brought into the circulation, and in this way rendered available, an increase of produce by cultivation, beyond this limit, was no longer possible, nor an increase of the population conceivable."—*Jour. of Royal Agricultural Society.*

But these "accidental" occurrences, like Hamlet's madness, seemed to have a *method* or uniformity about them which led to the promulgation and adoption of the theory that plants possessed the power of changing, or converting one substance into another, for example, that they could extract silica, and convert it into potash, where silica abounded in the soil and potash was deficient, and that on the contrary they could convert potash into silica, when silica was deficient. This theory was found untenable when it was discovered that the most abundant crops could not be grown on all descriptions of soil. Were the powers of the plant such as this theory supposes, then a soil composed of pure clay, or of pure sand, must be equally as fertile as a soil containing all the inorganic elements found in the wheat plant. But experience proves that every inorganic element found in the ashes of the wheat plant is essentially necessary to the proper growth and full development of the plant. Although lime forms less than one pound of the ashes of one thousand pounds of the wheat grain, yet this almost infinitisimal amount is just as essential and of as much absolute importance to the health, growth and maturity of the plant as is the silica which is found to be almost five times the amount of the lime. As already stated, the plant has not the power of supplying deficiencies of the soil; and to this one fact may in a great degree be attributed the necessity for the various species, genera, orders and families of plants. When the soil does not contain the necessary and appropriate elements for a certain plant, it fails to grow: but some other plant, to whose growth and development the wanting element is of no importance, will flourish on that spot. The reason why pitch pine and the sugar maple do not flourish on the same soil, is very obvious from an examination of the inorganic constituents of their respective ashes:

MAPLE.		PITCH PINE.	
Silica	0.40	Silica	7 50
Potash	4 62	Potash	14 10
Soda	2 90	Soda	20.75
Lime	41 33	Lime	13.60
Magnesia	6.42	Magnesia	4 35
Phosphate of Iron	.78	Phosphate of Iron	11 10
Phosphate of Lime	4.64	Phosphate of Lime	2.75
Phosphate of Magnesia	0.74	Phosphate of Magnesia	.90
Sulphuric acid	1.22	Sulphuric acid	3.45
Carbonic acid	35.90	Carbonic acid	17.50

Whilst the maple requires less than one-half of one per cent. of the amount of its ashes of silica, the pine requires seven and a half per cent.; nearly half of the ashes of the maple consist of lime, whilst little more than one-eight of the pine ashes are of the same element. But the pine assimilates fourteen times as much phosphate of iron as does the maple.

The vine will not flourish where there is no lime in the soil, whilst wheat requires a soil rich in phosphates. Tobacco, the walnut tree and celery leaves, contain saltpetre. Shœph obtained four grammes of crystallized salt-petre, from 100 grammes of coarse stems of the tobacco plant. There are many facts which might with propriety be introduced to prove the absolute necessity or inorganic elements; as well as the peculiar influences which some inorganic elements exercise over some of the plants grown upon soils containing them. Carbonate of lime is found to exist in the superficial cells of some varieties of chara.* On the Galmei Hills near Aix la Chapelle is found the *Viola lutea caliminaria*, which owes the peculiar color of its flowers to the presence of zinc.† The reason why the tea grown upon the island of Java is not pleasant nor of so good a quality is because of the excessive amount of salts of iron in the soil. Several attempts have been made to grow the tea plant in the southern portions of the United States, but the failure to produce as good an article as that from China must be attributed to the soil.‡ It is a well known fact that in China the cotton is naturally of the color known as "*nankin*"—a light orange, caused by the salts of iron in the soil; seeds from the Chinese cotton plant have been planted and grown in the United States, but the cotton had exchanged its "nankin" color for that of the cultivated Carolina cotton. In experiments conducted by Mr. Danberry, he states that he found barley would assimilate three times as much potash as it would soda, notwithstanding many compounds containing soda in excess were added to the soil. A heath plant (*Erica carnea,*) growing abundantly in the plains in the valley of the Lech river, is remarkable for the great proportion of lime which it assimilates, whilst another heath plant (*calluna vulgaris,*) closely related, but of a different species form the former, growing on the hill sides of the Lech is equally remarkable for the amount of silica which it contains.§ Struve found 100 parts of the ashes of equisetum hyemale to consist of 97 parts of silicic acid. If further proof were needed that plants require inorganic substances as their chief source of nutrition, a reference to the example of the lichen, or moss growing on the bare rock, may with propriety be made. The moss obtains its nutriment entirely from the rock which it decomposes, except it shall be demonstrated that plants receive nutritive substances or elements from the atmosphere. Saussure and others have proved that the seeds of beans, *Phaseolus vulgaris*, of peas, and of garden cresses, germinate and even grow to a certain extent in moist sand or moistened horse hair; but the plants began to droop as soon as the mineral substances contained in the seeds were exhausted; and notwithstanding some of them even bloomed,

* Bellingrodt † Payen.

‡ This is undoubtedly true so far as *quality* is concerned, but tea culture cannot be made profitable in the United States, for the reason that labor is too expensive. In China a tea gardener receives wages at the rate of about one dollar per month, and "boards himself." Any person whether male or female, free or slave, competent to be a tea gardener can obtain a better remuneration for services than obtains in China.

§ Roethe.

they could not possibly produce seeds, for the reason that the constituents essential for the formation of seeds were entirely absent.

"When we reflect that no plant can exist independently of certain *mineral* constituents, and that these occur only in certain definite quantities, and that some bases only, such as soda or potash, lime or magnesia occur in plants—and when finally we observe that these mineral substances are accumulated in very different proportions in the various organs of plants, and in accordance with the different periods of their development, although they present tolerably uniform relations under similar conditions and in identical organs—we are necessarily led to the idea that these substances exert a definite influence upon the life of the whole plant, and upon the origin of its organic constituents from carbonic acid, water and ammonia."—*Lehman.*

Plants undoubtedly have the inherent or vital power to imbibe and exhale the atmosphere, or in other words plants breathe; but this breathing process is by no means a nutritive one to either plants or animals; yet it is essentially necessary to both to enable them to assimilate substances for nutritive purposes which have been received within their respective organizations.

Much has been written on the function which inorganic matter has been supposed to perform in the growth of the plant;—many chemists have endeavored by the analyses of the ashes of different parts of the plant to determine precisely the purpose and office of each compound. It occurred to the Duke of Salm Horstmar of Brunswick, (Europe,) that a more correct method would be to compose a soil of inorganic elements, all of which should as far as possible be prepared in an artificial manner—then by omitting in consecutive experiments a single element in each experiment, it was presumed that a more correct knowledge of the importance and special functions of each element would be obtained.

The following which I have translated from the German, embodies his

EXPERIMENTS AND RESULTS ON THE NUTRITION OF PLANTS.

In order to ascertain the inorganic nutrition of plants, it becomes necessary to select a medium which should be entirely free from any admixture of other inorganic elements. For this reason the carbon which I selected was obtained from the purest crystallized sugar; and to avoid any admixture of inorganic substances, it was thoroughly heated in a platina vessel. The experiments of Gærtner suggested the idea to me that plants would grow well in carbon. Small tin cups without any aperture in the bottom and coated on the inner surface with beeswax were the vessels used in the following series of experiments. The plants were watered with distilled water; the place in which the experiments were conducted was an uninhabited chamber, facing to the south; the plants were placed on a fixture at the window, so as to enjoy the noonday sun.

EXPERIMENTS WITH WHITE OATS.

The first experiment, the following composition and in the following proportions, viz:

Carbon (of sugar)		$2\frac{1}{2}$ ounces.
The silicate of Potash was dissolved in 40 grms. of water.	Silicic acid	0.075 grms.
	Potash	0.03 "
	Nitrate of ammonia	0.05 "
	Nitrate of magnesia	0.03 "
Carbonate of lime		0.5 "
Carbonate of magnesia		0.05 "
Phosphate of lime		0.1 "
Sulphate of lime		0.1 "

In this composition the plant attained a hight of 25 inches, had 5 flowers which produced five imperfect fruit, incapable of germination. The blossoms were very delicate; the leaves of a pale color—yellowish green. The plant when dried weighed 0,37 grammes. I will now proceed to give the results of the first twenty-nine experiments with white oats:

RESULTS.

In all these experiments made with a carbonaceous inorganic soil or rather a soil composed of inorganic elements, entirely devoid of all nitrogenous substances or ingredients, it was found that the plant not only grew, but actually grew better than with the addition of nitrogenous ingredients—besides the plant weighed four times as much in the former as in the latter case. But the plant in both cases was a frail pigmy, whose regular formation was very remarkable.

2. In that series of experiments in which no inorganic nor nitrogenous ingredients were added, a well proportioned dwarf plant was the result; but in the experiment where nitrogenous ingredients were added, and other inorganic ones withheld, the plant was not well proportioned, but had leaves of a very lively green, and were extraordinarily long; a single flower (blossom) was produced. Both plants when dry had the same weight.

3. In that series of experiments wherein *certain* inorganic ingredients were added, combined with nitrogenous ones, the plants were very thrifty. In an experiment with the same proportion of nitrogen, but an omission

of the other inorganic ingredients, the plant died in the first leaf. When any one of the inorganic ingredients mentioned in the experiments which produced thrifty plants were omitted, then the plants died in an early stage of development; or if they lived beyond it, were very feeble, pale in color and their entire formation abnormal.

4. When a greater proportion of certain inorganic ingredients were added to the carbon of sugar, or coal dust of sugar, without reducing the amount of nitrogen mentioned above, the result was a powerful assimilation and increase of blossoms. From these experiments we are led to conclude that inorganic ingredients in combination with nitrogenous ones, must exist in the soil to produce normal and powerful plants, and that certain inorganic elements are essential to the plant as nutriment.

5. If we combine with the enumerated inorganic ingredients silicic, phosphoric and sulphuric acid, and potash, lime and magnesia only (together with the nitrogenous salt), we find that the plant grows more rapidly than without them, but it remains very pale, feeble and abnormal.

6. But if we combine with this mixture a very small quantity of oxide of iron, then we find its effect upon the plant to be very surprising indeed—the plant now assumes a normal dark-green color, the leaves are of a luxuriant growth and proportionate strength; the whole plant has a healthy stiffness and robustness, and its weight is more than double that of one grown without the iron. Upon the whole the plant was abnormal; traces of dried spots were very manifest in the centre of the leaves; the stalk and capsule gave indications of an abnormal condition. An excessive proportion of iron increased the dessicated spots in the leaves, and prevented the formation of flowers.

7. When a small proportion of carburetted oxide of manganese was added to the above named composition, a powerful plant was grown, which exhibited no signs of dessication on the dark green leaves, but had a normally developed stem and powerful joints. Manganese appears to increase the assimilation of the plant; at all events the plant grown with manganese and iron weighed considerably more than without. But manganese produces an abnormity in the structure in the sheath of the last leaf, inasmuch as the latter appears to have turned on its axis, so as to render the breaking through, or expansion of, and the full development of the panicle difficult. In the stools or side shoots this abnormal condition was not manifest; hence the inference that it is caused by the quantity of manganese.

8. These experiments do not decide that soda is an *essential* ingredient, although its presence appeared beneficial, more especially when there is

an excess of manganese, inasmuch as it removes the abnormity caused by the manganese in the sheath of the last leaf. But if there is no potash in the mixture, then the opposite result takes place, inasmuch as the soda not only strengthens the turning of the last leaf sheath, but makes the leaf itself appear wound or twisted.

9. Up to a certain point, soda appears to neutralize the potash, although uniformly at the expense of the plant.

10. Magnesia cannot neutralize lime.

11. When phosphoric acid was omitted in the mixture, but silicic and sulphuric acid, potash, lime and magnesia retained, it was found that nitrogenous salts were much more effective, than when sulphuric acid was omitted and phosphoric added to the mixture. But in both these cases, although the plant was well proportioned, yet was exceedingly weak. The one which was grown without phosphoric acid, by some extraordinary freak produced a perfect seed; on the contrary, the one which was grown with phosphoric acid, but the sulphuric omitted, produced no fruit, although this acid enters very minutely into the composition of the plant or fruit. This to me indicates the importance of both these acids in relation to the assimilation of the nutrition of the plant. The importance of the sulphuric and phosphoric acids are more manifest when we compare the weights of the plants produced in these several experiments. The weight of the plant is found to be four times greater when both are present than when either is omitted.

12. When silicic acid was omitted, the plant did not stand erect, but reclined; it was a very smooth, pale, well proportioned dwarf.

When lime was omitted, the plant died in the second leaf. Without soda or potash, it attained the length of three inches.

Omitting magnesia, the plant remains feeble and *couchant.*

The plant was very weak and tender, although erect and normally formed when phosphoric acid was omitted.

It was weaker, although erect and well proportioned, but without fruit, when the sulphuric acid was omitted.

Without iron, the plant is pale, feeble and abnormal.

It will not attain its full strength, neither will it bloom profusely, without manganese. From these experiments with the carbon of sugar, it appears that: Silicic Acid, Phosphoric Acid, Sulphuric Acid, Potash, Lime, Magnesia, Iron, and Manganese, are the ash producing ingredients essentially necessary to produce the oat plant.

13. These experiments do not determine whether chlorine is, or is not essentially necessary in the production of this plant;—although the car-

bonate of sugar was washed and the inorganic ingredients free from chlorine (except in the case of the experiment made with sal. ammoniac), yet in two cases in the water which was extracted from the plants grown in the sugar coal dust, there were decided traces of chlorine, although too small in quantity to be measured. This chlorine was not derived from that of the seed, for the reason that there is a still much smaller quantity in the seed. The distilled water with which the plant was watered was distilled rather rapidly.

I will state in conclusion another experiment made with the coal dust of sugar, namely, an experiment which was conducted in a cast iron vessel, and therefore contained oxide of iron and manganese. The inorganic ingredients were the same as in the first experiment, with the exception to the coal dust was added some soda and chloride of soda. This experiment showed what ingredients were wanting in the others; because in this the plant was not only very vigorous, deep green, but bore five perfect seed grains, which successfully withstood the germinative test. Soda as well as iron, therefore, appear to be necessary in the formation of the oat fruit.

COMPARISON OF EXPERIMENTS WITH WHITE OATS, WHICH WERE NOT GROWN IN COAL DUST, WITH THE FOREGOING EXPERIMENTS:

These experiments were suggested by Alexander von Humboldt. They were made in the purest brook sand heated to a glowing heat, and combined with artificial silicic acid, and finally with rock crystal, so as to approximate somewhat to the natural soil. The inorganic additions were the same as in the preceding experiments, and the experiments themselves were conducted in the same manner—always omitting one of the component ingredients in order to test its effect or necessity. And here I would remark that basic-phosphorous oxide of iron, nitrate of soda, chloride of sodium, and nitrate of potassium, were added in several special experiments.

Cups made of filtered white wax, without any orifice in bottom or sides, were the vessels in which the experiments were made.

The result of these experiments may in brief be stated as follows:

1. In pure, well heated sand, without any inorganic or nitrogenous additions, the oat plant grew with normal structure and proportions, yet very small and tender.

2. The number of fruits were reduced to a solitary one, although the sand was not entirely free from silicates and traces of phosphorous oxide

of iron. In the absence of nitrogenous combinations, the assimilation of all atmospheric ingredients is greatly retarded.

3. With the addition of nitrogen—but without any other inorganic ingredient—to this sand, which contained traces of silicates, the plant grew higher, bore one blossom and one fruit more, than in the preceding case, but the stalk lost the power to stand erect. The same experiment in every respect made in pure, natural quartz, instead of brook sand, produced a plant with scarcely any stalk, and no flowers—the assimilation being apparently entirely prevented.

4. When nitrogen was omitted, but the following seven articles combined, viz: Silicic Acid, Potash, Lime, Magnesia, Oxide of Iron, Phosphoric Acid, and Sulphuric Acid, the plant remained very small and feeble, as in the first experiment, the flowering force much reduced, and the capacity for producing fruit ceased entirely; but instead thereof there appeared to be a disposition to produce another stalk by the side of the first. The result of vegetation in this case is therefore abnormal. Assimilation goes on very slowly—is scarcely perceptible.

5. When these seven inorganic ingredients were combined with a nitrogenous one, and administered as nutriment to the plant in a proper manner, then was the growth of the plant not only normal, but vigorous, and the flowers very much increased in quantity, but a normal termination of vegetation did not take place, notwithstanding a great propensity to grow side shoots. In this experiment it was found that assimilation went on very rapidly; thus demonstrating that the conditions of its success have been discovered.

6. When any *one* of the above enumerated seven inorganic ingredients was omitted, although the nitrogen was combined with the remaining six, it was found that the proper development was disturbed in a greater or less degree, in the following manner: When lime was omitted, the plant died in the second leaf, without giving any indication of forming a stalk.

Without magnesia, the stalk was not erect but couchant, feeble, color abnormal, the structure of the flowers changed, and the flowers deformed and without fruit.

Without potash the stalk was very short, feeble, couchant, color abnormal; flowers, reduced to a solitary one, and it very defective.

Without soluble silicic acid and without potash, the growth of the stalk was reduced to 3 inches, color abnormal, the leaves dying prematurely, and no flowers.

Without phosphoric acid, the stalk was very frail, couchant, color pale, flowers reduced to a solitary perfect one, no fruit, but a disposition to throw out side shoots.

Without sulphuric acid, no stalk formation—the plant died in the third leaf; a shoot was thrown out, but shared the same fate.

Without iron, the green color is wanting in a greater or less degree; the plant appears as though it were grown in a dark place—no flowers are formed, or else are very much deformed and very defective. (When aluminum was supplied the plant seemed to suffer the loss of iron in a less degree—the clay, however may have contained traces of iron.)

7. From this it appears that the above named seven inorganic substances are essentially necessary to the growth and development of the plant, even to the formation of the flowers, provided that the proper nitrogenous ingredients are present. These experiments do not, however, confirm the necessity of chlorine—in these experiments every accidental admixture with chlorine was carefully avoided by rinsing and cleansing; whilst the plants were watered with double distilled water; notwithstanding all this care, there were evident traces of chlorine in the plant, which could not possibly have proceeded from the seed, since there is not in a single seed sufficient chlorine to be detected.

These seven inorganic substances failed to produce fruit.

8. Sodium does not appear to possess the properties necessary to neutralize the potassium.

9. The greater portion of these results of experiments made in quartz and quartz sand, correspond very nearly with the results of experiments made with sugar coal. At the same time it must be remembered that the sand contained silicates, and contained very small proportions of phosphate of iron; the sugar coals on the other hand, were not altogether free from traces of inorganic substances as subsequent investigations proved.

The experiment with the sugar coals, omitting all inorganic substances other than nitrate of ammonia, proved to be very different from a similar experiment with quartz sand. It is very evident from the roots of the plant, that in the sugar coal experiment, entirely too much nitrate of ammonia was employed. Experiments with both the above bases prove that the results are greatly influenced by the proportion of iron which enters into the composition.

10. Manganese does not appear to be essentially necessary for the formation of fruit, especially when too much iron has not been employed. The question of the essentiality of manganese was exceedingly difficult to be decided in the sugar coal experiment, whilst the more powerfully absorbing qualities of iron in moist coal dust, render the proper determina-

tion of the relative proportions yet more intricate; thus in all the coal dust experiments, manganese appeared to be essentially necessary on account of the presence of the iron. (For the same reason is manganese necessary in a soil which has a comparatively large per centage of iron. In some soils it is found not unfrequently amounting to fully one per cent.)

11. When iron is in excess the growth of the stalk is abnormal, the leaves become dried with brown spots (iron spots) in various places, (corresponding with the experiments in coal dust with this difference, that in the latter experiment the color of the spots was varied.) The flowers are imperfect and dwarfed, and the fruit undeveloped. That iron is an essential ingredient in the soil, and that the plant requires an exceedingly small proportion of it, is manifest from the analysis of the ashes of a vigorous, normal and fruitbearing plant, produced in brook sand which had been heated to a red heat, then digested in muriatic acid and the necessary inorganic ingredients added afterward, with the exception of iron, a sufficient quantity of which was in the sand.

12. Phosphate of iron is found to be an excellent source of iron for the plant. When brook sand is employed oxyhydrate of iron may be added; the quartz will soon be found to be tinged with a greenish cast, caused by microscopic algæ, which announce the operation of the oxyhydrate.

13. Fluate of lime dwarfs the growth of the plant, and prevents flowering, even when added in very small quantities.

14. But when the above named seven inorganic ingredients were combined with the nitrogenous ingredients and added to the quartz, it did not produce a normal growth of fruit. It was in the test experiment only, with heated brook sand digested in muriatic acid that proved an exception to the general rule, and proves also that the failure of the former to produce fruit, is by no means attributable to the season, for the reason that both experiments were conducted at the same time. This test experiment proves also, that the seven ingredients, together with the nitrogenous elements in this case did produce fruit—they should, therefore, have produced the same result in the quartz, but as they failed to accomplished it in the latter case, we must conclude that the brook sand contained an inorganic substance essentially necessary for the formation and development of fruit which was not contained in any of the added ingredients.

15. Alumina appears to be such a fruit forming and developing ingredient as above mentioned; at least several experiments indicate such results. The experiment with hydrate of alumina produced two germinating seeds; that with artificial silicate of potassium and alumina produced two seeds having germinating properties; so also resulted the experiment with feldspar from Baveno. The experiment with scolecit from Iceland—composed

of silicic acid, lime, alumina, and water, soluble in a dilute acid—containing no trace of sodium, produced no fruit, which impairs the stress laid on the importance of silicate of alumina.

16. The experiment with 3 decigram. clay from almerode (slightly heated) which, although it produced five germinating seeds, appears to have contained, other and essentially necessary ingredients for the growth and development of the fruits, as the clay contained only about 6 centigrammes of alumina, and was not certainly any more soluble after being heated than was the hydrate of alumina in one of the former experiments, which produced fewer perfect fruits. The washed clay from almerode contains, according to Forchhammer, aside from silicate of alumina, about 13 per cent. of potassium, manganese, iron, and traces of chalk, and undoubtedly traces of sodium. In 0.3 grms. of washed clay of almerode, I found 0.0047 potassium and 0.0013 of sodium, therefore I am led to conclude that the sodium is the important agent.

17. The side-shoots or suckers merit special attention, as they appear to have an important relation to the formation and development of fruit. Whenever side-shoots made their appearance, it was invariably found to be after the vegetating period, as well as after the appearance of the fruit. They originate always either immediately before, or co-incident with the sterile flowers in all these experiments.

In the experiment with hydrate of alumina, as well as in the one with silicate of potassium and alumina, also in the one with feldspar from Baveno, in each of which experiments two germinating fruits were produced, the side-shoots made their appearance after the plants were in bloom; and in the experiment which produced five perfect fruits, they attained a respectable size. On the other hand, in the experiment with 3 decigram. of clay from almerode, which produced five perfect fruits, and singular as it may appear, two small projections made their appearance as side-shoots *after* the fruit had fully ripened. But finally it must be observed that in all test experiments in brook sand which produced 6, 8, or 9 perfect fruits, there were no traces of side-shoots. Now if we take into account the proportion of flowers to the perfect fruits, in connection with the number of side-shoots, as follows:

Experiment.	Flowers.	Fruits.	Side-shoots.
1. Hydrate of alumina	7	2	2
2. Clay from Almerode	8	5	2 smallest.
3. Feldspar from Baveno	4	2	2
4. Artificial silicate of potassium and alumina	6	2	2
5. Test experiment in brook sand	9	8	0
6. Same	8	6	0
7. Brook sand digested in muriatic acid	11	9	0

we	find	the	proportion	of	Flowers	in	2	cases	to	be	as	8	to	5
	"	"	"	"	Fruits	"	6	"	"	"		8	"	6

The proportion in these two experiments are so nearly equal as to be remarkable, and to excite some surprise that in the case of the brook sand all vegetation ceases with the ripening of the fruit, but in the experiment with the 3 decigram. of clay from almerode, mixed with quartz, vegetation did not cease with the ripening of the fruit, but produced after that period two small side-shoots.

From this it would appear that the 3 decigrams of clay from almerode, aside from the alumina, contained one or more inorganic substances which were essentially necessary to the formation of fruit, but not in sufficient proportion or abundance to produce a sufficient amount of fruit which should exhaust the normal vegetative power coincident with the ripening of the fruit.

18. The experiment with the 3 decigrams of washed clay from almerode, which was heated in the open air, is one of singular as well as peculiar importance. It furnishes us with the extreme proportion of inorganic substances contained in 3 decigrams of clay essentially necessary to perfect fruit—under these conditions. It is very clear that the energy or force of the elements were not exhausted in forming and perfecting the 5 fruits, from the fact that sufficient vegetative force and material yet remained to form two small side-shoots. If there had been a sufficient surplus of vitality or vegetative force, it would have found its way to, and have perfected the remaining two flowers; by referring to experiment 7, it will be seen that sufficient of the other inorganic elements were present.

19. A very singular phenomenon was exhibited in an experiment in well heated brook sand, which in addition to the usual addition of inorganic ingredients, contained chloride of potassium and carbonate of sodium. In this case the side-shoots made their appearance at a peculiar period, namely, before the stalk which bore the fruit panicle was developed. This is precisely what takes place in practical agriculture when the oats are sowed on a rich and strong soil, and it is also found by experience that the fruit increases in proportion to these side-shoots.

From this it is very evident that 0.005 grms. of chloride of potassium, and 0.001 of carbonate of sodium, either singly or combined, produced fruit and side-shoots, because a cotemporaneous experiment was conducted in brook sand without these ingredients, in which the phenomenon of fruit and side-shoots did not take place. This experiment is important, inasmuch as it serves to show that in either the chloride of potassium or carbonate of sodium the necessary elements for the formation and development of fruits are contained. But which of these two ingredients supplied the necessary material for fruits, future experiments must determine. It is remarkable, however, that when the experiment was conducted in pulverized flint, even with the addition of the above named two ingredients, no fruit was produced.

20. The appearance of side-shoots coincident with the flowering period, or after the maturity of the fruit, is indicative of a total or partial want of the proper ingredients to form fruits. If this exponent were not strictly observed, the 1st and 2d experiments might serve to mislead rather than guide us correctly; because in these experiments we might be inclined to ascribe the fruit formative elements to the alumina; but upon a more minute examination it will be seen that the alumina is entirely inessential to this end. It is, however, not only not impossible, but highly probable that a trace of sodium was contained in the alumina, or silicate of potassium and alumina, which alone was the cause of the formation of the fruit. No traces of sodium could be found in the ashes of the plants which were grown in alumina, from which all other elements had certainly been expelled.

As an annual plant, the oat must cease vegetating the moment its fruit has ripened, and when we shall have diecovered the exact proportion as well as the precise number and quality of the ingredients to produce this result, we shall have attained the object of these experiments.

21. A small, clear drop or globule resembling dew was formed on the end of the first leaf, at the time of its first appearance, but as the leaf became more fully developed the globule disappeared. It was found on the first leaf only. It made its appearance daily just after sunset, but during the night increased somewhat in sise, but evaporated the next day, except when the air was moist and damp; it then remained the entire day. It contained a large per centage of gum; in the experiments conducted in sugar coal dust, without the addition of any inorganic ingredients other than 0.004 grm. of nitrate of ammonia, the globule was remarkably abundant in gum. This globule made its appearance on the end of the first leaf in *every experiment.*

After the evaporation of the drop, a gummy substance as residuum may be seen at the extremity of the leaf during the day time. That this phenomenon is independent of the soil in which the plant is grown, is certainly evident from the fact that it was observed on the plants grown in sand, as well as in those grown in brook sand, in quartz, and in sugar coal dust. The fruit which was obtained from an experiment made in sand with nitrate of ammonia, without any other inorganic substances, was planted in the same ingredients, and the first leaf again produced the globule, which remained longer during the day time than the others. The entire phenomenon is sometimes completed in two days.

22. A singular phenomenon occurred during an experiment to test the germinative properties of fruits grown in hydrate of alumina; there was an abnormal development of the first leaf, as it came forth from its sheath; it retained, although fully an inch long, its tubular or cylindrical form without spreading at the end. This abnormality is indicative of a disturbance in the development of the roots, which did not occur in testing the vegetative properties of the 5 fruits grown in the almerode clay.

23. There were 0·02 grms. of nitrate of ammonia diluted in 15 grms. of distilled water, and added to a plant which had developed its first and second leaves in pulverized quartz, to which were added the usual inorganic ingredients. The result was the destruction of the plant, after becoming covered with yellow spots. Whatever inorganic elements it is intended to furnish the plant from ammonia, must be introduced into the soil before germination commences, or else dilute it in the proportion of ·01 grm. of nitrate of ammonia to 50 grms. of distilled water; apply in sprinkling the compound, answering the place of soil, otherwise the organism, particularly in the development of the roots, becomes disturbed.

24. Since the plant itself is the best analyst of the soil, and by its development testifies to the condition of the soil much more correctly than any artificial analysis by chemists possibly can determine, it certainly is desirable that practical agriculturists adopt some method similar to this series of experiments, that is, take a number of water-tight vessels, fill them with soil from the same spot, then add a different inorganic ingredient to each vessel, plant seed therein and note the differences, and observe the effects of the ingredient added.

25. Experiments in silica, prepared from silicate of potassium, thoroughly washed and heated to a white heat, has failed to produce a plant. Even with the addition of all the inorganic substances usually employed, it produced a very weak and dwarfish plant only. It appears that the fine laminae of the silica are entirely too light, the roots elevating them in every direction, while the roots themselves appear to be little else than elongated air bladders, which soon collapse and the plant dies.

26. More recent experiments indicate that sodium is of essential import-an e in the formation of fruit in the oat plant.

27. With regard to iron, it is necessary to remark that in the ashes of a plant grown in a basis containing phosphate of iron, there was no great

difficulty in tracing iron in combination with sulphuric acid in the ashes of the plant; but chemical analysis would never have indicated the essential part performed by iron in the formation and development of fruit, if the synthetic system had not been adopted.

EXPERIMENT WITH SPRING BARLEY.

The experiments with this plant were conducted solely to determine the requisite inorganic ingredients to produce and develop fruit. They were conducted in waxen vessels, and in all other respects conducted as were the experiments with the oat plant. The composition of the artificial soil is here repeated, so that the reader can see how it compares with the preceding ones:

65.000	grms.	well heated brook sand, fully oxydized, but not washed.	
0.1	"	carbonate of lime.	
0.04	"	super phosphate of lime.	
0.03	"	sulphate of lime.	
0.02	"	carbonate of magnesia.	
0.02	"	nitrate of posassium.	In 15 grms. of distilled water.
0.018	"	silicic acid. } dissolved.	
0.009	"	potassium.	

The development of the plant was normal. The stalk was 19 inches long, produced eight blossoms, each one of which produced a perfect fruit, which possessed all the requisite germinative properties. This experiment served as a test.

The composition of an artificial soil, in which sodium is entirely omitted is here presented:

65.000	grms.	coarsely pulverized mountain crystal, carefully washed.
0.50	"	carbonate of lime.
0.06	"	super phosphate of lime.
0.03	"	sulphate of lime.
0.05	"	basic phosphate of iron, heated with mountain crystal.
0.02	"	nitrate of potassium dissolved in 15 grms. distilled water.
0.001	"	carbonate of magnesia.

The seed planted in this composition was obtained from a barley plant which was grown entirely without sodium, but most certainly in cleansed brook sand. The stalk was 12 inches long. The ear or spike remained sheathed in the upper leaf, was undeveloped; bore neither blossom nor fruit. It must be remarked, however, that in the experiment which produced the seed employed in the above experiment, chloride of sodium was so intimately combined with the brook sand, as not to be entirely inseparable, even after the most thorough treatment. It would then appear that the chloride of sodium in the preceding experiment served the purpose of forming and developing the fruit. Two more experiments with this plant appear to be worthy of notice:

First.—Without sodium. The same composition with mountain crystal as in the preceding experiment. Stalk 9 inches long, the ear or spike not visible, without flowers and without fruit. Although it was regularly watered, the plant gradually died. No side shoots.

Second.—With sodium. The same inorganic composition as in the last experiment, with the addition of 4 milligrams of nitrate of sodium. Stalk 16 inches long, normal, the entire ear visible, with long beards but without pollen sacs, without blossoms and consequently fruitless.

RESULTS.

From the fourteen experiments which were made with barley, it appears that another ingredient aside from sodium, is necessary for fruit formation and development, which the plant found in brook sand, because in this latter it bore fruit—the essential ingredient was a chloride. Later experiments prove most incontestibly that iron is absolutely necessary in the structure of the stalk.

EXPERIMEMTS WITH WINTER WHEAT.

In well heated brook sand, but not washed, digested or triturated, but with the addition of the usual inorganic ingredients, together with nitrate of potassium, fruit was produced.

In carefully washed brook sand, which was afterward digested in boiling dilute sulphuric acid, to which the usual ingredients were added, but sodium and chlorine omitted, the stalk was weak and decrepid, and produced neither flowers nor fruit.

In the same artificial soil, with sodium added, the stalk attained the length of 21 inches, produced 34 leaves, bore three flowers and two perfect fruits.

No globule or dew-drop was found on the wheat plant, as was on the oats and barley, in the experiments with them. The experiments with the wheat plant indicate the necessity of sodium for the formation and development of fruit. Eighteen experiments were made in the wheat plant, all however, in brook sand, digested in sulphuric acid; the most important of these experiments are the following:

EXPERIMENT FIRST—*without soda and without chlorine.*

65.000 grms. crystalized quartz—the finest powder removed by washing.*
0.02 " nitrate of potassium dissolved in 15 grms. of distilled water.
0.1 " carbonate of lime.
0.05 " super phosphate of lime.
0.02 " sulphate of lime.
0.02 " carbonate of magnesia.
0.04 " basic phosphate of oxide of iron heated with the quartz.
0.001 " carbonate of the oxide of manganese.

The plant died whilst in the sixth leaf, without any stem or flowers, thus showing the necessity of sodium.

For the sake of brevity in the following experiments, the annexed names of six salts will be designated by that of "the usual salts," viz:

Nitrate of potash, carbonate of lime, phosphate of lime, sulphate of lime, carbonate of magnesia, carbonate of manganese.

EXPERIMENT SECOND—*with nitrate of sodium.*

One milligram of nitrate of sodium dissolved in 15 grms. of distilled water "the usual salts," added when the plant was in the third leaf. The plant died, in the seventh leaf without stem. The last three leaves had the appearance of bristles rather than anything else. The roots were exceedingly delicate.

3d Experiment, with 5 milligrams of nitrate of sodium, together with "the usual salts." The plant died without forming any stem, and the last leaves were again like bristles. The cause in this case may be attributed to the fact that the plant germinated in a compound destitute of sodium.

4th Experiment, with same substances and the "usual salts," with the addition of 1 milligram of chloride of sodium. Plant died without forming stalk—it had germinated in a compound destitute of sodium.

The last three experiments do not indicate the necessity of the presence or absence of sodium, probably because they were made in an inverted manner; yet these experiments possess a scientific interest, as they seem to demonstrate the influence which the sodium exerts upon the activity of the component parts of the germinating seed.

5th Experiment, without nitrate of sodium, with chloride of sodium. The chloride of sodium was in this case added before germination took place, and from this cause, it is presumed, that the stalk attained the

* The finest powder of the pulverized quartz was necessarily removed, in order to remove as far as possible all the chloride of potash and chloride of soda, which is inherent in the crystallized quartz. These chlorides have invariably been found in German, French and American crystals.

height of 14 inches. It bore no perfect blossom, the flowering portion of the defective ear consists of two bearded chaff-like scales. The plant had 15 leaves, was abnormal, but important. The "usual salts" were of course added.

6th Experiment, omitting iron, but substituting 5 milligrams of nitrate of sodium and one milligram of chloride of sodium, together with the "usual salts." The stalk was without an ear, delicate, sent out two suckers in the early part of its existence, but which produced no stalk. The compound was completed before the seeds were put in to germinate. The absence of iron is here readily discernable.

7th Experiment, omitting iron and manganese. Five milligrams of nitrate of sodium, and one milligram of chloride of sodium were in the compound, together with the "usual salts." The plant remained without stalk and without bloom. The leaves were of a lively green. The necessity of manganese for the growth of the stalk in this case, seems very manifest. The elongation of the first sprout consumed an extraordinary amount of time.

8. Experiment omitting iron, manganese, sodium, chlorine, but with the "usual salts." The plant produced seven green leaves, but produced neither stalk nor bloom.

9. Experiment with the addition of iron, manganese and the "usual salts," together with 3 milligrams of nitrate of sodium and one-half milligram of chloride of sodium. This plant exhibited extraordinary tardiness during the stalk formative period; it remained absolutely in *statu quo* during six weeks, when there was added 1-5 of a milligram of sulphate of iron dissolved in 14 grms. of water. In a remarkably short period of time the stalk "shot up" to the height of 9 inches; but the plant died from defective watering. It was, however, manifest that no flowers were to be formed.

RESULTS.

From the contradictory results in the foregoing experiments, it is very manifest that another ingredient is essential to this artificial soil in order to produce the flowers; and the disparity in these results can be fully understood and investigated when the undetermined ingredient shall have been discovered. Oxide of iron, oxide of manganese and chloride of lime appear to be essential, but yet not sufficient to produce the flowers.

EXPERIMENT WITH SPRING WHEAT.

The quartz in this experiment was digested in muriatic acid, because it appeared to be of a slightly ferruginous nature;—it was afterwards washed very carefully and dried. Omitting iron and chlorine.

65·000 grms. quartz,
0·035 Silicic acid,
0.018 Potassium, liquified by heat,
0·02 Nitrate of potash,
0·005 Nitrate of sodium,
0·002 Nitrate of ammonia,
0·1 Carbonate of lime, dissolved in 15 grains of distilled water.
0·05 Super phosphate of lime,
0·03 Sulphate of lime,
0·02 Carbonate of magnesia.

The plant was normal and green, 13 inches long, bore 5 flowers, without anthers, and consequently without fruit. Notwithstanding the severe trituration and digestion of the quartz in muriatic acid it yet contained enclosed within its small particles, glimmerings of iron, hence this experiment is important as serving to show that very little iron is sufficient to produce the desired result.

EXPERIMENT WITH WINTER RYE.

This plant conducted itself strangely, according as it was placed to enjoy the morning or noon-day sun only.

There were several experiments made with fine brook sand, the other ingredients being the same. Two of the experiment vessels were so situated at a window as to enjoy the morning sun only; whilst two others were placed at another window so as to enjoy the noon-day sun only. These plants all bloomed; those which enjoyed the noon-day sun produced fruit whilst those placed at the east window produced none. These experiments I have repeated several times, and always with the same results. The cause is not very manifest for this singular phenomenon, if it is not to be found in the fact of polarization of light by the glass in the window, and the additional fact that the chemical or actinic rays prevail to a much greater extent at noon than in the morning.

In all these experiments with winter rye as well as with the winter wheat, no drop was apparent at the extreme point of the young leaflet, as there was in the oats and barley.

In one experiment only with mountain crystal were plants obtained which bore flowers, but which produced no fruit. The ingredients were: nitrate of potassium, carbonate of lime, phosphate of lime, sulphate of lime, carbonate of magnesia, basic phosphate of oxide of iron, carbonate of manganese. This composition contained no sodium. In all the other experiments with mountain crystal, with the addition of nitrate of sodium, chloride of sodium, phosphate of oxide of iron, as well as when the oxyde of iron and nitrate of sodium were omitted, and also when nitrate of sodium and chloride of sodium were mingled, I obtained no flowers at all.

EXPERIMENTS *with a view of ascertaining what inorganic ingredients are necessary to be added to the barren, virgin soil of Westphalia to make i fertile.*

The virgin sandy soil for experiment was obtained from immediately beneath the depth attained from the surface by the forest weeds. The quantity necessary for experiment, was carefully dried and then thoroughly mixed, then 65 grammes were placed in each of the wax-coated vessels for experiment after having been thoroughly mixed with ingredients to be added. The plant selected for experiment was the white oat.

A single grain was all that was retained in each experiment, that one which germinated the best was the one used; distilled water was the kind used. 1st. Without any of the artificial compounds it produced a very weak and delicate plant. 2d. When 0·01 grms. of carbonate of ammonia was added; it produced a plant which died in the second leaf. 3d. When 0·05 grms. of phosphate of lime was added to the ammonia named in the preceding experiment, a very tender and sickly plant was produced, in which one leaf died as fast as another was produced. 4th. When 0,02 grms. of nitrate of potassium was substituted for the carbonate of ammonia, but the other ingredients the same as the preceding experiments, an exceedingly weak plant was produced, the fourth leaf of which became yellow spotted. 5th. With 0·01 grm. of nitrate of potassium only, the plant attained the length of 3 inches, but was very feeble. 6th. With 0·02 grms. nitrate of potash and 0·03 grms. sulphate of lime, the plant pro duced was very weak. 7th. With 0·05 grms. superphosphate of lime, 0·03 grms. of sulphate of lime and 0·02 grms. nitrate of potash a very vigorous plant was produced, with broad dark green leaves and strong stalk. 8th. With 0·1 grm. of carbonate of lime, 0·05 superphosphate of lime, 0·01 sulphate of lime and 0·02 nitrate of potash, the plant was very vigorous. 9th. With 0·05 grms. superphosphate of lime, 0·03 sulphate of lime, 0·02 carbonate of magnesia and 0·02 of nitrate of potash, a very vigorous plant was produced. The result of these experiments indicate that not only is phosphate of lime wanting to make this barren soil fertile, but that sulphate of lime and potash are equally essential.

These experiments are peculiarly interesting, inasmuch as they prove most conclusively that superphosphate or phosphoric acid is not the *only* ingredient necessary to fertilize the soil.

After all, the plant itself is the best chemist to analyze the soil, and for the practical agriculturist (with his present knowledge on the subject) is certainly the most unerring.

It may not be inappropriate in this connection to insert the following, referred to by Liebig in his Agricultural Chemistry:

EXPERIMENTS OF WIEGMANN AND POLSTORF.

The composition of the artificial soil used in the experiments of Wiegmann and Polstorf, on the organic ingredients of Plants, was as follows (Preischrift, p. 9):—

Quartzy sand	861·26
Sulphate of potash	0 34
Chloride of sodium	0·13
Gypsum (anhydrous)	1 25
Chalk (elutriated)	10·00
Carbonate of magnesia	5·00
Peroxide of manganese	2·50
Peroxide of iron	10 00
Hydrated alumina	15·00
Phosphate of lime	15 60
Acid of peat with potash*	3·41
" " soda	2 22
" " ammonia	10 29
" " lime	3 07
" " magnesia	1 97
" " peroxide of iron	3 32
" " alumina	4 64
Insoluble acid of peat	50·00

The following experiments were instituted in pure sand, and in the artificial soil:—

VICIA SATIVA.

A.—*In Pure Sand.*

The vetches attained by the 4th of July a height of ten inches, and seemed disposed to put out blossoms. On the 6th of the same month, the

* This salt was made by boiling common peat with weak potash ley, and precipitating, by means of sulphuric acid, the dark-colored solution. This precipitate is that termed Torfsaeure (acid of peat), in the above analysis. The salts of this acid, referred to in the analysis, were obtained by dissolving this acid in potash, soda, or ammonia, and by evaporating the solutions; the salts of magnesia, lime, peroxide of iron, and alumina, were obtained by saturating this solution with their respective bases, by which means double decomposition was effected. HUMUS is the substance remaining by the decay of animal and of vegetable matters, which are seldom absent from a soil. This was replaced by the acid of peat in the experiments of Wiegmann and Polstorf. When the acid of peat is boiled for some time with water, it passes into an insoluble modification denoted above as insoluble acid of peat.

blossoms unfolded; and on the 11th they formed small pods, which, however, did not contain seeds, and withered away by the 15th. Similar plants, which had already begun to have yellow leaves below, were drawn with their roots out of the sand, the roots washed with distilled water, and then dried and incinerated.

B.—*In Artificial Soil.*

The plants reached the height of eighteen inches by the middle of June, so that it became necessary to support them with sticks; they blossomed luxuriantly on the 16th of June; and about the 26th put out many healthy pods, which contained on the 8th of August ripe seeds, capable of germinating. Similar plants to the above were taken with their roots from the soil; they were then washed and incinerated.

HORDEUM VULGARE.

A.—*In Pure Sand.*

The barley reached on the 25th of June, when it blossomed imperfectly, a height of 1¼ foot, but it did not produce seed; and, in the month of July, the points of the leaves became yellow; on which account, on the 1st of August, we removed the plants from the soil, and treated them as before.

B.—*In Artificial Soil.*

The barley, by the 25th of June, had reached a height of 2 1-4 feet, by which time it had blossomed perfectly; and yielded, on the 10th of August, ripe and perfect seeds; upon which the plants, together with their roots, were taken from the soil, and treated as formerly.

AMENA SATIVA.

A.—*In Pure Sand.*

The oats on, the 30th of June, were 1 1-2 foot in height, but had blossomed very imperfectly; they did not produce fruit; and, in the course of July, the points of their leaves became yellow, as in the case of the barley; on which account the stalks were removed from the soil on the 1st of August, and treated as formerly.

B.—*In Artificial Soil.*

The oats reached 2 1-2 feet on the 28th of June, having blossomed perfectly. By the 16th of August they had produced ripe and perfect seeds; the stalks and roots were, therefore, removed from the soil, and treated as above.

POLYGONUM FAGOPYRUM.

A.—*In Pure Sand.*

The buckwheat, on the 8th of May, seemed to flourish the best of all the plants grown on pure sand. By the end of June, it had reached a height 1 1-2 foot, and branched out considerably. On the 28th of June, it began to blossom, and continued to blossom till September, without producing seeds. It would certainly have continued to blossom still longer, had we not removed it from the soil on the 4th of September, as it lost too many leaves: it was treated as before.

B.—*In Artificial Soil.*

The buckwheat grew very quickly in this soil, and reached a height of 2 1-2 feet. It branched out so strongly, that it was necessary to support it with a stick; it began to blossom on the 15th of June, and produced perfect seeds, the greater number of which were ripe on the 12th of August. On the 4th of September, it was taken from the soil along with the roots, and treated as before, on account of losing too many leaves from below; although it was partly still in blossom, and with unripe fruit.

NICOTIANA TABACUM.

A.—*In Pure Sand.*

The tobacco plant sown on the 10th of May did not appear till the 2d of June, although it then grew in the normal manner; when the plants had obtained their second pair of leaves I removed the superfluous plants, leaving only the five strongest specimens. These continued to grow very slowly till the occurrence of frost in October, and obtained only a height of five inches, without forming a stem. They were removed along with their roots from the sand on the 21st October, and treated as the above.

B.—*In Artificial Soil.*

The tobacco sown on the 10th of May came up on the 22d of the same month, and grew luxuriantly. When the plants obtained the second pair of leaves, I withdrew the superfluous plants, and allowed only the three strongest to remain. These obtained stems of above three feet in height, with many leaves; on the 25th of July they began to blossom; on the 10th of August they put forth seeds; and, on the 8th of September, ripe seed capsules, with completely ripe seeds, were obtained. On the 27th of October, the plants were removed from the soil, and treated as above.

TRIFOLIUM PRATENSE.

A.—*In Pure Sand.*

The clover, which appeared on the 5th of May, grew at first pretty luxuriantly, but reached a height of only 3 1-2 inches by the 15th of October, when its leaves became suddenly brown, in consequence of which I removed it from the soil, and treated it as above.

B.—*In Artificial Soil.*

The clover reached a height of ten inches by the 15th of October; it was bushy, and its color was dark green. It was taken from the soil, in order to compare it with the former experiments, and was treated in the same way.

CONSTITUENTS OF THE ASHES OF THE SEED.

100 parts of dry seeds yield—

	Soluble in water.	Soluble in muriatic acid.	Silica.		Ashes in 100 parts.
Vicia fabia	1·562	0·563	0·442	=	2·567
Hordeum vulgare	0·746	0·563	1·123	=	2·432
Avena sativa	0·465	0 277	2·122	=	2 864
Polygonum fagopyrum	0·823	8·547	0·152	=	1·522
Trifolium pratense	1·218	3·187	0·282	=	4·687

CONSTITUENTS OF THE ASHES OF THE PLANTS GROWN IN PURE SAND AND IN THE ARTIFICIAL SOIL.

		Soluble in water.	Soluble in muriatic acid.	Insoluble in water and muriatic acid (Silica).		Ashes.
Vicia sativa, 15 grms plants, dried in air	In sand	0 516	0·375	0·135	=	1·026
	In artificial soil	0 693	0 821	0·320	=	1·834
Hordeum vulgare, 12·5 grms. plants	Sand	0 123	0 195	0·355	=	0 673
	Soil	0·167	0 226	0·487	=	0·880
Avena sativa, 13 grms. plants	Sand	0·216	0·024	0 354	=	0 594
	Soil	0·225	0·030	0·461	=	0 746
Polygonum fagopyrum	Sand (12 grms. plants	0·086	0·094	0·045	=	0·225
	Soil (12·7 gr plants	0·148	0·226	0·133	=	0 507
Nicotiana tabacum	Sand (4 grms plants)	0·223	0·252	0·031	=	0·506
	Soil (12·5 plants)	1·146	2·228	0·549	=	3·923
Trifolium pratense, 14·5 grammes plants	Sand	0·522	0·350	0·091	=	0 963
	Soil	0·659	0 943	0·082	=	1·684

The preceding numbers express the unequal weight of mineral nutritive substances taken up from the sand and artificial soil by equal weights of the different plants mentioned. The absolute and not the relative weight of the component parts of the ashes is given. For example, the five tobacco plants grown in sand gave 0·506 gr. in ashes, whilst the three which grew in the artificial soil gave 3·923; five would, therefore, have given 6·525 gr. The proportion of the mineral ingredients taken up by five tobacco plants from the sand, and that taken up from the artificial soil by an equal number of plants, is as 10 : 120. In an equal space of time, those which grew in the artificial soil absorbed nearly thirteen times more of inorganic ingredients than those in the sand, and the whole development of the plant was exactly in proportion to the supply of food. Wiegmann and Polstorf subtracted the ashes of the seed used from the numbers in the last line, which show the amount of ashes in a given weight of the grown plant; but this has caused a small error in the numbers, as all the plants grown in the sand were reduced to ashes, and a corresponding amount only of those grown in the artificial soil. The weight of the seed of every plant grown was 3 grammes, if we except the tobacco, which was not weighed.

Table showing the Amount of Moisture in the Vegetable Substances analysed in the Experiments of Boussingault.

	Subst. dried at 110° C.	Water.		Subst. dried at 110° C.	Water.
Wheat	0·855	0·145	Beet	0·122	0·878
Rye	0·834	0·166	Turnips	0·075	0·925
Oats	0·792	0·208	Helianthus tub...	0·208	0·792
Wheat straw	0·740	0·260	Peas	0·914	0·086
Rye straw	0·813	0·187	Pea straw	0·882	0·118
Oat straw	0·713	0·287	Clover stalk......	0·790	0·210
Potatoes	0·241	0·759	Stalk of Hel. tub..	0·871	0·129

The foregoing are practical demonstrations of the part played by each inorganic substance, and the proof is conclusive that without inorganic substances and certain other conditions, such as temperature, atmosphere, light, &c., plants cannot attain to perfection.

Unfortunately for the immediate interests of Agriculture, there are two parties, each claiming that the opponent is laboring under erroneous impressions. The one party is Liebigian, or followers of Liebig, who believe that mineral manures are a *sine qua non* to successful agriculture, whilst the opponents (who are chiefly to be found marshaling under the banner of Messrs. Gilbert & Lawes, of England,) are advocates of organic manures. The experiments of Salin Horstmar, and those referred to by Liebig, are not introduced into this report with the view of interfering with the discussion or investigation of the parties, but as a record of a series of experiments, which, in the opinion of the writer, have been made in the right direction, and in the same spirit and with the same intent, the following extract from experiments, by Messrs Gilbert & Lawes, is introduced:

The composition of the grain yielding the most important article of human food in temperate climates, its yield of valuable products, and the varying composition either of the grain itself, or of these products, according to the conditions of growth, or the circumstances of after preparation, are subjects worthy the attention equally of states and of men of science. Accordingly we find, that a chemical examination of wheat-grain and its products, has from time to time been undertaken by chemists of repute; sometimes as a matter of private investigation, and at others of public inquiry; and almost as numerous as the names of experimenters, are the special lines of research which they have selected.

We are indebted to Beccaria for the first notice, more than a century ago, of the gluten in wheat. Among the earlier investigators of the subsequent period, are, Proust, Vauquelin, De Saussure and Vogel, who have examined the proximate principles, and some of the changes to which they are subject, in various descriptions of wheat, of flour, or of bread. M. Boussingault has somewhat elaborately studied various branches of the subject more recently; and we are indebted to Dumas, Payen, Johnston, and Dr. R. D. Thomson for original, as well as a considerable amount of collected information. The most recent, on some points the most detailed, and from advance in methods, perhaps on some also the most reliable, are the results of M. Peligot, in 1849, on the proximate constitution of various kinds of wheat, and of M. Millon in 1849 and 1854, on somewhat similar points. Lastly, in 1853 M. Poggiale, and in 1855, Dr. Maclagan, have given the results of their investigations on the characters and composition of bread.

Besides these more general investigations, we have had in recent times many special inquiries connected with our subject. Thus, M. Boussingault has given us an analyses of the ashes of wheat; and many other such analyses have been made in Germany, and elsewhere, since the first appearance, in 1840, of Baron Liebig's work on "Chemistry in its Applications to Agriculture and Physiology." In this country, Mr. Way has given us the most extensive series of wheat-grain-ash analyses, his list including those of 26 specimens or descriptions.

The plan of our own investigation, which unfortunately has been much less perfectly filled up than we at first intended, was entered upon more than a dozen years ago, and was devised with reference to the following points:

1st. The influence of varying characters of season, and of various manuring, upon the organic and mineral composition of wheat grain.

2d. The characters of varieties, especially in relation to their adaptation, and the qualities they then develop, under the influence of broader distinctions as to locality, altitude, latitude, and varying climatic circumstances generally.

It is in the second branch of the inquiry that we have fallen the furthest short of our intentions. With a view to its prosecution, a journey through the chief corn growing districts of Europe, commencing at the northernmost point at which wheat is grown successfully, was about to be undertaken in 1848; but the social disturbances on the continent at that period, necessarily prevented it. The plan proposed was—to collect information, as to the geological and meteorological characters of the various localities, as to the mode of culture, and as to the general average yield, both in straw and grain; and lastly, to procure characteristic specimens for chemical examination at home. Failing entirely in the execution of this design, the Exhibition of 1851 was looked forward to as an opportunity for procuring specimens not only of wheat, but of other vegetable products, and perhaps also important particulars of their growth, from various countries and climates. Such, however, was the division of authority, and such the alleged preference given to public institutions in such matters, that, whether the latter benefited or not, the collection which we, as private individuals, were enabled to make, was entirely inadequate to our object. From these difficulties it is, that our second main object of inquiry was necessarily to a great extent abandoned; and chiefly for this reason, but partly owing to the pressure of other subjects; the first or more limited or local branch of the investigation has in recent years been but imperfectly followed up. And, as it is probable that it must for some time remain so, it has been thought desirable thus to put on record the results already obtained; hoping that they may serve the double purpose, of confirming or adding to previously existing knowledge, and of indicating to others the points most requiring further study.

The following is a brief outline of the plan of investigation which has yielded the results which we have now to lay before the society:

From the season 1843–4, up to the present time, wheat has been growing in the same field continuously, both without manure, by ordinary, and by various chemical manures. As a general rule, the same description of manure has succeeded year after year on the same plot of land. The amount of produce, corn, straw, and chaff, and its characters as to weight per bushel, &c., have in every case, been carefully ascertained and recorded. Samples from each plot—both grain and straw—have also been collected every year. Of each of these samples two weighed portions are coarsely ground; the *dry matter* determined at a temperature of 212 °; and the *ash* by burning on sheets of platinum, in cast iron muffles arranged for that purpose.* Other weighed portions of grain and straw are partially dried, so as to prevent their decomposition; and in this state they are preserved for any examination of their organic constituents. By this course of procedure, a vast mass of results has been obtained, illustrating the influence of season and manuring, upon the per centage of dry substance, and of mineral constituents, in the produce. In selected cases, the *nitrogen* in the grain, and in the straw, has been determined. A summary table of these dry matter, ash, and nitrogen results, will be given below. In from twenty to thirty cases complete analyses of the grain-ashes have been made, and the results of these will be given in full.

Besides the experiments above described, in selected cases, chiefly from the produce of the earlier years of the field experiments, it was sought to ascertain the comparative *yield of flour*, and also the characters of the flour, of grain grown by different manures in the same season, or by the produce of different seasons. The *colonist's steel handmill* was first had recourse to for this purpose. But it was soon found, that it was extremely difficult so to regulate the machine, as to secure uniform action upon the different grains; and it was further found, that the grain, and especially the bran, was cut up rather than crushed, so as to leave too much of flour in the portion separated as bran, and too much of bran in that separated as flour; and hence the results were not sufficiently comparable with those of the ordinary mill. Arrangements were therefore made for prosecuting the inquiry at a flour mill in the neighborhood, worked by water power. Weighed quantities of the selected samples (from 125 to 250 lbs. each,) were passed through the stones, and the "*meal*" thus obtained, through the dressing machine, under our own personal superintendence; great care being taken to clear from the different parts of the apparatus the whole of one lot, before another was commenced upon.

The yield in the dressing machine of each of the different products was ascertained, and its per centage in relation to the total grain or its "meal," has been calculated. Portions of each of these products have had their dry matter (at 212 °,) and their mineral matter (by burning on platinum,) determined. The percentage of nitrogen in a few selected series—from the finest flour down to the coarsest bran—has also been estimated; and

* The dry matter and ash, were not determined in such complete series in the earlier years, as in the later.

in the same cases, the amounts of one or two of the more important constituents of the ash have also been determined. The results of these dry matter, ash, nitrogen, and constituent of ash determinations, in the series of different products obtained in the mill, will be given in tables further on.

The original design, was to complete the examination of the mill products, by determining in several series of them, the per centage of each of their proximate organic principles; and also the amount and composition of mineral matters, associated with them respectively. It was hoped, by this latter inquiry, to obtain important collateral information, bearing upon the influence of various constituents upon the healthy and special development of the plant. Although, however, specimens of the flour are preserved for this purpose, as well as the ashes of each crude product, it is feared that this subject cannot be proceeded with, at least for a considerable time to come.

Portions of the different products of the dressing machine (including more or less of the finest flour, of the more granular, or of the more branny particles respectively,) from grains of somewhat various history of growth, have been experimented upon to ascertain their comparative bread-making qualities; and these results, together with a few examinations of baker's bread, and a discussion of the results of other experimenters, as to the yield of bread from a given amount of flour, and the per centage of water and of nitrogen in the former, will be given below.

With this short outline of the plan of investigation which has been pursued, we proceed now to a discussion of the results which have been obtained.

In Table I. are given, in the first four columns, certain prominent characters of the produce of each of ten years of the successive growth of wheat as above described. The items are:—

The total produce per acre (corn and straw,) in lbs.;
The per cent. of corn in the total produce;
The per cent. of dressed corn in the total; and,
The weight per bushel of dressed corn in lbs.

The figure given for each year, generally represents the average of about 40 cases; and the characters enumerated are the best which can be given in a summary and numerical form, to indicate the more or less favorable condition of the respective seasons for the healthy development of the crop, and the perfect maturation of the grain.

In the second set of three columns are given, side by side with the general characters just described, the per centages in the grain of each year:—

Of dry substance;

Of ash in dry substance; and,

Of nitrogen in dry substance;

the two former items being in most cases the average of 30 to 40 cases in each year; but the per cent. of *nitrogen*, is in each instance, the mean of a few selected cases only.

In the third set of three columns, are given similar particulars relating to the composition of the straw. The per centages of dry substance and of ash in the straw, are however, not the averages of so many cases in each year, as are those for the corn; and the determinations of nitrogen in the straw, have also been made in fewer cases than in the grain.

It will thus be seen that the table affords a summary view of a really enormous amount of experimental result, and we ought to be able by its means to discover, at least the broad and characteristic effects of varying seasons, upon the composition of the crop.* This, indeed, is all we could hope to attain, in such a mere outline and general treatment of the subject as is appropriate to our present purpose.

TABLE I.

General Summary.

Harvests.	Particulars of the Produce.				Composition of Grain.			Composition of Straw.		
	Total corn and straw per acre in lbs.	Per cent corn in total produce	Per cent dressed corn in total corn.	Weight per bushel of dressed corn in lbs.	Per cent dry (212°)	Per cent ash in dry.	Per cent nitrogen in dry.	Per cent dry (212°)	Per cent ash in dry.	Per cent nitrogen in dry.
1845	5545	33·1	90·1	56·7	80·8	1·91	2·25	..	7·06	0·92
1846	4114	43·1	93·2	63·1	84·3	1·96	2·15	..	6·02	0·67
1847	5221	36·4	93·6	62·0	..	..	2·30	..	5·56	0·73
1848	4517	36·7	89 0	58·5	80·3	2·02	2·39	..	7·24	0·78
1849	5321	40·9	95·5	63·5	83·1	1·84	1·94	82·6	6·17	0·82
1850	5496	33·6	94·3	60·9	84·4	1·99	2·15	84·4	5·88	0·87
1851	5279	38·2	92·1	62·6	84·2	1·89	1·98	84·7	5·88	0·78
1852	4299	31·6	92·1	56·7	83·2	2·00	2·38	82·6	6·53	0·79
1853	3932	25·1	85·9	50·2	80·8	2·24	2·35	81·0	6·27	1·20
1854	6803	35·8	95·6	61·4	84·9	1·93	2.14	83·7	5·08	0·69
Means.	5053	35·4	92·1	59·6	82·9	1·98	2·20	83·2	6·17	0·82

* It should be stated, that up to 1848 inclusive, the description of wheat was the Old Red Lammas; from 1849 to 1852 inclusive, it was the Red Cluster, and since that time the Rostock. The variations, according to season, both in the characters and composition of the produce, are, however, very marked within the period of growth of each separate description.

Leaving then out of view all minor points, and confining ourselves to our already defined object—namely, that of ascertaining the general direction of the influence of variation of season upon the composition of the wheat crop—we cannot fail to see, that wherever the three items indicating the *quality* of the produce markedly distinguish the crop as favorably developed, we have a general tendency to a high per centage of dry substance, and to a low per centage both of mineral matter, and of nitrogen, in that dry substance. This generalization is more especially applicable to the grain; but with some exceptions, mostly explicable on a detailed consideration of the circumstances and degree of its development, it applies to a great extent to the straw also.

Let us take in illustration the extreme cases in the table. The seasons of 1846, 1849, and 1851, with, in the cases of the two latter, large produce also, give us the best proportion of corn in total produce, more than the average proportion of dressed corn in total corn, and the highest weight per bushel—a very significant character. With this cumulative evidence as to the relatively favorable development and maturation of these crops, we find the grain in two of the cases, to be among the highest in per centage of dry matter; and in the third (1849,) though not so high as we should have expected, it is still above the average. The per centages of mineral matter and of nitrogen in the dry substance of the grain, are at the same time, in these three cases, the lowest in the series. The seasons of 1850 and 1854 again, with large amounts of produce, yielded also very fairly developed grain; and coincidently they afford a high per centage of dry substance, and lower per centages both of mineral matter, and of nitrogen, in that dry substance, than the cases of obviously inferior maturation. With some exceptions, it will be seen, that the straws also of these 5 better years, give a tendency to low per centages both of mineral matter and of nitrogen in their dry substance.

Turning now to the converse aspect, the season of 1853, shows itself in the general characters of the produce, to have been in every respect the least favorable to the crop; and it should be added that in this instance (as well as in 1845, to which we shall next refer,) the seed was not sown until the spring. In 1853 the produce of grain was small as well as very bad in quality; and with these characters, we have in the grain nearly the lowest per centage of dry matter, and the highest per centage of ash and of nitrogen in that dry matter. In the straw, too, the dry matter is low, the ash somewhat high, and the nitrogen much the highest in the series. In 1845, another year of spring-sowing, and at the same time of very bad quality of produce, we have nevertheless a large *amount* of growth; a fact which tends to explain some of the differences in composition as compared with 1853. Thus, 1845 gives us low per centage of dry matter, but not very high, either ash or nitrogen, in the grain. The straw, however, gives high per centages both of ash and of nitrogen; it being in the latter point next in order to 1853. The seasons of 1848 and 1852 again show low characters of produce. The former has coincidently the lowest per centage of dry matter in the grain in the series; and both have high per centage of ash and nitrogen in the dry substance of the grain. In the straw, the ash is in 1848 the highest, and in 1852 above the average; the nitrogen in dry matter of straw being however in neither instance high.

In several of the cases here cited, there are deviations from our general assumption on one point or other. But an examination in greater detail, would in most or all of them clear up the apparent discrepancy. When indeed, we bear in mind how infinitely varied was the mutual adaptation of climatic circumstances to stage of growth of the plant, in almost every case, it would indeed be anomalous, did we not find a corresponding variation on some point or other, in the characters or composition of the crop. Still, we have the fact broadly marked, that within the range of our own locality and climate, high maturation of the wheat crop is, other things being equal, generally associated with a high per centage of dry substance, and a low per centage of both mineral and nitrogenous constituents. Were we, however, extending the period of our review, and going into detail as to varying climatic circumstances, interesting exceptions could be pointed out.

It may be observed in passing, that owing to the general relationships of the amounts of corn to straw, and the generally coincident variations in the per centages of nitrogen in each, the tendency of all these variations is in a degree so to neutralize each other, as to give a comparatively limited range of difference in the figures, representing for each year, the per centage of nitrogen in the dry substance of the total produce—corn and straw together.

The tendency of maturation, to reduce the per centages of mineral matter, and frequently of nitrogen also, is not observable in corn crops alone. We have fully illustrated it in the case of the turnip; and our unpublished evidence in regard to some other crops, goes in the same direction. The fact is indeed very important to bear in mind; for it constitutes an important item in our study of the variations which are found to exist in the composition both of the organic substance, and of the ash, of one and the same crop, grown under different circumstances. We may particularly observe, that the obvious reduction in the per centage of nitrogen in wheat-grain, the more, within certain climatic limits, the seed is perfected, is in itself a fact of the highest interest; and it is the more so, when we consider how exceedingly dependent for full growth, is this crop upon a liberal supply of available nitrogen within the soil.

Bearing in mind, then, the general points of relationship which have been established between the characters of the crop as to development and maturation on the one hand, and the per centage amounts of certain constituents on the other, let us now see—what is the general influence of characteristic constituents of *manure*, upon the characters and composition of our wheat crop, which is allowed to remain on the land until the plant has fulfilled its highest function—namely, that of producing a ripened seed?

In illustration of this point we have arranged in Table III, the same particulars as to general character of the crop, and as to the composition of the produce, from several individual plots during the ten years: instead of the average of the series in each year, as in Table I. The cases selected for the comparison are:—

1. A continuously unmanured plot;

2. A plot having an excess of ammoniacal salts alone every year:

3. The average of several plots, each having the same amount of ammoniacal salts as the plot just mentioned, but with it, a more or less perfect provision by manure, of the *mineral constituents* also.

It would be impossible to give the detail supplying all the results collected in this Table III; but perhaps it is only proper that we should do so, so far at least as the per centage of nitrogen in the dry substance of the grain is concerned.

TABLE II.

Determinations of Nitrogen per Cent. in the Dry Matter of Wheat Grain grown at Rothamsted.

Harvests.	Experiments. 1	2	3	4	5	Mean.
Unmanured.						
1845	2·28	2·21	2·33	2·30	....	2·28
1846	2·11	2·12	....	....	....	2·11
1847	2·11	2·08	2·22	2·22	....	2·16
1848	2·33	2·34	2·32	2·37	....	2 34
1849	1·85	1·83	1·91	....	....	1·86
1850	2·07	....	2·10	2 07	....	2·08
1851	1·80	1·74	1·89	1·76	....	1·80
1852	2·31	2·23	2·38	2·31	....	2 31
1853	2·26	....	2·33	2·38	....	2 32
1854	2·06	2 06	1·98	1·96	....	2·01
Manured with Ammoniacal Salts only.						
1845	2·18	2·29	2·22	2·23	....	2·23
1846	2·18	2·12	2·29	2·19	....	2·19
1847	2·35	2·29	2·42	2·32	....	2·34
1848	2·39	2·41	2·39	2·49	....	2·42
1849	1·89	....	2·04	1·92	....	1·95
1850	2·13	....	2·08	2·19	....	2·13
1851	2·15	2·12	2·09	2·25	....	2·15
1852	2·41	2·50	2·44	2 58	....	2·48
1853	2·43	2·48	2·37	2·44	....	2·43
1854	2·31	2·22	2·31	2·37	....	2·30
Manured with Ammoniacal Salts and Mineral Manure. (Mixed Plots.)						
1845	....	....	....	....	....	....
1846	2·20	2·14	....	2·14	....	2·16
1847	2·34	2·38	2·40	2·42	2·44	2·40
1848	2·36	....	2 40	2·42	2·48	2·41
1849	1·96	1·97	2·10	2 07	....	2 02
1850	2·16	2·28	2·25	2·25	....	2·23
1851	2·00	1·98	2 02	1·92	....	1·98
1852	2 43	2·34	2·31	2 40	2 32	2·36
1853	2·30	2·34	2 29	2·28	....	2·30
1854	2 16	....	2·12	2 07	....	2·12

It is necessary to make a few remarks in reference to this Table of more than one hundred nitrogen determinations. They were made by the method of burning with soda-lime, and collecting and weighing as platinum salt in the ordinary way. Few, perhaps, who have only made a limited number of such determinations, then, only on pure and uniform substances, and who have not attempted to control their work at another period, with fresh re-agents, or by the work of another operator, will imagine the range of variation which is to be expected when all these adverse elements are to have their influence. It is freely granted, that the variations shown in the Table between one determination and another, on one and the same substance, are sometimes more than could be desired. The following, however, are the circumstances under which they have been obtained. Experiments 1 and 2 were pretty uniformly made by the same operator, but not all consecutively, or with the same batch of re-agents. It was thought, therefore, that independently of any variations between the two determinations, it would be desirable to have results so important in their bearings, verified by others. Accordingly, samples of each of the ground grains were given under arbitrary numbers, to two other operators, and their results are recorded respectively in colums 3 and 4; and where a fifth determination is given, it is a repetition by one or other of the experimenters last referred to. We should observe, that we have found it almost impossible to procure a soda-lime that will not give more or less indication of nitrogen when burnt with an organic substance not containing it; and hence we have at length adopted the plan of mixing 1·2 per cent. of non-nitrogenous substance intimately with the bulk of soda-lime, igniting it in a muffle, moistening and reheating it gently. After this treatment the soda-lime is free from ammonia-yielding matter. It should further be remembered, that a ground wheat-grain is by no means an uniform substance. Indeed, as we shall show further on, some of the particles of which such a powder is composed, may contain half as much again of nitrogen as others; and thus any inefficiency in the grinding, or error in taking the portion for analysis, may materially affect the result. Notwithstanding all these circumstances, and the admittedly undesirable range of difference in the several determinations in some cases, it will be observed, that generally three at least of the numbers agree sufficiently closely, and in some cases the fourth also. In fact after all, a study of the detailed table, must give considerable confidence, at least in the direction of the variations between the *mean* results given in Table III, and in their sufficiency for the arguments founded upon them. With these remarks on the data, let us proceed with the discussion of Table III itself, which next follows:

TABLE III.

	Particulars of Quantity.			Particulars of Quality.									Composition of Grain.									Composition of Straw.								
	Total Produce (Corn and Straw) per acre in lbs.			Per Cent. Corn in Total Produce			Per Cent. Dressed Corn in Total Corn.			Weight Per Bushel of Dressed Corn, lbs.			Per Cent. Dry (212°.)			Per Cent. Ash in Dry.			Per Cent. Nitr gen in Dry.			Per Cent. Dry (212°.)			Per Cent. Ash in Dry.			Per Cent. Nitrogen in Dry.		
	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only	Minerals & Ammoniacal. Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammoniacal Salts.	Unmanured.	Ammoniacal Salts only.	Minerals & Ammonical Salts.
1845	4153	6246	....	34·7	31·7	....	90·9	90·4	....	56·5	56·2	....	81·2	80·0	80·9	1·93	1·88	1·99	2·28	2·23	....	....	....	....	....	....	....	....	0·92	....
1846	2720	4091	4666	44·4	45·2	42·4	94·7	94·1	93·6	63·7	63·6	63·1	84·0	85·2	84·1	2·03	1·88	1·91	2·11	2·19	2·16	....	....	....	..	....	5·84	....	0·63	0·71
1847	3025	4593	5479	37·1	37·1	36·0	91·6	93·1	93·1	60·9	61·5	62·3	....	....	...	....	....	....	2·16	2·34	2·40	....	....	....	5·97	5·55	5·33	0·74	0·74	0·70
1848	2664	3701	4661	35·7	36·0	36·5	88·8	83·9	89·3	57·3	58·1	58·7	...	81·2	80·4	2·14	2·00	2·02	2·34	2·42	2·41	....	....	....	8·03	6·77	7·01	0·69	0·82	0·84
1849	2843	4992	5619	43·2	42·9	40·5	96·1	94·8	95·4	61·4	62·3	63·7	82·3	82.7	83·0	1·90	1·71	1·81	1·86	1·95	2·02	82·1	83·9	82·5	7·26	6·13	5·97	0·80	0·85	0·82
1850	2721	4810	5877	36·8	35·8	33·2	95·6	94·2	94·2	60·6	60·2	61·2	83·8	84·3	84·4	2·07	1·90	2·01	2·08	2·13	2·23	82·6	85·7	84·4	7·21	5·47	5·67	0·83	....	0·94
1851	2710	5036	5583	40·0	39·0	38·1	89·5	91·0	92·3	61·1	61·9	62·6	84·3	84·5	84·0	1·96	1·82	1·87	1·80	2·15	1·98	84·3	84·9	84.4	6·78	5·58	5·60	0·75	....	0·82
1852	2457	4107	4970	35·0	32·1	30·6	90·9	92·6	92·1	56·6	55·9	56·5	82·6	83·7	83·5	2·11	1·91	1·98	2·31	2·48	2·36	82·8	83·3	82·6	7·41	5·85	5·99	0·93	0·89	0·79
1853	1772	2691	4913	20·2	23·8	26·8	74·3	75·2	89·5	45·9	48·6	51·9	80·1	80·4	80·9	2·52	2·08	2·13	2·32	2·43	2·30	81·6	80·9	81·2	6·50	6·15	5·96	1·27	1·29	1·03
1854	3496	5808	8311	38·9	38·1	34·7	93·9	94·0	95·6	60·6	60·5	61·9	84·7	84·8	85·1	2·01	1·79	1·89	2·01	2·30	2·12	83·8	84·3	84·1	5·26	4·74	4·92	0·75	0·56	0·75
	2856	4608	5564	36·6	36·2	35·4	90·6	90·3	92·8	58·5	58·9	60·2	82·9	83·0	82·9	2·07	1·85	1·96	2·13	2·26	2·22	82·8	83·8	83·2	6·80	5·78	5·81	0·84	0·84	0·82

A glance at this Table III, shows that the *quantity* of produce varies very much indeed in one and the same season, according to the manuring. With these great differences in the *quantities*, dependent on manuring, we have far less marked differences in the *quality* of this ripened crop, dependent on the same causes; and this, with some few exceptions, is the same whether we look to the columns indicating the general characters only, or the composition of the produce. That is to say, the same general distinctions between the produce of one season and another, are observable under the several varying conditions of manuring in each, as have been exhibited in the Table I of averages alone. In fact, season, or climatic variations, are seen to have much more influence than manuring, upon the character and composition of the crop.

We have said that, other things being equal, the per centage of nitrogen in our wheat grain was the lower the more the seed was perfected; and we have also said, that nitrogenous manures greatly aid the development of the crop. But, an inspection of the columns of Table III which give the per centages of nitrogen in the dry substances of the grains produced under the three different conditions of manuring specified, shows us that there is almost invariably, a higher per centage of nitrogen where ammoniacal salts alone have been employed, than where the crop was unmanured. We also see that, almost invariably, there is a higher per centage of nitrogen where mineral manures as well as ammoniacal salts have been used, than in the produce of the corresponding unmanured plots. A closer examination shows, however, though the indication is not uniform, that there is nevertheless, an obvious tendency to a lower percentage of nitrogen, where the mineral constituents also have been employed, than where the ammoniacal salts have been used alone; and with this, there is on the average, a somewhat higher weight per bushel, indicating higher degree of maturation. Then, again, what are the circumstances of these experiments, under which an increased per centage of nitrogen in the fixed substance of the produce, is obtained by a supply of it in manure? The unmanured plot with its low per centage of nitrogen in produce, is shown by the field experiments, to be greatly exhausted of the annually available nitrogen, relatively to the annually available mineral constituents required by the wheat crop. The plot, with the ammoniacal salts alone, is shown by the field results to be defective in the requisite and available minerals, relatively to the available nitrogen, and hence the crop is grown under a relative excess of the latter. Again, the plots with mineral manures and ammoniacal salts together, received so far an excess of the latter, as to yield, with the minerals, a larger crop than the average of the locality under rotation, and larger also, than the average of seasons would ripen healthily. It is then, under these artificial and abnormal circumstances, of the somewhat unnaturally low per centage of nitrogen, from obvious defect of it in relation to the developing and maturing capabilities of the season on the one hand, and the obviously relative excess of it on the other, that we got an increased per centage of nitrogen in wheat-grain by the use of it in manure. Even under these extreme conditions, the range of variation by manuring is very small; and there is nothing in the evidence that justifies the opinion, that, within the range of full crops and healthy maturation, the per centage of nitrogen in wheat-grain, can be increased at pleasure by the use of it in manure. That very opposite extremes of condition of soil-supply, may directly influence the composition even of wheat-grain, is however, illustrated in the per centages of mineral matter, as well as those of nitrogen, given in the table. Thus, taking the mean results only, we have with the relative excess of mineral constituents on the unmanured plot, the highest per cent. in the produce; with the greatest relative defect on the plot with ammoniacal salts only, the lowest per cent. in the grain; and with the medium relation in the other plots, the medium per cent. in the produce. Excepting, however, abnormal conditions, as already remarked, variation in climatic circumstances, has much greater influence on the per centage-composition of wheat-grain, than variation in manuring.

Let us now turn to the composition of the *ash* of wheat-grain. Independently of the defect of a sufficient number of published analyses of wheat-grain ash, a dozen years ago, when we took up the subject, it was then generally believed that the composition of the ash of vegetable produce, would vary considerably with the supplies of the different constituents in the soil; it was thought indeed, that according to the abundance of their presence, one base might substitute another, as for instance *soda*, *potash*, and so on. About the same time that we undertook a series of wheat-ash analyses, the ashes of various succulent vegetables were also analysed. This latter investigation led us to conclude, that the fixity of the composition of the ash of such substances, depended very much upon the degree of maturation of the produce; and in fact that some constituents—soda and chlorine for instance—occurred in much larger quantities in the more succulent and unripe, than in the more elaborated specimens. It seemed to be perfectly consistent with this experience, to find in the ash of a comparatively perfected vegetable product like wheat-grain, a considerable uniformity of composition—such indeed as the analyses now to be recorded will indicate.

These analyses were made ten years ago by Mr. Dugald Campbell, and the late Mr. Ashford. And as, since that time, the methods of ash-analysis have in some points been improved upon, it will be well to give an outline of the plan then adopted: especially as it is by a consideration of the tendencies to error on some points, that we must interpret the bearings of the actual figures given. On this point we need only add, that Mr. Campbell fully concurs in the tenor of our remarks.

Method of Analysis:—Three portions of ash were taken.

No. 1. In this the sand, silica, and charcoal, phosphate of iron, phosphoric acid, lime, and magnesia, were determined. The ash was dissolved in dilute hydrochloric acid, evaporated to perfect dryness, moistened with hydrochloric acid, boiled with water, and the insoluble matter collected and weighed, as—*sand, silica, and charcoal.* To the filtrate, acetate of ammonia was added after digestion, the precipitate separated, dried, ignited and weighed—as *phosphate of iron.* To the filtrate now obtained, a solution of a weighed portion of pure iron dissolved in nitro-hydrochloric acid was added, then acetate of ammonia, and the mixture digested until the whole of the iron was precipitated as phosphate of the peroxide with excess of peroxide, from which was calculated the *phosphoric acid.* From the solution filtered from the phosphate of iron and oxide of iron, the *lime* was separated as oxalate and ignited as carbonate; and from this last filtrate, the *magnesia*, by phosphate of soda and ammonia.

No. 2. A second portion of ash was put into a carbonic acid apparatus, the acid, if any, evolved by means of nitric acid, and determined by the loss. The solution being filtered, sulphuric acid was separated by nitrate of baryta; and afterwards *chlorine* by nitrate of silver.

No. 3. To a solution of a weighed portion of the ash in hydrochlorie acid, caustic baryta was added in excess, and the precipitate separated by filtration; the excess of baryta was then removed by carbonate of ammonia, and the filtered solution evaporated to dryness, the residue heated to redness and weighed; water added, any insoluble matter deducted, and the remainder taken as chlorides of potassium and sodium; a solution of chloride of platinum was now added to separate the *potash;* the *soda* being calculated from the loss.

It is now admitted, that the separation of phosphate of iron from the earthly phosphates by acetate of ammonia as above described, is unsatisfactory; and it is probable the amounts given in the tables as phosphate of iron are too high, and if so, part of the difference should obviously go to the earthy bases. For a similar reason it is possible that the phosphoric acid determinations may be somewhat too high—also at the expense of the earthy bases. Then again, it is well-known that in practice the process for potash and soda, is one of some delicacy; and that the tendency of manipulative error is to give the soda somewhat too high. We conclude upon the whole, that our phosphoric acid determinations *may* be somewhat high; our phosphate of iron pretty certainly so; and probably the soda also; the other bases being, on this supposition, given somewhat too low.

The wheat-grain ash-analyses, 23 in number, and referring to the produce of three separate seasons, and of very various manuring, are given in the following tables—numbered IV, V and VI respectively.

TABLE IV.

Analyses of Wheat-Grain Ash.—Harvest 1844.

Plot Numbers	2	3	5	1	9		15	16	18	
Manuring, per acre	Farm yard Manure—14 tons.	Unmanured.	Superphosphate Lime—700 lbs.	Superhhosphate Lime—700 lbs. Rape Cake, 150 lbs.	Superphosphate Lime, 616 lbs. Sulphate Ammonia, 65 lbs. Analysis 1	Analysis 2	Superphosphate Lime, Pota and Magnesia and Silicate Potash.	As 15 with Soda and Sulphate Ammonia 65 lbs.	As 16, and Rape Cake, 154 lbs.	M ans.
Characters of the Produce:										
Per Cent. Corn in Total Produce	46·4	45·2	46·1	46·4	48·3		46·9	46·8	43·6	46·2
Weight per bushel of Dressed Corn, (lbs.)	59·2	58·5	58·2	59·0	62·2		62·0	62·5	62·0	60·4
Per Cent. Dry Substance in Corn, (at 212°)	82·8	81·8	81·1	82·3	83·6		83·1	83·3	83·2	82·65
Per Cent. Ash in Dry Substance	2·06	2·17	2·25	1·88	2·00		2·02	2·03	1·96	2·05
Constituents of Ash:										
Phosphoric Acid	48·13	50·84	51·02	50·48	49·92	49·98	50·39	51·43	49·28	50·16
Phosphate of Iron	2·56	2·45	2·62	2·10	2·32	2·55	3·00	2·54	2·75	2·54
Potass	28·91	30·22	29·37	27·40	29·06	29·45	29·09	28·33	28·53	28·93
Soda	·76	·00	·22	1·12	·90	·00	·00	·00	2·10	·57
Magnesia	11·84	11·04	11·81	10·10	10·84	10·36	10·86	11·38	11·38	11·07
Lime	3·77	3·00	3·18	2·71	3·39	3·73	3·17	3·31	3·48	3·30
Chlorine	Traces.	·12	Traces.	·52	·15	·11	·09	·21	Traces	·13
Silica, Sand, and Charcoal	2·64	2·72	1·49	5·45	2·57	2·21	1·86	1·47	1·70	2·45
Totals	98·61	100·39	99·71	99·88	99·15	98·39	98·46	98·67	99·22	99·15

TABLE V.

Analysis of Wheat-Grain Ash.—Harvest, 1845.

Plot Numbers	2	3	5A	5B	6	15	17		Means.
Manuring, per acre	Farm-yard Manure, 14 tons.	Unmanured.	Superphosphate Lime in 1843–4. Unmanured.	Superphosphate Lime in 1843–4. Carbonate Ammonia (Solution.)	Superp'sphate Lime, 112 lbs., Sulphate Ammonia 112 lbs. Rape Cake 560 lbs.	Bone-ash 224 lbs. Hydrochloric Acid 224 lbs. Sulphate Ammonia 224. lbs.	Superp'sphate Lime 224 lbs. Sulphate & Muriate Ammonia, each 112 lbs. Rape Cake 280 lbs.		
							Analysis 1	Analysis 2	
Characters of the Produce:									
Per Cent. Corn in Total Produce	33·4	34·7	34·8	32·5	33·9	34·2	35·4		34·13
Weight per bushel of Dressed Corn (lbs.)	56·7	56·5	57·5	57 2	57·7	57·5	55·7		56 97
Per Cent. Dry Substance in Corn (at 212°)	80·0	81·2	81·1	80 9	81·7	80·9	80·6		80·91
Per Cent. Ash in Dry Substance	1·89	1·93	1 88	1·98	1·92	1·91	1.92		1·92
Constituents of Ash:									
Phosphoric Acid	47·08	48·69	45·69	47·81	51·56	50·26	51·34	50·01	49 05
Phosphate of Iron	1·97	2 31	3·66	4·58	1·22	1·07	·80	1·20	2 10
Potass	25·16	28·53	29·06	28 87	31·75	32·27	30·20	30 47	29 54
Soda	8·01	·00	6·19	5 01	·00	·00	·68	·00	2 49
Magnesia	11·06	11·58	9·57	8 98	10·14	10 00	10·65	9 96	10·24
Lime	3·66	3·57	3·39	2·02	3·20	3·36	3·06	3·16	3·18
Chlorine	·00	·20	·00	·00	Trace	Trace	·40	·23	·10
Silica, Sand, and Charcoal	3·29	3 39	1·45	1·68	2·36	2 21	2·61	3·40	2·55
Totals, ...	100·23	98·27	99·01	98.95	100·22	99·17	99·74	98·43	99 25

TABLE VI.

Analyses of Wheat-Grain Ash.—Harvest, 1846.

Plot Numbers	2	3	1	8a	4	11a	
Manuring, per acre	Farm-yard Manure, 14 tons.	Unmanured.	Bone-ash, 224 lbs.	Bone-ash, 224 lbs. Sulphate and Muriate Ammonia, each 112 lbs.	Bone-ash, 224 lbs. Hydrochloric Acid, 224 lbs. Sulphate Ammonia, 224 lbs.	Bone-ash, 224 lbs. Sulphuric Acid, 224 lbs. Sulphate and Muriate Ammonia, each 112 lbs.	Means.
Character of the produce:—							
Per Cent. Corn in Total Produce	42·7	44·4	43·6	43·6	42·6	43·1	43·3
Weight per bushel of Dressed Corn (lbs.)	63·0	63·7	62·6	63·6	63·5	63·2	63·3
Per Cent. Dry Substance in Corn (at 212°)	84·1	84·0	83·3	84·5	84·8	83·9	84·1
Per Cent. Ash in Dry Substance	2·07	2·03	2·04	1·91	1·99	1·91	1·99
Constituents of Ash:—							
Phosphoric Acid	50·01	49·89	50·62	49·47	48·73	50·08	49·80
Phosphate of Iron	1·65	1·66	3·10	2·52	2·62	3·06	2·43
Potass	30·03	30·60	27·93	29·58	31·00	29·18	29·72
Soda	·35	·25	·10	·00	·00	·00	·10
Magnesia	11·03	10·97	10·79	11·13	10·43	10·34	10·78
Lime	2·98*	2·89*	4·04	4·63	4·31	4·22	3·84
Chlorine	·12	·09	·30	·34	Traces	·17	·17
Silica, Sand, and Charcoal	1·88	2·17	2·18	2·54	2·62	3·00	2·40
Totals	98·05	98·52	98·96	100·21	99·71	100·05	99·24

* It would seem probable that in these two cases the Lime is given too low; but as the analyst, Mr. Ashford, is dead, no reference can be made, and we have unfortunately not had time to repeat the analyses prior to publication, as we had intended.

It is at once seen, that this ash may be reckoned to contain neither sulphuric acid, carbonic acid, nor chlorine. The latter at least occurred only occasionally, and then in such small quantities, as to lead us to the supposition that its presence is accidental, or at any rate not essential, in the ash of a perfectly ripened grain. From the frequent absence of soda again, and from the uncertainty in its determinations as above alluded to, we are led to look at it as an equally unessential ingredient in the grain-ash of perfectly ripened wheat. Excluding then the chlorine, the soda, the iron of the phosphate of iron, and that portion of the matter collected as insoluble, which may have been soluble silica—the whole of these, on the average, amounting to a very few per cent.—the ash of wheat-grain is seen to consist essentially of *phosphates only;* the bases being potash, magnesia, and lime. The potash amounts to nearly one-third of the whole ash; the magnesia to rather more than one-third of the potash; and the lime to about one-third of the magnesia.

If we now compare with one another the analyses of the eight different ashes in 1844, those of the seven in 1845, or of the six in 1846, having regard to the manures by which the crops were grown, it is impossible to say that these have had any direct and well-defined influence upon the composition of the ash of the grain. Thus we find, looking at the Table for 1844, that several of the plots manured with super-phosphate of lime, yield a grain-ash having no higher per centage of phosphoric acid than that of the unmanured plot. Again, where potash is added (plots 15, 16, and 18), the per centage of it in the ash is not greater than the average of the cases where it was not employed. And again, in the only case where soda was employed (plot 16), there is none of it found in the ash; nor, lastly, is the per centage of magnesia obviously increased by the use of it in manure. A similar detailed consideration of the composition of the ashes of the seasons of 1845 and 1846, would, as already intimated, lead to a similar conclusion. In fact, the variations in the composition of the ash of this supposed ripened product, according to the manure by which it is grown, seem to be scarcely beyond the limits of error in the manipulation of the analysis; though, one case at least of the duplicate analysis of the same ash—namely, that of No. 9, 1844—indicates the range of variation from this cause to have been but small; in the other (No. 17, 1845), it was somewhat greater.

Although the accuracy of the analyses may not be such as to show the difference in composition, if any, dependent on *manure*, yet it is found to be quite adequate to indicate the marked differences in the *degree of development and maturation* of the grains, dependent upon *season*. Before calling attention to the figures illustrating this point, it should be remarked that the season of 1845 was the worst but one, and that of 1846 nearly the best, for ripening the grain, during the thirteen years of our continuous growth of wheat. And we shall find, consistently with this, and with the conclusions arrived at in connection with Tables I. and III., that the variation in the composition of the ash is, comparing one year with another, much the greatest in the produce of the bad ripening season 1845, and much the least in the good ripening season 1846. This point, and some others, are illustrated in the following Summary Table, No. VII.:

TABLE VII.

Composition of Wheat-Grain Ash.

	Variation in per Cent. in each Season.			Mean for each Season.			Means according to Manuring.			General Means.	
	1844. 9 Cases.	1845. 8 Cases.	1846. 6 Cases.	1844. 9 Cases	1845. 8 Cases.	1846. 6 Cases.	Unmanured (3 years.	Farm-yard Manure (3 years.)	Other Manures (3 years) 17 Cases.	23 Cases, Rothamsted.	26 Cases Mr. Way.
Characters of the produce :—											
Per Cent. Corn in Total Produce..........	......	......	......	46·2	34·1	43·3	41·4	40·8	41·3	41·2	
Weight per bushel of Dressed Corn (lbs.)..	......	......	......	60·4	57·0	63·3	59·6	59·6	60·1	60·0	
Per Cent. Dry Substance in Corn (at 212°)	......	......	......	82·6	80·9	74·1	82·3	82·3	82·5	82·4	
Per Cent. Ash in Dry Substance..........	......	......	......	2 05	1·92	1·98	2·04	2·01	1·97	1·99	1·69
Composition of Ash :—											
Phosphoric Acid........................	3·30	5·87	1·89	50·16	49·05	49·80	49·81	48·41	49·88	49·68	45·01
Phosphate of Iron......................	·90	3·87	1·45	2·54	2·10	2 43	2·14	2·06	2·45	2·36	0 82*
Potass..................................	2·82	7·11	3·07	28·93	29·54	29·72	29 78	28·03	29·50	29·35	31·44
Soda....................................	2·10	8·01	·35	·57	2·49	·10	·08	3·04	·95	1·12	2·71
Magnesia................................	1·74	2·60	·79	11·07	10·24	10·78	11·20	11·31	10·51	10·70	12·36
Lime....................................	1·06	1·64	1·74	3·30	3·18	3·84	3·15	3·47	3·43	3·40	3·52
Sulphuric Acid..........................	......	......	......	......	....	....	......	.. ..	......	......	0·34
Carbonic Acid...........................	......	......	......	......	....	....	......	......	......	......	0·02
Chlorine................................	......	......	......	·13	·10	·17	·14	·04	·14	·13	·13
Silica, Sand, and Charcoal.............	......	......	......	2·45	2·55	2·40	2·76	2·60	2·41	2·47	3·67†
Totals....	......	......	......	99·15	99·25	99·24	99·06	98·96	99·27	99·21	100·03

* Peroxide of iron.

† Mr. Way gives this as soluble silica, exclusive of the sand and charcoal included with it in our own analyses.

Looking at the first Division of this Table VII., it is seen that in the item of *phosphoric acid*, the variation in the per centage among the several cases in each year, is the greatest in 1845, and the least in 1846; in the *phosphate of iron*, it is the greatest in 1845; in the *potash*, it is the greatest in 1845, much less and about equal, in 1844 and 1846; in the *soda*, it is much the greatest in 1845, and much the least in 1846; in the *magnesia*, it is again far the greatest in 1845, and it is the least in 1846. In the case of the *lime*, we have an exception to this general indication, dependent on the two low amounts of it given for Nos. 2 and 3, 1846; but if these are really in error in the direction suggested at the foot of Table VI., the indication would be the same as for the other constituents. We have then in the circumstances of the seasons, and in the comparative characters of the produce coincident with these variations, the evidence that for one and the same description of grain, in a perfectly matured condition, the composition of the ash will be, within certain narrow limits, constant.

So far as the constituents of the ash of the entire grain of wheat is concerned, we have only further to call attention to the three other Divisions of this Summary Table No. VII. In these are shown, side by side:—

In the second Division of the Table, the mean composition of the ashes for each of the three separate years;

In the third Division, the mean composition for the three years together: (*a*) of the grain-ash from the unmanured plot—(*b*) of that from the farm-yard manured plot—(*c*) of the grain-ashes from all the other manures during the three years, including 17 cases; and

In the fourth and last Division, the mean composition of all our own wheat grain-ashes analyzed, 23 in number, by the side of the mean of 26 analyses of the grain-ashes of wheat, of different descriptions or grown in different localities, published by Mr. Way.

We will go into very little detail discussions of these mean results, as the points they illustrate have most of them already been alluded to. We may first remark, as a point to which we shall recur further on, that the mean per centage of *lime*, is the least in the bad year 1845, and the greatest in the good year 1846. Again, it is greater in the average from the manured plots, than in that from the unmanured. We may perhaps here anticipate by saying, that this is at any rate consistent with what we shall afterwards have to record, namely, that the ash of the finer flour—of which there is a greater proportion in the grain of the seasons of best maturation—contains more lime than that of the coarser and more branny portions of the grain.

Lastly, in reference to this Summary Table, we would call attention to the mean composition of wheat grain-ash yielded by the 26 analyses given by Mr. Way, by the side of that of the 23 specimens grown at Rothamsted. Mr. Way's analyses, equally with our own, show that wheat grain-ash essentially consists of phosphates of potash, magnesia, and lime. He, however, if we exclude silica, gives higher per centages of base, and a lower one of acid, than our own analyses indicate. Mr. Way's average amount of phosphoric acid is indeed nearly 5 per cent. less in the ash than ours. His series, however, included many descriptions of wheat, and our own only one—the Old Red Lammas. In several of his cases, too, we observe that the per centage of this acid very closely approximates to our own average.

There is no doubt that the question "How does the plant obtain its nutriment from the soil; and if it is nourished by inorganic or mineral substances only, how or by what process are these rocky and earthy substances dissolved and liquified so that they may be absorbed by the plant?" has frequently intruded itself on the mind of the reader whilst perusing these pages.

A summary abstract has already been given of Mr. Osborne's observations and experiments; but it must be borne in mind that his experiments extended no farther than the growth of the plant until the period of the exhaustion of the albuminous body, or the amount of nutriment prepared by the parent plant for the existence and development of the embryo until it had attained sufficient growth to elaborate nutriment from the soil. Mr. Osborne's observations and experiments extend no further then than the period during which the embryo or fœtus receives its nourishment from the parent through the umbilical cord. The plant must now be considered as having the umbilicus severed, and commencing life on its own account—dependent for its nourishment—its daily bread—on its own industry.

By what process do the roots absorb moisture or liquids from the soil? Physiological botanists are divided in opinion upon this question. Whilst the one party affirms that the plant is endowed with vitality, and that this vitality is sufficiently powerful and manifest to absorb by inspiration (meaning a vitalized capillary attraction,) another party as confidently asserts that the plant receives its nutriment from the soil by *endosmosis* (inside impulsion,) thus practically denying to the plant all vitality, because the process of endosmosis and exosmosis is a purely mechanical one. It may not be inappropriate in this connection to detail the process and experiment of endosmosis and exosmosis. Take a glass tube of any convenient length, and firmly tie a piece of bladder over one end of the tube;

if the tube be now partially filled with a strong solution of common table salt, it will be found that the solution will not penetrate through the epidermis, in case the tube is suspended in the air. But if the tube be inserted into a vessel containing pure water, the solution of the salt will be found to have permeated the bladder and impregnated the pure water with a saline taste; at the same time the volume of the solution in the tube will have been augmented by the pure water penetrating the bladder and commingling with the saline solution. The act of the pure water, or *outside* element finding its way through a membrane or integument so as to commingle or be assimilated with the inside element is termed *endosmosis;* whilst the reverse act (although simultaneous) is termed the *exosmosis;* but both these actions are purely mechanical, because they may be successfully performed by substances entirely devoid of any vitality.

The doctrine of endosmose has undoubtedly obtained considerable support from the well known fact, that plants absorb indiscriminately all substances held in solution in water; but then they give off through their roots (*Liebig*, *Mulder*, *Lehman*) or through other parts all matters which may injure their vital activity. If plants possessed the power of selecting or absorbing such substances only as were essential to their growth and development, the problem of nutrition would be one of comparatively easy solution; but as they do not possess this power the problem is exceedingly complex, and with the most diligent research, assiduous investigation and observation our knowledge of the relations existing in the nutritive process of vegetable organisms is so very circumscribed and imperfect "that it is much less easy to establish a convincing refutation than to adduce a strict proof."

It is however a fact established beyond successful contradiction that the roots of plants absorb moisture and liquids from the soil, and that the functions of the roots are other than a mere support to retain the plant immoveably and in an upright position. The fluids are unquestionably drawn from the soil by the roots under the influence of a *vital* force or power, and not a mechanical one, for were the doctrine of endosmosis correct, it is not very obvious that there could be any annual plants, or that roots would decay without being removed from the place where they grew.

Isert, a Danish physician, discovered that a vessel filled with water, in which the tropical plant *Pistia Stratiotes* was growing, evaporation took place six times as rapidly, or rather it evaporated six times the amount of water, as did a vessel of water of the same size in which no plant whatever was growing. This then is proof positive that plants absorb water and that it is exhaled by them. Moleschott in his "CIRCUIT OF LIFE," says that this evaporation is one of the most powerful causes of the absorption of elements in solution, by the roots of plants. Liebig says, "From the surface of young plants a constant evaporation of water takes place, the amount of which is in proportion to the temperature and surface. The numerous fibres of the roots supply the water which is evaporated, just as if they were so many pumps; so that as long as the soil continues moist, the plants receive, by means of water, the necessary constituents of the soil. A plant with double the surface of another plant must evaporate twice the quantity of water that the latter does. The water thus absorbed is expelled again in vapor, but the salts and constituents of the soil introduced to the plant by its agency still remain there."

I have never been fully persuaded that the view taken by Moleschott, Liebig or Lehman, in this relation to be corret. It has always appeared to me that evaporation from surfaces of plants was a consequence, rather than a cause—that it was the method adopted by nature to relieve the plant of an excess of moisture as well as a means by which effete matter is removed. How can evaporation take place from plants which have no evaporating surfaces? It is well known the green parts of plants, leaves, buds and flowers are the only portions from which evaporation takes place; how then can *evaporation* in spring time before the buds have swollen, be the cause of absorption of fluids from the soil by the roots, so as to cause the flow of sap? so as to cause grape vines if injured to bleed? But so far as the wheat plant is concerned, is it an established fact that evaporation takes place from the leaves, before the roots have absorbed fluids from the soil?

This theory of evaporation as the cause of absorption of fluids by the roots of plants advanced by Liebig, amplified by Moleschott, and partially although evidently hesitatingly endorsed by Lehman, whilst it is more plausible and really less objectionable than the theory of *endosmosis*, is perhaps equally distant from the truth, because it ignores any and all vital actions or participancy by the plant itself.

What the precise function of the main root (C, fig. 3,) whose appearance is the first obvious evidence of successful germination, is not known; but it is tolerably well ascertained that it is entirely absorbed immediately after the rootlets have commenced the process of absorption. From the discoveries made by Mr. Osborne (see ante, on Germination,) it is highly probable that the rootlets convey to the capsules (E, E, E, fig. 3,) a solvent fluid, or vegetable gastric juice, which fluid solves such inorganic substances as cannot resist its solvent properties, and the *new* mass is then taken up by the capsules or spongioles which are found at the *termini* o every root and rootlet, and also by the absorbent cells ever formed at the extremities of the numberless suckers, for it is at these points that Mr. Osborne found the cell structure ever greedily taking in whatever of foreign matter he succeeded in introducing into the *media*, in which the plants were grown. Mr. O. distinctly states that he could not trace any circulation in the roots towards the crown or origin of the root, but distinctly traced a circulation towards the capsule on the extremity of the rootlet.

This gastric juice or solvent fluid may consist chiefly of carbonic acid, which is very essential to the growth of plants, and as has been fully detailed in the chapter on germination, is found to exist in the albuminous body of seed immediately after germination has commenced. A statement has already been made enumerating the different inorganic or elementary substances which enter into the composition of the wheat plant; in order to exhibit the tenableness of the solvent fluid hypothesis, it will be necessary to illustrate the affinity for or solvent power of carbonic acid over the elementary substances.

The air which we inhale is composed of oxygen and nitrogen, but that we exhale, or which is returned from the lungs, is composed of carbon and oxygen, or carbonic acid. Carbonic acid is given off from various substances in the course of decay, and it exists in the atmosphere as a product of combustion—for the burning of coal, wood, or any other substance produces carbonic acid. It exists in very considerable quantities in the mineral kingdom, combined with metallic oxides; also in all spring and river water, either in combination with earthy and alkaline bases, or dissolved in the water in an uncombined state. In volcanic districts carbonic acid issues from the ground from the fissures or crevices caused by eruptions or earthquakes.

Carbonic acid is also the production of fermentation and putrefaction. Carbonic acid being thus generally diffused throughout nature, is continually being introduced into the soil by rains. Substances containing a large proportion of carbon are excreted by the roots and absorbed by the soil; in this manner the soil receives the greater part of the carbon it had yielded as food to the young plants in the form of carbonic acid. After the removal of a crop of annual plants, their roots remain in the soil, and there undergo putrefaction, thus furnishing a substance which will yield carbonic acid to a new vegetation. The decay of woody fibre converts a volume of oxygen gas into an equal volume of carbonic acid;—the "woody fibre in a state of decay is the substance called HUMUS," and is a continued source of carbonic acid. Humus or vegetable mould therefore does not nourish plants by being assimilated in its soluble state, but by furnishing a gradual and continual source of carbonic acid, which is the chief nutriment to the roots of plants, and is renewed as long as the soil admits the free access of air and moisture—these conditions being necessary to effect the decay of vegetable matter.

The sources just enumerated furnish an ample supply of carbon for all the purposes of vegetation. A contrariety of opinions have long prevailed as to the manner in which plants are supplied with carbon. It is a favorite theory with some vegetable physiologists to attribute the supply as having been received entirely from the atmosphere, through the medium of the leaves. However plausible such a theory may be, it does not explain all the phenomena of vegetation which its advocates claim for it. It is very evident that young and growing plants have obtained their full proportion of mineral substances from the soil, from the fact that equal quantities of young plants yield twice the amount of ashes that matured plants do. Saussure found that wheat before blossoming yielded $\frac{70}{1000}$; when in blossom $\frac{}{1000}$, but after the ripening of the seeds it yielded only one-half this quantity of ashes. If, then, the theory be correct that plants obtain all their carbon from the atmosphere, it will be difficult to explain how plants should be affected by drouth, since they have already received all they require, according to this theory, from the soil, and carbonic acid is rather more abundant—in the opinion of another set of advocates—before than after storms or rains, so that the plant can inhale or absorb from the atmosphere all the carbon, nitrogen and oxygen requisite to elaborate and assimilate the mineral food. Lehman, the celebrated physiological chemist, says: "The first origin of *carbo-hydrates* which we meet with in their more advanced stages of development, as dextrine, sugar, starch, and cellulose, has, with apparent correctness, been referred to the decomposition of carbonic acid under the influence of light." But experience teaches that however abundant carbonic acid may be, if there is a long continued absence of rain, that plants droop, wither and die, and will not produce the starch, sugar, &c., in the seeds, which they would under the influence of genial rains and an adequate supply of carbonic acid, from and through the roots. Liebig, however, is not perfectly satisfied that plants receive more than one-fourth of the necessary amount of carbon from the atmosphere; for he says: "Young plants, when dependent on the air alone, can only increase their amount of carbon according to their absorbing surfaces. But it is obvious, if their roots receive, by means of humus, *three times* the amount of carbonic acid absorbed by their leaves in the same time, their increase in weight will be four-fold, on the assumption of the existence of all the conditions for the assimilation of the carbon. Hence four times the quantity of stems, leaves, and buds must be formed; and by the increased surface thus obtained, the plants will receive in the same degree an increased power of absorbing food from the air." In the case of drouth affecting the plants, the difficulty will not be removed, when it is asserted that notwithstanding the plants receive all their carbon from the atmosphere, they receive nitrogen, hydrogen, and oxygen from the roots: because it must be apparent to every one that it is more probable that these last named gases are absorbed from the atmosphere than that carbonic acid is; and it is somewhat inconsistent to assert that the heaviest gas is absorbed by the leaves from the atmosphere, while the lighter ones are absorbed by the roots from the soil.

Finding the theory of supplying the plants with carbon from the atmosphere untenable, Prof. Henfrey* offers the following, no doubt in a spirit of conciliation: "Since it is evident that if the different external organs, such as the leaves, stems, and roots, can *all* exercise *any* of the functions of vegetable life, the general anatomy or study of external form can be of little use in guiding us, and we must make ourselves acquainted with the characteristics of the elementary tissues of which any given organ is composed. To illustrate this, we are not liable to mistake when we say that in man and the higher animals respiration is performed by the lungs. We could not say in the same general way that the leaves constitute the respiratory organs of plants, for this function is not only ordinarily performed in part by green shoots of the stem, but in some cases, as in the Cacti, the leaves are represented by hard spines, and the stem assumes entirely the respiratory function; and yet the Cactaceæ belong to the highest class of plants. Again, the stomach and intestinal canal of animals in general are the organs for the absorption of food; and this function is only combined with others when the whole organization is very low in the scale; but in plants we not uncommonly see the roots assuming additional or different functions, even in the highest forms of vegetable life: for in the turnip, carrot, and other analogous plants, the root becomes an organ not simply of absorption, but for the deposition and temporary preservation of assimilated food."

This statement, from the pen of Prof. Henfrey, is the more valuable because he is not only Professor of Botany in King's College, London, but is one of the best vegetable physiologists of the present day.

With the reluctant admission of Liebig that three-fourths of the carbonic acid required by the plant is obtained through the roots, and the

* Royal Agricultural Journal, Vol XVII.

positive statement of Henfrey that the leaves are not *always* the respiratory organs, and even if they were, respiratory organs are not organs of nutrition; there is little hazard in asserting that the chief source of carbonic acid, of which the plant directly avails itself, is that obtained from the soil. But if there are any who think the assertion heterodox and not sustained by any respectable authority, I will again quote Liebig, "A soil in which plants vegetate vigorously, contains a certain quantity of moisture indispensably necessary to their existence. Carbonic acid, likewise, is *always* present in such a soil, whether it has been abstracted from the air, or has been generated by the decay of vegetable matter. Rain and well water, and also that from other sources, invariably contains carbonic acid. Plants, during their life, constantly possess the power of absorbing by their roots moisture, and, along with it, air or carbonic acid."

Besides, it is an incontrovertible fact, that plants require mineral substances as food and these are furnished it through the roots in the form of solutions. On a previous page mention has been made of the formation of clays from felspar; it is a well ascertained fact that water saturated with carbonic acid readily solves felspar, so also, all minerals and rocks containing silicates of alkaline bases, are incapable of resisting the continued solvent action of carbonic acid dissolved in water. The alkalies with lime and magnesia will either dissolve alone, or the former will enter into solution along with silica, while the alumina remains behind, mixed or combined with silica. Phosphate of lime is soluble in water containing carbonic acid. Carbonic acid in the soil then, is capable of solving and holding in solution potash, soda, magnesia, lime, silica and alumina. Is it not, therefore, exceedingly probable, if not absolutely certain, that because carbonic acid solves these elements and holds them just in the condition to be absorbed and assimilated by the plant through the roots, that the roots at the same time absorb the necessary amount of carbonic acid? What evidence is there that the roots absorb the minerals in solution and reject the carbonic acid, when it is not denied by any vegetable physiologist, that the roots absorb indiscriminately every fluid substance presented to them?

It is well known that the seeds of all cereals are chiefly composed of starch, that is, carbon, oxygen and hydrogen, as organic elements. If plants derived their carbon from the atmosphere, there would be no difficulty in obtaining perfect seeds from plants grown in water; but experience does not confirm this supposition, for however well the plants may grow in water, they rarely bloom, and when they do, they never produce seed. Liebig says: "The food contained in the atmosphere does not suffice to enable these plants to obtain their maximum size in the short period of their life.

If the object of culture is to be attained, there must be present in the soil itself an artificial atmosphere of carbonic acid and ammonia, and this excess of nourishment which the leaves cannot get, must be conveyed to corresponding organs existing in the soil."

The chief arguments which have been presented to sustain the position that plants derived their carbon directly from the atmosphere, through the agency of the leaves, are rather inferential and negative than otherwise. One of them is, that because plants exhale carbonic acid at night, they consequently inhale it during the day, but it might with the same propriety be inferred that because the moon shines or gives out rays of light at night, that it absorbs or collects them during the day, to dispense again at night. The fact is that it requires light to fix the carbon in the plant, which has been absorbed by the roots and leaves or other green parts. When daylight ceases then the decomposition of the carbonic acid is interrupted—during daylight carbon was retained and oxygen given off, (it will be remembered that carbonic acid consists of carbon and oxygen,) but when darkness takes the place of light, then the carbonic acid is not decomposed, but escapes every moment through the leaves, and as soon as daylight is again ushered in, the decomposition commences and the carbon is retained and fixed by the influence of light—similarly, perhaps, in many respects as the *shadow* is fixed on the sensitive plate in the daguerrian's hands—while the oxygen is excreted.

Another argument presented by the theorists who hold that plants obtain all their carbon from the atmosphere through the leaves, is the well known experiment of a plant having been grown in a tub filled with soil, and at the end of a certain time the plant grew to be a tree weighing considerably more than the entire soil did at the commencement of the experiment, while the soil itself appeared to have diminished in weight a few pounds only. Now this experiment fails to prove that for which it was instituted. The plant was not watered with distilled, but with spring or brook water, neither was the soil so enclosed as to exclude dust, insects, and excrements from birds, &c., from accumulating on it. The plant received from rain and by artificial watering, all the alkalies which were not in the soil, or which had been exhausted, as well as the necessary amount of carbonic acid. Sea water contains less than one-ten thousandth part of its weight of carbonate of lime, and the phosphate of lime in sea water is so small that its amount cannot be determined in a pound of the water, yet this exceedingly minute quantity, seems to be an ample store, and furnishes the material for the habitations of the myriads of marine mollusca and corals, and for all the phosphates found in the flesh and bones of all the living animals of the ocean. It is almost superfluous to repeat here that the water of brooks and springs, as well as rain water, contain many alkalies, as well as carbonic acid in solution; and that the roots of plants are constantly engaged in absorbing them. Hence the carbon as well as alkalies, of which the tree in question was composed, were conveyed to the roots in solution in water, and the experiment affords no proof whatever that the carbon was inhaled through the leaves.

AMMONIA.

Ammonia is the next important substance essential to the growth and development of the plant. Ammonia is a combination of hydrogen and nitrogen, and occurs in the atmosphere as carbonate of ammonia, in mineral waters as chloride of ammonia—it also occurs in brook, spring and rain water; the common yellow clay will yield ammonia when heated after having been exposed to the action of the atmosphere. Ammonia is found in animal secretions and excrements; in fact carbonate of ammonia was at first very extensively manufactured in Egypt from camel's dung.*

Competent chemists state that there is a sufficient amount of ammonia contained in rain water to supply the growing crops; but should the supply fail from drought, then the supply is undoubtedly obtained from the soil, either from the barn-yard manure, the clay or the lime; for there is scarcely a limestone in existence which will not, under certain chemical processes, yield ammonia. Decaying animal bodies emit ammonia, that is whenever the decomposition of animal substances is effected with the assistance of water, their nitrogen is invariably liberated in the form of ammonia. Liebig says this is a fixed rule without any exceptions, whatever may be the cause which produces the decompositions. All organic compounds evolve the whole of their nitrogen in the form of ammonia when acted on by alkalies. It is well known that all "wheat" and "potato" soils contain alkalies, hence whenever nitrogenous manures are introduced there is speedily as much ammoniacal salts produced as the growing vegetation may require. In 1846 Dr. Krocker, of Germany, examined a number of soils to determine the amount of ammonia which they contained. Annexed are the results of his investigations in tabular form:

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* Ammoniacal liquor or gas liquor is extensively obtained in the condensing vessels of coal gas works. Some agriculturists who were aware of the importance of ammonia in the growth of vegetables, have been impressed with an idea that the application of gas liquor to growing crops would have a favorable effect. I know of no instance in which the hopes of the experimenter were realized. Gas liquor contains carbonate, hydrocyanate, hydrosulphate and sulphate of ammonia.

Table of the Ammonia contained in the Soil.

BY DR. KROCKER.*

Soils examined.	Ammonia in 100 parts of Earth dried in the Air.	Specific Gravity.	Ammonia in a stratum of solid Matter 0·25 metre thick, on 1 hectare, in pounds.
Clay soil, before manuring........................	0·170	2·39	20314
Clay soil......	0·163	2·42	19723
Surface soil, at Hohenheim.......................	0·156	2·40	18730
Subsoil of the same field.........................	0·104	2·41	12532
Clay soil, before manuring........................	0·149	2·41	17953
Clay soil, before manuring........................	0·147	2·41	17713
Clay ready to be sowed with barley.........	0·143	2·44	17446
Clay soil, before manuring...........	0·139	2·41	16749
Loamy soil, before manuring......................	0·135	2·45	16537
Loamy soil, before manuring......................	0·133	2·45	16292
Earth from America, never manured........	0·116	2·18	12644
Sandy soil, never cultivated.......................	0·096	2·50	12000
Loamy earth, dug out............................	0·088	2·50	11000
Sandy soil, never cultivated.......................	0·056	2·51	7028
Nearly pure sand................................	0·031	2·61	4045
	0.0988		11952
	0·0955		11552
	0·0768		9288
Marle............	0·0736	2·42	8904
	0·0579		7004
	0·0077		931
	0·0047		568

* Ibid., vol. lviii., 1846.

Porous substances have the power, as a general thing, of condensing ammonia, hence soils condense and retain it until called into action by water or carbonic acid to be assimilated and form a portion of the growing plant. It is capable of undergoing quite a number of transformations when in contact with other bodies. When pure it is extremely soluble in water: it forms soluble compounds with all the acids, when in contact with certain other substances it is capable of assuming the most various and opposite forms, in which one would not suspect so caustic an alkali was participating. Chemistry teaches that formate of ammonia, under the influence of a high temperature, changes into hydrocyanic acid and water, without the separation of any of its elements. Ammonia forms urea, with cyanic acid, and a series of crystalline compounds with the volatile oils of mustard and bitter almonds.

On a previous page it was mentioned that the pungent smell in stables, in which horses and cattle were kept was entirely due to ammonia. If the places where the urine and manure drop from the animal in the stable be occasionally sprinkled with plaster of Paris, the offensive smell will vanish, whilst none of the ammonia will be lost, but will be condensed by the plaster of Paris. The ammonia in stables is always found in combination with carbonic acid;—the ammonia enters at once into combination with the sulphuric acid contained in the gypsum or plaster of Paris, forming sulphate of ammonia, which is identical in composition with a substance which occurs native, and is known as *mascagnine*, and which is an efflorescence upon recent lavas—its composition being sulphuric acid 53·28, ammonia 22·81, water 23·91. The carbonic acid of the ammonia combines with the lime and forms a carbonate of lime. These newly formed compounds are entirely destitute of volatility and consequently of smell.

Every clay that turns red when burned contains ferruginous or iron oxides; the ammonia absorbed by clays of this character, is separated by every shower of rain, and conveyed in solution to the soil, in which form it is imbibed by the roots of the plants. When ammonia in the form of salts as *mascagnine* above described, or other salts, is applied to the soil not the least portion of it is lost to plants, because it is soluble in water, and hence readily imbibed and assimilated. Mulder, however conjectures that ammonia passes into plants in combination with organic acids.

It has long been suspected that ammonia yielded nitrogen to plants, but since ammonia has been found to exist in every portion of the plant, this view has become somewhat modified. It exists in beet roots, in the sap of the maple tree,* and in all blossoms and fruit in an unripe condition.

On a preceding page a statement has been made of variable quantities of gluten found in different varieties of wheat, as well as in the same varieties grown under different circumstances. Gluten is found by analysis to consist of—

Carbon 53·27.
Hydrogen 7·13.
Nitrogen 16·04.
Sulphur 23·62.

Proust found wheat to contain 12·5 per cent. of gluten; Vogel found Ba-

* In the year 1834, I was engaged with Dr. Wilbrand, professor of botany in the University of Giessen, in an investigation respecting the quantity of sugar contained in different varieties of maple-trees, growing upon unmanured soils. We obtained crystallized sugars from all, by simply evaporating their juices, without the addition of any foreign substance; and we unexpectedly made the observation, that a great quantity of ammonia was emitted from this juice when mixed with lime, in the process of refining, as practised with cane sugar. The vessels which hung upon the trees in order to collect the juice were watched with the greatest attention, on account of the suspicion that some evil disposed persons had introduced urine into them, but still a large quantity of ammonia was again found in the form of neutral salts.

varian wheat to contain 24 per cent.; Davy obtained 19 per cent. from winter and 24 per cent. from summer wheat. He found that wheat from Barbary contained 19 per cent., and that from Sicily 21 per cent. of gluten. Boussingault found that wheat grown in Alsace contains 17·3 per cent.; that in the "*Jardin des plantes*" 26·7, whilst the standard winter wheat contained 33 per cent. of gluten. It once was thought that the different proportions of gluten found in plants was entirely an inherent quality of the particular variety of wheat, but more recent investigations and experiments seem to warrant the conclusion that it is due to the different methods of cultivation and soils, rather than being an inherent quality in varieties; although, perhaps each of the causes enumerated, contribute towards producing such a result. It is a well known fact in agricultural chemistry, that animal manure not only increases the number of seeds, but produces a most remarkable difference in the proportion of nitrogenous substances, one of which is gluten.

Liebig gives an account where "one hundred parts of wheat grown on a soil manured with cow dung (a manure containing the smallest quantity of nitrogen) afforded only 11·95 parts of gluten, and 62·34 parts of amylin, or starch; whilst the same quantity grown on a soil manured with human urine, yielded the maximum of gluten, namely, 35·1 per cent., or nearly three times the usual quantity. · The conclusion is that it is ammonia which yields nitrogen to the vegetable albumen, which is the principal azotized constituent of plants. The vast importance of nitrogen may be inferred from this fact; namely, we may furnish a plant with carbonic acid, with humus, in short with all the necessary elements, but if nitrogen is withheld, it will not attain complete development; an herb will be produced, it is true, but it will not produce any flowers, but even if it does produce flowers it will not produce seeds, and although starch and even sugar may be produced, it will be found that gluten is entirely absent.

The following summary of results of examinations of winter wheat are condensed from "Jahrbuch der Akademie zu Tharand," by A. Stockhardt, and exhibits clearly the part played by nitrogen:

1. ROOTS.

The *watery* contents decrease continually, during the development of the plant, being smallest in quantity at the time of flowering.

The *nitrogenous* contents increase at first, then decrease, but with considerable fluctuations, and are greatest about the time of the formation of the head, (2·6 per cent.) and smallest at the time of ripening (1·15 per cent.)

The ashy contents increase until flowering, and decrease thenceforth until harvest-time; they are greatest at the time of flowering, (16·4 per cent.) smallest at the time of ripening (11·02 per cent.)

2. STALKS.

The watery contents decrease continually, and are smallest in quantity about the time of flowering.

The nitrogenous contents increase at first, but from the time of flowering, when they have attained their maximum, (3·1 per cent.) they decrease regularly until harvest, at which time they amount to (1·15 per cent.)

The ashy contents correspond with the nitrogen in variation, being greatest at the time of heading, (7·5 per cent.) and least at maturity (3·7 per cent.)

3. HEADS.

The watery contents decrease continually, most slowly at the time of flowering, most rapidly in the latter periods of vegetation, and much more rapidly in the chaff, (empty heads) than in the grains.

The nitrogenous contents diminish continually until after flowering, and are consequently greatest in the young heads still enclosed in the involucre (3·5 per cent.) This diminution continues in the chaff after flowering, (1·6 per cent.) but on the contrary the grains become somewhat richer in nitrogen until maturity (2·4 per cent.)

The ashy contents increase somewhat regularly until after flowering, (6·4 per cent.) This increase continues in the chaff until harvest, (9·4 per cent.) while a very considerable decrease occurs in the grains, (1·9 per cent.)

4. THE DIFFERENT PARTS OF THE PLANT COLLECTIVELY.

Every part of the plant shows at the beginning of the process of heading out, its maximum of nitrogen; the stalks containing the most, the ears less, and the roots the least. About the time of maturity, the different parts follow each other in regard to their content of nitrogen thus: grains, chaff, stalk, root, the latter two being nearly equal.

The best refutation which I have seen of the theory that plants derive not only their carbonic acid, but their nitrogen, from the atmosphere, is the following, which I reproduce from an essay on agricultural chemistry, published in the *Journal of the Royal Agricultural Society*, written by Liebig, in 1856, in defence of his views as mis-interpreted by Messrs. Gilbert and Lawes of England.

"Experience demonstrates that the produce of two fields in the same district are very unequal. One meadow yields twice, thrice, four times as much hay as another meadow of equal surface, under the same external circumstances. An acre of clover in one field yields twice, thrice, or four times as much clover as an acre of another clover field. There are fields, nay, entire districts, on which clover does not grow or grows but poorly. *What is the cause of this unequal fertility?* The surface of the fertile, and that of the unfruitful field, are in contact with a precisely equal volume of air; to both, therefore, are presented by the air and by the rain, precisely equal quantities of carbonic acid and ammonia; it is, therefore, plain that the cause of the difference of produce must be sought for, not in the atmosphere, but in the soil; this cause must be the inequality of the soil, while the external conditions are the same.

In the fertile soil, twice, thrice, or four times as much of the terrestrial elements of nutrition have entered into the plants, than in the unfruitful one. There have, therefore, been more of these terrestrial constituents present, either absolutely or as regards their capacity of assimilation (their power of entering into the plant, from their existing in available chemical forms,) in the one soil than in the other. The amount of produce in these cases is unquestionably proportional to the quantity of mineral elements of nutrition present in the soils, and not to the quantity of carbonic acid and ammonia, for the atmosphere has supplied to both an equal quantity of these materials; but in the one soil the conditions of their conversion into organic compounds were efficient, or operative, or greater in quantity, during the same time than in the other.

HUMUS.

Much has been written upon the influence of humus upon the growth of plants, and it is highly probable that very little is absolutely known of its importance, or manner of action. Humus has been defined by chemists to be vegetable substances in a state of decay, as roots of crops, dead leaves, &c. Those who have paid especial attention to its action, and have conducted experiments with no other object in view than to ascertain the part it plays, have reluctantly concluded that, in the form in which it exists in the soil, it does not yield the least particle of nourishment to the plant. It is well known that vegetable mould forms a rich soil, and that plants grow rapidly and attain a much greater size in spots where much vegetable matter has decayed or is in an advanced state of decay; investigators, therefore, were much disappointed when they found that humus yielded no nutriment directly to the plant. But it is of the utmost importance as a constant source of carbonic acid. Woody fibre, chips, roots of crops or decaying leaves, when moist, convert the oxygen gas with which they come in contact into an an equal volume of carbonic acid. Very few soils which contain vegetable matter, are so compact as to exclude the atmosphere; there is thus a constant conversion of oxygen into carbonic acid, and it is not improbable that in compact soils the plant itself absorbs oxygen from the atmosphere, for the purpose of having it converted into carbonic acid, by bringing it into contact with the vegetable matter. When we loosen the soil which surrounds the young plants we favor the access of air, and as a matter of course we accelerate the formation of carbonic acid; in this consists the great benefit of "hoeing" or "cultivating" plants.

Humin substances all contain naturally, water and ammonia in various proportions, and occur in black turfs, soil and root. From humus is obtained an acid called humic acid, which has a great tendency to absorb ammonia, and holds it so firmly that even by boiling with carbonate of soda it does not escape. The best agricultural chemists are, however, of opinion that no humic acid is found in the soils. The action of humus then is merely to furnish a supply of carbonic acid, and hasten the development of the plant; as it is a law in vegetable physiology that when the food of a plant is in greater quantity than its organs require for their own perfect development the superfluous nutriment is employed in the formation of new organs, that is new roots and fibrils, new branches, leaves, &c. Hence wheat tillers or stools most when sown in good soil, and protected by a good covering of snow.

The position that humus, as such, is of no importance whatever, or that very excellent crops can be grown *without* it, is strikingly illustrated by the fertile soil around Naples. Those who have traveled there state that the farms and villages are situated from eighteen to twenty-four miles from one another, there being no roads leading from the one to the other, consequently there has been no transportation of manure. The cereals have been cultivated there for many hundreds of years—perhaps thousands—without any restoration being made to the soil of any part of that which has been removed from it. And yet these lands are famous for the abundant crops they bear, while there is no proof positive that any humus was ever contained in the soil. On the other hand, wheat does not thrive in many parts of Brazil, where the soils are particularly rich in this substance; or in our own climate where soils are formed of mouldered wood, that its stalk under these circumstances attains no strength, and droops prematurely. It is well known that the strength of the stalk is due to sili cate of potash, and that wheat, as well as all the other cereals, require certain phosphates, which are not found in a soil containing humus in a great proportion. Therefore, wheat grown in soils rich in humus have tender stalks, diminutive heads and no seeds.

Humus is said to be absolutely insoluble in pure cold water, but is soluble when combined with oxygen, and in that condition is taken up by water as carbonic acid.

Mulder includes among the substances which fix the ammonia in a rich soil, the five acids which he discovered in the humus, namely ulmic, humic, geic, crenic and apocrenic acids. The acids which are formed during the decay of animal as well as vegetable substances, decompose the carbonate of ammonia which is conveyed to the soil by rain, and having thus become soluble, are transferred, in the form of ammoniacal salts, to the roots of plants, where they are very rapidly decomposed (even in the extreme end of the root fibrils) and are converted into other bodies.

When any of the above mentioned acids are found in the soil, they are generally united with bases, especially with ammonia. They should perhaps be regarded as the products of different stages of decay, because as the process of decay does not cease, organic constituents are subject to a constant change; thus by the oxidation of ulmic acid arises humic acid; from humic acid geic acid, and in like manner, by the oxidation of geic acid, crenic acid may be formed. The constitution of these matters is expressed by the following empirical formulæ:—

Ulmin	C. 40	H. 16	O. 14
Ulmic acid	C. 40	H. 14	O. 12
Humin	C. 40	H. 15	O. 15
Humic acid	C. 40	H. 12	O. 12
Geic acid	C. 40	H. 12	O. 14
Crenic acid	C. 24	H 15	O. 19
Apocrenic acid	C. 48	H. 22	O. 24

Of these substances, crenic acid is soluble in water; apocrenic, ulmic, and humic acid dissolve in alkalies; ulmin and humin are insoluble in water and in alkalies; but to a certain extent they can be made soluble by being changed into ulmic and humic acids.

[For want of space in this report, I feel myself compelled to omit several details, with this brief description of the principal inorganic compounds and elements, as well as the offices upon and in relation to each other, as well as towards the plant, conclude this portion of the essay.

The formation of sap; cell growth; the formation of the flowers, the chemical changes in the ovarium consequent upon impregnation, the formation of the fruit, the formation of *milk*, the successive changes from the "milky state" to the perfect fruit, and many other phenomena might with propriety be detailed in this place; but as this subject alone would form a large volume, it has under the circumstances been deemed proper to omit it. The subject will be found properly discussed in Goadley's Animal and Vegetable Physiology, Liebig's revised Agricultural Chemistry, Henfrey's Elementary Botany, revised edition, Mohl on the Structure of the Vegetable Cell, Carpenter's Vegetable Physiology, Unger's Botanische Briefe, Moleschott's Physiologie des Stoffwæchsels, Moleschott's Kreislauf des Lebens, Schleiden's Die Pflanze, Gray's How Plants Grow, Gray's Structural Botany, Rhind's Vegetable Kingdom, &c., &c.]

WHEAT REGION OF THE UNITED STATES.

A failure of the wheat crop in England affects the exchanges of the whole world; and a scarcity in France generally brings about a revolution.

In a country so extensive as ours, we need not fear a failure; but the boast so often made, that "we can feed the world from our surplus," is vain boasting. Beyond feeding our own great and constantly increasing population, we shall not, generally, have any great surplus. We too often think that all our wild land is wheat land. This is far from being true. The land properly adapted to wheat, is limited to ten degrees of latitude, and twenty of longitude—embracing only about half the States. Outside of this belt, wheat is raised, it is true, but not with profit; and it is, generally, a poor article of spring wheat, but little better, if any, than northern rye.

To show that our wheat region is not capable of producing so great a surplus as we imagine, we have only to look at facts instead of fancies. We may take, perhaps, as the average crop of wheat produced, that of 1848—which was 126,000,000 bushels—and our population 22,000,000, which gives a trifle over five and a half bushels to each inhabitant. Now, the consumption of wheat in England is 166,000,000 bushels annually, which gives six bushels to each inhabitant—about half a bushel more to each person than we should have if we consumed our whole crop. It is true we have a surplus that will average ten or twelve million bushels a year, for export, but that is produced by the substitution of corn for wheat, as an article of bread; cut off this substitute, and we should be our own consumers of all our wheat, and there would be a scarcity besides. As our exports have scarcely, if ever, exceeded twelve million bushels, we may safely take that as the average surplus. Besides guarding against a partial failure of a crop of corn or wheat, we have also to look to the constant flow of population to our shores from abroad, as well as to the natural increase at home. The foreign tide setting to our shores may be put down at 400,000 annually: all of whom have to be fed, for the first year at least. This will require from two to three millions of our surplus. But it is estimated that our population will double in twenty-five years; and if our wheat growing sections are fixed, and stationary in quantity, we must increase the ratio of wheat to the acre, or our surplus will, by the next census, be measured by the algebraic quantity of minus.

To rouse our farmers to the facts of which they appear to pay no attention—the limited area of wheat land, and the necessity of properly managing it so as to produce the greatest possible amount of wheat with the least possible exhaustion of the soil—let us examine the different sections of our country, and see the extent of those adapted to the raising of wheat.

The State governments of New England have, by the offer of premiums, encouraged their farmers in the production of wheat; but though much labor may produce small crops, we believe all will agree that New England is not, and cannot be, a wheat producing section. The States south of North Carolina, or say latitude 33°, never have, and never will be wheat growing States. Kentucky, Tennessee, and Missouri, are best adapted to corn, and wheat can never be regarded as the great staple of either. Cotton is the staple of Tennessee; hemp and tobacco of Kentucky and Missouri. Kentucky, and Missouri, too, are unsurpassed as grazing sections, and for raising stock; and there is no reason to suppose that they will change the agriculture best suited to their condition, for wheat culture.

Indiana, Illinois, and "The Far West," are painted to us as the great wheat regions, to which we are to look for the wheat to supply the world. The common idea is, that this whole region is peculiarly adapted to wheat; but this, like many other popular theories, may not be strictly correct.

The prairie sod—the virgin soil of the West—when first broken up, generally produces good wheat. So it will in New England. But virgin soil will not always last—like virgin beauty it becomes old, and fades with age. This prairie sod consists of friable mould, and when, by cultivation, and exposure to the atmosphere, it becomes completely pulverized, and then covered with surface water, as much of it frequently is, the frost will heave the wheat out of the ground, and it is winter killed. If the plants are so fortunate as to escape winter killing, this friable mould, when dry, is an almost impalpable powder, and the high prairie winds will blow it from the roots of the plants, exposing them to the dry and parching rays of the sun, and what the winter has spared the summer kills. These effects will not always follow, but the older these prairie lands become the more subject will they be to them.

To look at facts: Illinois, high as she stands, in reputation, as a wheat growing State, is behind cotton growing Tennessee, and hemp and tobacco growing Kentucky, in the production of wheat. Illinois produces less than seven bushels of wheat to each inhabitant, while Tennessee produces nine bushels, and Kentucky produces seven bushels and a half to each inhabitant.

To avoid the evils of winter killing in the culture of wheat, in Illinois, they have resorted to the culture of spring wheat, sown on the land where the fall sowed crop had been winter killed. This increases the quantity at the expense of the quality.

The geological survey of Iowa and Wisconsin, carried on by order of Congress, gives the reasons why those Western States cannot be permanently first-rate wheat lands. The report states that "a striking feature in the Iowa and Wisconsin soils (and the same remark applies to the Illinois prairies) is the entire absence, in most specimens, of clay, and the large proportion of silex."

Now silex, or sand, and calcareous earth, and humus, are necessary for wheat; but it also requires a considerable mixture of clay.

An agricultural writer, the late Mr. Coleman, states that "*the soil preferred for wheat, in England, is a strong soil, with a large proportion of clay.*" The absence of this clay is what renders the prairie soil so friable, and is the great desideratum in the soil to make it a permanently productive wheat soil.

Henry L. Ellsworth, of Indiana, an extensive farmer, and able agricultural writer, says: "After a full consideration of the subject, I am satisfied that stock raising, *at the West*, is much more profitable than raising grain. The profits of wheat appear well in expectation, on paper, but the prospect is blasted by a severe winter—appearance of insects—bad weather in harvesting, in threshing, or transporting to market—or, last, a fluctuation in the market itself."

Solon Robinson, a prominent agricultural writer, says: "In southern Indiana, Illinois, all of Kentucky, Tennessee, and northern Missouri, it [wheat] is affected by the rust. It is the most precarious crop in the West, and altogether unsafe for the farmer to rely on."

These parts form the belt of ten degrees of latitude, and twenty degrees of longitude, as the wheat growing section of the United States. Much of this section, even, is now, by continued cropping, exhausted and unproductive. Maryland, Virginia, and Delaware, are worn out, and although naturally adapted to wheat growing, must remain unproductive until restored by nature, or a kind of culture different from that furnished by slave labor.

The natural, and permanent wheat region, lies between latitude 33° and 43° North. Wheat can be produced North and South of this belt, but cotton, sugar, and tobacco will ever be more profitable South,—and even a part of the territory within these bounds is better adapted to cotton, tobacco, and hemp, than it is to wheat. A part of it is exhausted; and a part of it, for want of clay in the soil, will, by cultivation, become friable—a black mud that will freeze out the plants in winter, and an impalpable dust that will blow away and leave the roots bare in the summer.

This wheat section embraces Ohio, the south parts of Michigan and New York, the whole of Pennsylvania, Maryland, Virginia, and Delaware; and in these States we find where is raised, or has been, the greatest wheat production. Ohio stands at the head of all the wheat-growing States, in the aggregate of her production. Her crop in 1850, was twenty-eight million bushels, being nearly sixteen and a half bushels to each inhabitant. The geological survey of the State gives the reason, and confirms the statement, that "*a large mixture of clay in the soil is necessary to the perfect growth of wheat,*" and that the absence of it, from the soil of the praries of the west, would prevent them from ever becoming permanently good wheat-producing sections.

Thus, the reports of the geological survey of Ohio shows the soil to be "clayey," clayey loam," and "clay sub-soil," and it produces sixteen and a half bushels to each inhabitant, while Indiana, with a richer soil, produces only eight and a half bushels, and Illinois, with a still richer soil, produces only seven bushels to each inhabitant. Virginia, Maryland, and Delaware, as well as New York, were formerly great wheat-producing sections. But many parts of New York, that formerly produced twenty-five bushels to the acre, do not now average over five bushels; and many parts of Maryland, Virginia, and Delaware, that formerly produced abundantly, will not now pay the cost of cultivatien. EXHAUSTION is written all over them, in language too plain to be misunderstood.

Ohio has reached her maximum of wheat production, and, if not retrograding, is at least stationary. Thirteen bushels to the acre, may be set down as an average production, and this average must continue to grow rapidly less, till, like the exhausted lands of Virginia, her soil will not produce enough to support the cultivator, unless an improved system of husbandry is introduced to increase its fertility. The idea of skinning the soil of our wheat-growing sections, with a view of abandoning them soon and going west to procure new and fertile wheat land, must itself be abandoned, as we are on the western verge of the permanently good wheat producing section.

Our only resource now is to preserve our wheat lands where they are not exhausted, and to restore them where they are. Under judicious and scientific tillage, the lands of England, that have been under cultivation for hundreds of years, now produce twenty-five bushels to the acre. This is done by a liberal use of lime, plaster, clover, and a judicious rotation of crops. In wheat-raising, this rotation is clover and corn. Peas, beans, turnips, beets, and carrots, all furnish a good rotation, and furnish good food for sheep, which are good on wheat land. In fact the culture of wheat and raising of sheep should go together. The rotating crops furnish food for the sheep, and the sheep furnish the best of manure for wheat land. All the manure derived from the sheep should be carefully preserved for enriching their land. It is highly concentrated, and prepares the land for a generous crop of wheat at a small expense. The manuring agent consumes the crop that gives the land rest from wheat culture, and prepares the soil for another crop of wheat.

Plow deep, then; bring up the phosphates from below, and then apply your manure. Soils must be plowed deep to produce good wheat—first, to get the phosphates, and, secondly, to give the roots of the wheat plants a chance to run deep. One acre plowed twelve inches deep will produce more wheat than four acres plowed six inches deep.

Again we say—plow deep—save all your manure, and use it freely; apply your lime, clover, and plaster; rotate your crops; and instead of thirteen bushels to the acre being an average crop of wheat, you will just as easily get an average of twenty-five. Turn your attention to renovating your lands, instead of dreaming of the fertile West, and make Ohio what God intended her to be, the granary of the Union, and unless our farmers turn their attention, and very soon too, to the renovation of their wheat lands, even *Ohio will soon be among the non-producing wheat lands.* That portion of Canada, which is included in the wheat region, is no longer profitably cultivated with wheat, and has fallen off, in wheat production, from 22,981,244 bushels to 942,835 bushels in a year. This falling off of over twenty-two millions of bushels of wheat a year in Canada, was gradual, but took place between 1827 and 1844. This has curtailed the product of the crop in the wheat-growing regions immensely, and Canada may be left out of the wheat region.

Wheat requires *"a large mixture of clay in the soil for its perfect growth,"* for want of which the territory west of Ohio can never be a permanent wheat-growing region, and Virginia, Maryland, and Delaware, and most of New England, are exhausted by long continued cropping without renovation. It will be seen, then, that the wheat region is narrowed down to very confined limits, and, what is more lamentable, these limits are becoming less productive. It is on this account that we call attention to this all-important subject. Unless our farmers are roused up to this subject, the small remaining wheat region will be so nominally only; or, like Illinois, must soon be turned to the production of spring wheat.

In a work called "American Husbandry," published in England in 1775, the writer says: "Wheat, in many parts of the province of New York, yields a larger produce than is common in England. Upon good lands about Albany, where the climate is the coldest in the country, they sow two bushels and better to an acre, and reap from twenty to forty. The latter quantity is not often had, but from twenty to thirty bushels are common, and with such bad husbandry as would not yield the like in England, and much less in Scotland." Such was the productiveness of the wheat lands of New York eighty years ago.

In 1845, the average per acre of that same wheat land, in Albany county, was only seven and a half bushels: in Dutchess county, only five bushels: Columbia county, six bushels; Rensselaer, eight bushels; and West Chester, seven bushels per acre. In northern Ohio we believe we may safely place the average product of wheat at thirteen bushels per acre. Now, after a cultivation of about half a century, our yield of wheat has decreased about one-half per acre. The process of diminution is still going on, and unless soon arrested by the application of proper manures, and a better system of tillage, our average product, like those parts of New York to which we have referred, will soon be between five and eight bushels per acre.

In England, where the land has been in cultivation for centuries, the average yield is twenty-one bushels per acre; in Scotland, thirty bushels; and in England crops have been raised as high as eighty-eight bushels to the acre.

Now it may be laid down as an axiom that, climate and local circumstances being the same, what one soil will produce, another, by scientific cultivation, may be made to produce; and that the farmer, from a like amount of skill and labor in the cultivation of the soil, may anticipate the same results that have attended like efforts in other countries. If they pursue the exhausting process that has impoverished Virginia and some other States, they will reap an abundant crop of poverty and exhaustion. The work is going on rapidly. The estimated loss, by exhaustion, in the United States, is, annually, $30,000,000. This is equivalent to a loss of $500,000,000 capital, at six per cent. If, by scientific cultivation and manuring, our farmers will arrest this system of exhaustion, they will restore this capital; and these lands that now produce from five to thirteen bushels of wheat to an acre, can be made to produce as they do in England—twenty, forty and eighty bushels.

As we have so long looked at the vast west as an inexhaustible wheat region, it is hard to bring ourselves to a belief that it is not such, and still more so to believe that it is mostly a desert, incapable of producing anything, much less good wheat crops. That our farmers may know that what we say is literally true, we quote from Professor Henry, secretary of the Smithsonian Institute. He says:

"We are nearer the confines of the healthy expansion of our agricultural operations over new ground, than those who have not paid definite attention to the subject could readily imagine. The whole space of the west, between the 98th meridian and the Rocky Mountains, denominated the great American Plains, is a barren waste, over which the eye may roam to the extent of the visible horizon, with scarcely an object to break the monotony. From the Rocky Mountains to the Pacific, with the exception of the rich but narrow belt along the ocean, the country may also be considered, in comparison with other portions of the United States, a wilderness, unfitted for the uses of the husbandman.

"In traversing this region, whole days are frequently passed, without meeting a rivulet, or stream of water, to slake the thirst of the weary traveler. Between the parallels of 32° and 33°, occurs the great Colorado desert, extending to the river of the same name, which empties into the Gulf of California. The entire district is bare of soil and vegetation, except a few varieties of Cactus. Over the greater portion of the northern part of Sonora, and the southern part of New Mexico, sterility reigns supreme.

"We have stated that the entire region west of the 98th degree of west longitude, with the exception of a small portion of western Texas and the narrow border along the Pacific, is a country of comparatively little value to the agriculturist—and this line, which passes southward from Lake Winnepeg to the Gulf of Mexico, will divide the whole surface of the United States in two nearly equal parts."

It will thus be seen that comparatively all the wheat region is in the eastern half of the United States; that all west of longitude 98°, which is a line from the west side of Lake Winnepeg to the west end of the Gulf of Mexico, may be set down not only as a non-wheat producing region, but also as mostly an unproductive desert.

In this manner we see that "one-half of all the territory of the United States" is unproductive. Of the balance, Maryland, Virginia, Delaware, and New England may be said to be exhausted—much of New York nearly so. Tennessee is devoted to cotton, Kentucky to tobacco, and Missouri to hemp, narrowing down the area of the wheat region to a comparatively small territory.

Of this small territory, which we have designated as the wheat region, Ohio may be said to be the western verge of the real wheat-*producing* section. As this is contrary to the views of most people, who think the rich prairies of Illinois are great wheat-producing regions, we will give an extract from "*Emery's Journal of Agriculture,*" published at Chicago, the great wheat market of Illinois.

"South of [Minnesota, northern Wisconsin, and Michigan,] the want of the snow coming to protect the young plants from the almost constant freezing and thawing of winter, and drying winds of March, make it, in most seasons, a very uncertain crop. We have known good crops of winter wheat on sod land, in the district indicated, but these are exceptions to the general rule; *nor do we believe that winter wheat, on an average, has ever paid the expense of its culture in the section now noticed.* From the fact that its culture in that section is generally abandoned, and spring wheat largely cultivated in its place, we think the question is fully settled."

This authority, we think, fully sustains our position, that Ohio is the most westwardly State in the wheat-producing region. Indiana and Illinois are better adapted to other crops, or to spring wheat, than to the choice winter wheat of Ohio, Pennsylvania, and western New York. This narrows down the wheat region to a small territory, and instead of the vain boast that we can feed the world from our surplus wheat, indicates that we must husband our resources, and stop the deterioration of our soil by the liberal application of manure and better tillage, or we shall soon be importers of wheat instead of exporters. The most desirable portions of our territory have changed owners, and now belong to individuals instead of the government. If these are exhausted the like cannot be again purchased.

Our farmers, then, must look to it. They must preserve those wheat lands that are not exhausted, and renovate those that are, or we shall soon be out of the pale of the wheat-*producing* section, though in the natural wheat region. The tide of population that is moving westward must soon stop, as they will reach the verge of not only the wheat region, but of the agricultural region. It must soon return eastward in search of the wheat-producing region; and to enable them to find it a different system of tillage and manuring must be pursued.

FIRST WHEAT IN OHIO.

John H. Klippart:

DEAR SIR: The question might be asked, "who sowed the first wheat in Oho," by a thousand persons, without getting the desired information. Truman Guthrie, my father, emigrated to the northwest territory in the year 1788, and arrived at the mouth of Muskingum in July, about three months after General Rufus Putnam had arrived with the first pioneers of Ohio. My father brought a bushel of wheat with him from one of the frontier counties in Pennsylvania, which he sowed on a lot of land in Marietta, which he cleared up for that purpose, on the second bottom or plain, in the neighborhood of where the court-house now stands

The above is a simple relation of a fact that is to be found in a book written by Dr. Samuel P. Hildreth, of Marietta, entitled "Pioneer Settlers of Ohio," and which my brothers and myself have often heard him relate. My father lived and died in Belpre, Washington county, Ohio, in 1841, in the 77th year of his age—was born in the State of Connecticut.

Respectfully yours,

A. S. GUTHRIE.

Addison, Gallia Co., Ohio.

VARIETIES OF WHEAT.

There is perhaps no fact connected with the wheat plant better established than that it, by climate, soil and culture, may be much modified or changed. It would be requiring greater credence than the public are prepared to allow, were we to assert unqualifiedly that red bearded wheat could be changed into white smooth wheat; yet incredible as this appears to be, it is nevertheless true. There are instances on record of red wheat being changed into white, and of beardless having been derived from bearded;—these changes or modifications are not sudden, or the freaks of nature, but are the result of the continued influences of surrounding circumstances. The wheat plant is not the only plant whose qualities are affected by climate, soil and culture, neither is the vegetable kingdom alone subject to these influences. Whilst it is an indisputable fact that

Europeans have lived for many generations among the Kaffirs and Hottentots, as well as with African tribes nearer the equator, yet hundreds of years have failed to change the delicate carnation on the Circassian's cheek into the ebony of the negro—or to metamorphose the long, straight dark brown hair into the black wool; the Dutch families who settled in Southern Africa 300 years ago, are now as fair, and as pure in Saxon blood as the native Hollander; the slightest change in structure or color can at once be traced to intermarriage; but Saxon sheep being removed to the torrid zone, in a few generations the fine, soft, compact and valuable fleece is supplanted by a coarse, sparse, shaggy hair; and it is now generally admitted that the original Saxon sheep were exceedingly coarse. In Mexico the dog and the horse, both in the course of several generations become almost hairless, and instead of the hair have a skin not very unlike that of the elephant. In the torrid zone the bee does not lay up a store of honey—it provides sufficient only to feed the new brood.

There is reason to believe that plants, through the influences, of soil (their food) and climate undergo as great changes as does the animal kingdom; one of the best established evidences of which is that cotton grown in a certain district in China is of a nankin color, but when the seeds are brought to America and planted they produce the usual white cotton. It is said that the peach in its original soil was a virulent poison, and that the Persian warriors brought to Persia some of the seeds and planted them for the purpose of poisoning the points of their arrows, so as to render wounds caused by them to be fatal, but a change of climate and soil produced a fruit which is not only luscious, but is esteemed exceedingly healthy.*

It is a tolerably well established fact that continued culture of the same variety of wheat in the same place will considerably modify or improve its qualities.† The instance related by a gentleman, of red Mediterranean wheat changing into white is not the only one of the kind which has come to my knowledge, but is perhaps the best authenticated.

An excellent farmer communicates the following:

"I regard the Mediterranean wheat as earlier than most other varieties, especially when grown on heavy soil. I have known it to ripen more than a week earlier than the red bald or the Canada flint, and think it less liable to the ravages of the weevil. I am aware that it does not yield as greatly as some other varieties, when we are fortunate enough to have them do well, but as a general thing, I think it by far the safest for a crop.

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* Transactions of the Russian Economical Society.

† See *Old Red Chaff*—bearded, in list of varieties of wheats.

Three-fourths, if not nine-tenths of the wheat raised in this country is the Mediterranean variety. As to its value *now; I view it as quite different from what it was when first grown here.* I have the testimony of our millers as well as my own experience to sustain me in saying that this wheat yields a greater and better quality of flour than it did ten years ago, in this section at least."

Modifications of this kind requiring many years to consummate them, may no doubt have been observed by others who have never communicated their observations in such a manner as to find their way into print; whilst on the other hand very many statements purporting to be *observations* have found their way into print much to the *prejudice* of the progress of agricultural science.

There is no doubt that culture, climate, and soil, will modify the appearance of plants, to such an extent in many cases that the casual observer may be persuaded that an entire metamorphosis has taken place. From hasty observations, equally hasty inferences are generally made, and false conclusions are the result. One of these *pseudo* observations is the supposed transformation of wheat into chess or cheat, or, botanically, *Bromus secalinus.*

The advocates of this supposed metamorphosis claim that excessive moisture, and cold in the spring months, produce the change; another party of supposers claim that pasturing in the spring will cause the change, whilst a third party claim that hauling with a wagon over the field, after seeding, will change into chess every grain which has been so unfortunate as to have been passed over by any one of the wheels. It requires a greater faith in the susceptibility of species to be transmuted than I ever have been favored with, and requires more evidences than yet have been corroborated by examples in the vegetable kingdom, to believe that under any conceivable circumstances wheat can be transformed into chess. I will, in as brief a manner as possible, state my reasons for withholding assent to the *cheat* doctrine.

I. Although climate, soil, and culture may modify or improve given species of plants or animals, yet it does not change one species into another; the pine of Norway when removed to Mexico does *not* become a chestnut, nor the Saxon sheep become a goat, although the character of both pine and sheep are modified; yet when the sheep is returned to Saxony it re-assumes its original characteristics, and although wheat is derived from Ægilops, there is a far greater identity in the general, as well as in the botanical characteristics of both these plants, than there is between wheat and any other plant.

II. Cucumbers, melons, and pumpkins have more general and botanical characters in common than wheat and chess, yet who has ever claimed that cucumber-seed produced melons, and that these melons in turn produced pumpkins? There is no well authenticated case on record of as complete a transformation of one species into another as is claimed in the case of wheat changing into chess.

III. Like produces like; climate, soil, and culture may increase the size, or improve the quality of this product, but generic character can never be changed. The improved short-horn bull of to-day is an animal differing in outline *perhaps* from the "*ring streaked and speckled*" cattle of antiquity; but he cannot be changed into a giraffe, elk, deer, nor horse. There is far greater resemblance between oats and chess, than between wheat and chess. The wheat produces a head or *spike*, chess produces a diffuse and spreading top or *panicle*, as distinct and different from the wheat-spike as is a Morgan horse from a Rocky Mountain goat. There is no well authenticated case on record of any parent producing so unlike a progeny; neither is there any record of so great a transformation having taken place by the most exact conformity to known laws, and the most unremitting care and attention during a century, as is claimed by the wheat-transmutation advocates.

IV. The law, influence, or circumstances, must necessarily affect all within its reach—if it can possibly change a single one, it must operate on all similarly situated to the one changed. In Ohio we have generally about eight inches of rain in April and May; in 1858 we had eight and a quarter inches in the month of May alone, and fully half as much in April; if, then, excessive moisture is the cause of the transmutation, the entire wheat crop of 1858 in Ohio should have been transmuted. But the advocates of the theory may claim that so extensive an application is taking too great a license with their doctrine; we will therefore confine ourself to a square foot of ground which is perfectly level, and the soil is of the same quality, as well in mechanical as in chemical composition, as possibly may be found anywhere on a similar area. On this square foot was found wheat and chess growing in the following order:

C.	W.	W.	C.	W.	C.
W.	W.	C.	W.	W.	W.
W.	W.	W.	W.	C.	C.
C.	C.	W.	C.	C.	W.
W.	W.	C.	W.	W.	W.

To be sure they did not grow in such precise regularity as above indicated, but they all grew on the area above mentioned, and in the relative position as marked by the initials above—C. being Chess and W. Wheat. What law in nature could possibly transmute one-half the wheat stalks in the upper line, one-sixth of the second row, one-third of the third, two-thirds of the fourth, and one-third of the fifth, when the topography was precisely the same, the soil the same, the moisture and atmospheric influences precisely the same? *The truth is, no such transmutation ever took place; all the chess found in grain fields is the direct product of chess seeds.* This announcement may possibly startle some of those who hold that chess is deaf, or produces husks or chaff only; but they have never examined the flower of the chess, nor submitted the reproductive organs of this plant to microscopic investigation. Chess has as perfect a flower as wheat has, and produces a grain capable of germination, and thus reproduces and perpetuates its species. The husk or chaff of chess is very thick, and protects the albuminous body for several years from decay when it is too deep in the earth.

Every farmer must have observed in spring time, in pasture fields or meadows, where cattle had been during the autumn, that wherever there were droppings from the cattle, the grass appeared to have a thriftier growth, so much so that the number of droppings could be counted as so many green hillocks many rods distant. All the plants, whether clover, timothy, red top, June or orchard grass, whose seeds or roots came within the influence of the dropping, were affected by it; they all grew larger and greener than the grasses not so affected; but the clover was not converted into timothy or red top, nor June grass into clover or timothy. Neither does the manure affect the timothy and not the other grasses, but affects all alike. Therefore, if any influence operated upon the square foot of soil above referred to, it must have changed *all* the wheat on it into chess, if it possibly could have changed a single grain.

Chess requires considerable moisture to induce it to germinate, hence it is found most abundantly in moist places; here it grows more rankly than wheat does, and in a short time overshadows and chokes the wheat, and the careless observer, seeing chess abundant about harvest where wheat plants appeared in the spring, concludes that the one has been transformed into the other.

The thick hull or chaff of the chess protects the albuminous body from the operation of digestion in the craw of birds, or stomachs of horses or cattle. Birds passing over wheat fields may drop chess seeds, and from the droppings of horses and cattle chess seeds may germinate; hence it is not uncommon to find chess growing about stumps and logs in newly cleared lands.

If farmers will habitually sow clean seed, there is little danger that they will be troubled with chess.

There is another fact which it would be well to remember in controversies on subjects of this nature, viz: all species, and not unfrequently genera which are allied will hybridize, that is, will produce offspring partaking of the nature of both parents, yet not resembling either in every respect; thus the horse and ass are allied species of the *Equine* genus, they hybridize and produce the mule.* Wheat and chess *will not* hybridize, thus proving conclusively that there is neither specific nor generic affiliation existing between them.

Wheat may at different periods have been produced from the Ægilops in various countries: in India, Persia, Egypt, Greece, California, South America, &c., and the different varieties may have been derived from the originals from the various localities having been modified by soil, climate and culture.

Experience teaches that by high culture red wheats change into white ones, and although we have no direct evidence that bearded or awned wheat changes into beardless, yet the French Journal d'Agriculture Pratique, speaks very highly of a bearded wheat which loses all its beards the moment it ripens.

Mr. Daniel has introduced on the farm of Barliere (Haut Loire) a variety of white wheat from Russia, which merits attention. A small sheaf of it was on exhibition at the World's Fair. It is said to be very productive, and to make an excellent quality of second rate bread, such as is in general use by the agricultural population.

The spike or head of the wheat is stout and long, the awns or beards are *very* long, and drop off the very moment that the grain is matured. The chaff is thick and coarse, and protects the grain from many attacks to which the thinner chaffed varieties are subjected. The grain is large, white, and very heavy. It is cultivated by the farmers in the vicinity of Brionde, without extraordinary manuring, or other care, and the harvest generally yields 38 to 44 bushels per acre. It succeeds best in good soil, but is not susceptible of withstanding great extremes of cold, more particularly the cold of humid and insalubrious districts; although it appears not to have been affected by the cold of last December. The straw is long, heavy, and of a remarkable whiteness.—*Journal d'Agriculture Pratique, Feb. 20*, 1856.

It is by no means improbable that in some localities, the Mediterranean has, since its introduction into the United States, lost the awns or beards

* See page 556, where hibridization is more fully discussed.

and is now known as the beardless or smooth red Mediterranean. In localities where climate and soil more readily affect changes than culture, the smooth red Mediterranean may have become white. If the same variety of wheat were sent to Canada, Central Ohio, Tennessee, and California, from Norway or Denmark; and the wheat thus sent be cultivated on the same farm for a period of fifty successive years in each of the localities just mentioned, there is no doubt that at the expiration of this period, if a comparison were to be instituted, the varieties would be found to differ greatly from each other, and all differ from the original, not only in appearance, but in quality. And, more than all, whilst that in Canada ripens there the first of August, that in Tennessee the first of June, that in California the tenth of May, that in Central Ohio will not ripen before the first of July. If, then, imports be made of the identical variety to Ohio from Canada and Tennessee, and sown side by side with that already acclimated in Ohio, it will be found that that from Canada will ripen a few days *earlier*, and that from Tennessee a few days *later* than that of Ohio. Even in the limited extent of latitude embraced between Lake Erie on the North, and the Ohio river on the South, there is an appreciable modification in the same variety of wheat. A spike of Mediterranean grown in Trumbull county differs as much in appearance from a spike of the same variety grown in Lawrence or Scioto, as it does from a spike of "*old red chaff*," or of "*Quaker wheat*."

So well is this fact understood by botanists, that Prof. John Lindley remarked of the wheats on exhibition at the Crystal Palace in 1851:

"I have already said, that among the wheats produced in the Exhibition, that from our South Australian colonies is the best—that it is much the best. And here let me make a remark on that subject. It has been supposed that all we have to do in this country, in order to obtain on our English farms wheat of the same quality as this magnificent Australian corn, is to procure the seed and sow it here. There cannot be a greater mistake. The wheat of Australia is no peculiar kind of wheat; it has no peculiar constitutional characteristics by which it may be in any way distinguished from wheat cultivated in this country; it is not essentially different from the fine wheat which Prince Albert sent to the Exhibition, or from others which we grow or sell. Its quality is owing to local conditions, that is to say, to the peculiar temperature, the brilliant light, the soil, and those other circumstances which characterize the climate of South Australia, in which it is produced; and, therefore, there would be no advantage gained by introducing this wheat for the purpose of sowing it here. Its value consists in what it is in South Australia, not in what it would become in England. In reality, the experiment of growing such corn has been tried. I myself obtained it some years since for the purpose of experiment, and the result was a very inferior description of corn, by no means so good as the kinds generally cultivated with us. And Messrs. Heath and Burrows, in a letter which I have received from them this morning, make the same remark. They say, 'For seed purposes it has been found not at all to answer in England, the crop therefrom being ugly, coarse, and bearded.' The truth is, as was just observed, the peculiarities of South Australian wheat are not constitutional, but are derived from climate and soil. It appears, therefore, that wheat may be affected by climate, independently of its constitutional peculiarities: but it does not follow that wheat is not subject to constitutional peculiarities like other plants. There are some kinds of wheat which, do what you may with them, will retain a certain quality, varying but slightly with the circumstances under which they are produced: as, for example, is proved by some samples here, especially of Revitt wheat, of a very fine description, exhibited in the building by Mr. Payne, and which is greatly superior to the ordinary kinds of Revitt that appear at market. This clearly shows that Revitt wheat of a certain kind and quality is better than Revitt wheat of a different kind, both being produced in this country: so that, circumstances being equal, we have a different result, owing to some constitutional peculiarity of race."

The principal difference between red and white wheat exists in the amount of gluten and silex, or cortaceous (bran) substances. Gluten (*d.* Fig. 1, Plate —,) is found to be two or even three times as thick in some varieties, as in others. It is thinnest in white wheat, medium in *amber*, and thickest in coarse, heavy red wheats. The skins (*a. a. b.* Fig. 1,) abound in silex to a greater extent in red than in white wheats. But climate, soil and culture, modify the amount of gluten and silex, as well as other characteristics of the plant, and thus produce new varieties.

There are many varieties of wheat now cultivated in this State which owe their origin to some peculiar and perhaps local influence. There are several cases on record where the same variety has been habitually cultivated on the same farm for many years, when suddenly a strange *head* is found making its appearance in the field. This head not unfrequently is larger and presents other indications of being an excellent, if not superior variety of wheat. Where did it come from? The farmer has not been changing the variety of wheat, and why is there a single head only, or half a dozen heads at most? If there were a square yard or more covered with the new variety, one might suppose that the product of any entire head had been sown, or by some fortuitous circumstance had found its way there. It is idle to suppose that birds of passage might have dropped it in their migration; because, in the first place it is probable that the germinating qualities would be destroyed at least, if not the entire grain be digested; but because, if birds did convey it there, they must have obtained it somewhere, within a few days flight of the place where it was dropped, and the variety of wheat would be recognized as coming from the north, south, east or west. Notwithstanding the improbability of new varieties being introduced in the manner just mentioned, the theory is entitled to due consideration. The advocates of this theory assert that the birds which convey the grains, proceed from the north to the south, and bring the grain from the north. The northern varieties are more hardy than those acclimated here, and not so readily digested by the birds. The birds wing their way to the south at the approach of winter, when deep snows cover the ground and thus hide their accustomed food, in the far north; and the seeds dropped by them on our grain fields germinate before the cold of winter has actually set in.

It is true that any variety of wheat taken south any considerable distance from its accustomed locality, will not only increase in size, but present a more vigorous and hardy appearance than that already acclimated. Hence the plausibility of the "*bird*" theory.

Another party of theorists assert that the grain or grains which produce new and superior varieties, have accidentally fallen in places the soil of which is of peculiar chemical combination, or whose mechanical structure differs from the remainder of the soil, upon the same principle that grass growing under the droppings from animals in pasture fields, obtain elements and ingredients if not different in combination from those in the soil generally, yet in much greater proportion; that these incidental peculiarities of soil, produce characteristic changes in the structure and appearance of the plant. The advocates of this theory refer to the experiments of *Salm-Horstmarr*, on page —, as being collateral, if not conclusive evidence, of the correctness of their position.

A third party ascribes the origin of varieties to hybridization. It is very evident that wheat does not naturally hybridize, because if it did "mix" as readily as can corn, *sorghum saccharatum*, or *solium perenne*, the agriculturist could produce at pleasure, the most desirable varieties in vast quantities in a single year. Were it true that wheat hybridizes in the field without the agency or interference of man, then, to find grains of a dozen different varieties in the same head or spike of wheat, might be regarded as the *rule*, and a head in which the grains were all of the same variety would be the *exception*, yet how often do we find half a dozen varieties of wheat, sowed in the same field and growing side by side for successive years, preserving and perpetuating their characteristics, without the least appreciable change or alteration.

It must be obvious that wheat harvested in an unequal state of ripeness, cannot be the best for the purpose of making bread, as when the greater part of the grain has been cut in the state the farmer considered fitted for the miller, while the lesser part has been either in a milky state, or much over ripe, or some in states between both.

The greatest quantity of flour is not obtained from wheat cut in this manner, but would be obtained when every ear produced that fine, plump, thin-skinned, coffee-like looking germ, and a delicate, transparent, thin-coated bran. Hence it is assumed, that to have the best bread from any variety of wheat, is to have it so pure, that, supposing it to be grown on a level space, with one exposition, it will all ripen at the same time: slight differences being allowed for variation of soil, sub-soil, or accidental unequal distribution of manure; but, that as a general thing, it will ripen equally. I must here observe, that the cause why so much wheat appears to have many shrivelled, lean, ill-grown grains in it, arises often from the unequal growth of the many varieties that lurk in the purest crop. No writer has yet, I believe, directed the attention of the agricultural world to the cultivation of the pure sorts, originating from one single grain. It is contended that this has been the root of all evil; many have attempted to begin well, but few, if any, have thought of commencing from the original, and persevering and keeping it pure.

I am well aware that many may consider this project visionary and unattainable. It has been asserted that if even a pure crop were sown, the bees would mix the farina, mice would mix the grains, birds would do the same, and more than all, if it had been feasable, it would have been done long ago.

It is of paramount importance to ascertain and keep note of the period of flowering of each variety to be cultivated, on extensive farms, which will tend more to keeping up a pure sort, than any other method.

So far as actual experiments in hybridization with wheat are concerned I can do no better than to quote from the excellent lecture of Prof. John Lindley, referred to in a preceding page:

"But this leads to a question which I think of the highest interest, and one which has been more distinctly brought out in the exhibition that has just closed than it has ever been before. We all know the EFFECT of

HYBRIDIZING, or crossing the races of animals; and we also know that within certain limits, this may be done in the vegetable kingdom. We are all aware that our gardeners are skillful in preparing by such means those different varieties of beautiful flowers and admirable fruits which have become common in all the more civilized parts of Europe; but no one has paid much attention to the point as regards cereal crops. Yet it is to be supposed, that if you can double the size of a turnip, or if you can double the size of a rose, or produce a hardy race of any kind from one that is tender, or the reverse, in the case of ordinary plants, you should be able to produce the same effect when operating on cereal crop. It so happens, however, that the experiment has not been tried except on the most limited scale, and to what extent it may be carried, has been more brought out in this exhibition than it ever was before. In the last treatise on this subject by Dr. Gærtner, a German writer who has collected all the information it was possible to procure relating to the production of hybrids in the vegetable kingdom, the author declares that, as to experiments on cereal plants, they can hardly be said to have had any existence. The exhibition has, nevertheless, shown us that they have been made, and some examples will tell with what result. I have no very good means here of explaining such experiments, but I must advert to them, because they prove distinctly that you may operate upon the constitutional peculiarities of wheat, just as you may upon those peculiarities in any other plant. For instance, Mr. Raynbird, of Laverstoke, who obtained in 1848 a gold medal from the Highland Society for experiments of the kind, sent to the exhibition this box, which contains a bunch of Hopetown wheat, a white variety, and a bunch of Piper's Thickset wheat, which is red. The latter is coarse, and short strawed, and liable to mildew, but very productive. Mr. Raynbird desired to know what would be the result of crossing it with the Hopetown wheat, and the result is now before us in the form of four hybrids, obtained from those varieties.

"If you will take the trouble to examine them, you will see that beyond all doubt the new races thus obtained are intermediate between the two parents—the ears are shorter than in the Hopetown, and longer than in the Thickset wheat; in short, there is an intermediate condition plainly perceptible in them throughout. And it appears from the statement of Mr. Raynbird that these hybrid wheats, which are now cultivated in this country, have succeeded to a satisfactory extent, yielding forty bushels an acre. But in this instance, as in some others which I am about to mention, I do not at all attach importance to that circumstance. The essential part of the question is not the number of bushels produced per acre, but to show that you may affect the quality of cereal crops as you may affect animals and other plants. Mr. Maund, a very intelligent gentleman residing at Bromsgrove, in Warwickshire, has done much more than Mr. Raynbird, for he has obtained a greater variety of results, which he exhibits this evening. Mr. Maund has been occupied for some years past in the endeavor to ascertain whether something like an important result cannot be produced upon wheat by muling, and he exhibited the specimens before us in evidence of what may be done. You will observe that sometimes his hybrids are apparently very good, and sometimes worse than the parents, as we know is always the case. When you hybridize one plant with another, you cannot ascertain beforehand with certainty what the exact result will be: but you take the chance of it, knowing very well that out of a number of plants thus obtained some will be of an improved quality. If you examine this glass case you will at once see the results obtained by Mr. Maund. In each instance the male parent is on the left hand, the female on the right, and the third specimen shows the result of combining the two kinds; a better illustration could not be desired. Here is a hybrid considerably larger than the parents, and in the next instance one considerably shorter and stouter. In another example you see a very coarse variety gained between two apparently fine varieties; that is, perhaps, a case of deterioration. In another instance you have a vigorous wheat on the left, and a feeble one on the right, while one, much more vigorous than either, is the result. On the other hand we have some anomalous cases, in which the effect of hybridizing has been to impair the quality. Now, I think this is a very important case, well made out, because the moment you show that by mixing corn, as you mix other things, you obtain corresponding results, there is no reason to doubt that an ingenious person, occupying himself with such matters, will arrive at the same improvements in regard to varieties of corn as have already been obtained in the animal kingdom, and in those parts of the vegetable kingdom which have been so dealt with."

Mr. Maund enumerates eight instances in which successful cross-fecundation had taken place:

1. *Male.*—Old Lammas. *Female.*—Donna Maria,	A much larger ear than either.
2. *Male.*—Pearl White. *Female.*—Oxford Red.	Ditto.
3. *Male.*—Clustered Red. *Female.*—Satin White.	A coarse, rough, short-eared sort.
4. *Male.*—Old Lammas. *Female.*—King's White.	A very large, long ear.

5. *Male.*—Boston Red. / *Female.*—Donna Maria. } Large ear, and very strong straw.

6. *Male.*—White Cone (hairy.) / *Female.*—Northumberland Red (smooth.) } A long, beardless ear, rather downy.

7. *Male.*—Dark Cone. / *Female.*—Pearl. } A small, deformed ear, white, tinged with black.

8. A parcel of anomalous forms, all instances of deterioration.

The same law of transmission of qualities from parent to offspring appears to obtain in the vegetable, as in the animal kingdom. It is well known to all cattle breeders that the offspring bears a much greater resemblance to the sire than to the dam, whilst the *disposition* of the dam rather than that of the sire is transmitted. Mr. Maund in his series of experiments in hybridizing found that a strong sire and weak female produced a much better result than a weak sire and strong female. All of No. 8 in the above list were of this latter character. The new varieties thus artificially produced, usually prove to be of earlier development and maturity, as well as more prolific and better adapted to withstand the extreme vicissitudes of the the climate than either parent.

The entire practicability of producing new varieties of wheat at will, being thus demonstrated, we trust it is not indulging in too sanguine expectations when we predict that ere many years the farmers of Ohio will by this method produce the best varieties that the world ever saw.

There is no doubt that the cultivation of Mediterranean wheat would at once be abandoned in Ohio, were there a variety of white wheat which would as successfully resist the various diseases caused by fly, midge, rust, &c., and which would withstand the cold and drought as well. Such a variety can undoubtedly be produced by hybridization; and as an experiment in the proper direction we would suggest that a cross be produced between an early plant of the white blue stem, and an early one of the Genessee flint, or the Quaker wheat. It often happens that the first cross is not what is desired, then a cross between this first hybrid and one of the parent races, or even a second, or some cross of this kind may result in this quality. To demonstrate more fully, suppose a hybrid with Genessee flint as male, and white blue stem as female, is produced, which we will call the Genessee blue stem, but is not desirable, having too much of the characteristics of the original blue stem. Then produce a cross with the same former male upon this hybrid, and name the result hybrid No. 2. Suppose this result to partake yet too much of the blue stem characteristics; produce another hybrid with the same male as in the other cases, but with hybrid No. 2 as female, and name the product hybrid No. 3;

this result may now have more of the Genessee qualities than are desirable. Then a hybrid between No. 2 and 3, will perhaps produce the desired qualities.

Sometimes it happens that the varieties from which new varieties are sought to be obtained, will not hybridize with each other; as for example it should prove that the Mediterranean would not cross with Soules wheat, but that a cross from these two varieties would combine desirable qualities. When such a case occurs, then the process must take place which will cross with both the Mediterranean and the Soules. The Soules may be crossed upon the Genessee Flint, and this product called No. 1, or Soules Genessee, then Mediterranean may be crossed upon the Soules and the product called No. 2, or Mediterranean Genessee; then No. 1, (as male) crossed upon No. 2, (as female) will produce a hybrid which will be one-half Genessee, one-fourth Mediterranean and one-fourth Soules; this will be No. 3. This last hybrid will cross with the original Soules, and produce a variety that will be three-fourths Soules, one-twelfth Mediterranean and one-sixth Genessee; this hybrid will be No. 4. Then No. 3 crossed upon the Mediterranean will produce a variety, being three-fourths Mediterranean, one-twelfth Soules, and one-sixth Genessee; this will be No. 5. Now a cross between the hybrids Nos. 4 and 5, will produce a hybrid being five-twelfths Mediterranean, five-twelfths Soules, and one-eighth Genessee Flint. This No. 5 may be crossed back upon either of the parents, and the consequent hybrids crossed upon each other until all of the Genessee Flint taint is bred out; and then the result will be a hybrid of two varieties which originally would not hybridize with each other.

There is no doubt that these hybrids are constitutionally more susceptible to the influences of heat than the parent varieties, hence their earlier maturity. There is no reasonable doubt that by hybridization many excellent varieties may be produced, which, in Northern Ohio, will ripen in ordinary seasons not later than the 20th of June, and in Southern Ohio, as early as the tenth of June. Were such a variety produced, the ravages of the weevil would be set at defiance, the rust could not injure it, and many inconveniences experienced at present would be avoided.

It may not be inappropriate in this place to describe in detail the process of hybridization. In every glume of a perfect head of wheat we find three anthers, (or male portions of the flower) represented at *c*, Fig. 59, in an early state, more advanced in Fig. 62, and forcing the sides of the glume apart and finding its way to the outer world at *a*, Fig. 59, and *a*, Fig. 63. These anthers contain pollen grains or dust, which contains the seminal fluid or fecundating principle. The two delicate feathery portions found attached to the base of the glume, one of which, in Fig. 63, is marked *e*, are the *pistils*, or female portions of the flower; *d* Fig. 59, and *d* Fig. 63, is the *ovule*, or young wheat grain.

When the *anthers* arrive at *a*, Fig. 59, or *c*, Fig. 63, they become ruptured and shed the pollen grains upon the pistils of the glume which they are leaving; but do not shed their pollen on other glumes after they have escaped from the parent glume as has erroneously been asserted.* One *anther* only escapes at a time. Figs. 59, 62, and 63, were drawn from nature, 62 represents the interior condition of the glume at the proper time for hybridizing, *i. e.* before its own anthers have shed their pollen; Fig. 63, exhibits the glume after one anther (*a*) has escaped and another, *c*, partially extended, whilst Fig. 59, represents the two anthers as having escaped and emitted their pollen, whilst *a* is partially extended. Hence, since one anther only escapes at a time, it would be impossible for the anthers of one glume to fecundate the germs in a neighboring glume, except indeed it be demonstrated that the sides of the glume remain apart for such purpose. Those who may be disposed to take the pains to examine will find that the sides of the glumes are in such exceedingly close proximity as to exclude even the finest particles from entering. The exit of the anthers always takes place at the upper portion of the glumes, so that the pollen by its own gravity falls directly upon the pistils.

After a pollen grain has fallen among the tufted portion of the pistil, as at *f*, Fig. 60 (which represent a portion of the pistil, *e*, Fig. 63, highly magnified), it soon becomes exceedingly plastic. The pistil as well as the pollen grain is covered with an exceedingly thin coat of mucilaginous matter, which causes them to adhere when once in contact. The fimbria of the pistil contain ducts through which the pollen grain finds its way until it reaches the ovule, where it finds bodies having a great affinity for its contents, which are soon commingled with the surrounding parts. Fig. 61 represents a portion of the pistil very highly magnified, with a pollen grain, *d*, penetrating a branch of the main duct, *a*.

In order, then, to hybridize, it is necessary to take the heads of wheat which are intended to be the parents, both male and female, when they have arrived at that stage of maturity indicated by Fig. 62, or *before* any of the anthers have escaped from the glume. Suppose a cross is intended to be consummated between the Genessee Flint as male and White Blue Stem as female. Then on a dry and warm day—this state of weather

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* I was greatly surprised to find so astute an observer and critical writer as John Le Conteur, make the following statement. "The taller wheats are not likely to be impregnated by the shorter ones, but we find the contrary to be the case."

seems to be necessary, as at such time impregnation not only more readily takes place, but appears to be more successful—between 10 and 12 o'clock, hold the head of the Blue Stem downward, and carefully open the glumes; then with a very sharp pointed scissors, cut off the anthers (*a b*, Fig. 59; *d c c*, Fig. 63), and let them fall to the ground; great care must be taken that no anther is permitted to touch the pistil of the same head, either before or after separation of the filaments (*e*, Fig. 59; *b b*, Fig. 63); this is perhaps the most delicate part of the operation. After the anthers have been removed, pollen grains from the anthers of the Genessee Flint must be immediately applied to the pistil of the glumes from which the anthers have been removed.

In order to preserve the heads thus impregnated from injury by insects or birds, they may be enveloped in a hood of gauze or Swiss muslin, but no caution whatever is necessary to guard against the accidental introduction of pollen grains, as Mr. D. J. Browne intimates in the Patent Office Report for 1855, page 184.

"The three males are designed to impregnate the stigma of the one female, or pistil, which is situated in the centre of the anthers. From these anthers, a powder, or pollen, is emitted, which adheres to, or is absorbed by, the stigma, and is conveyed by it down to the berry, or seed, at its base, and thus effects the work of fecundation. So decided is the preference of the pistil for the pollen of its own stamens, that it is often impossible to impregnate it with that of any other head, while a particle of this is near. Impregnation takes place best when the weather is dry and warm, as a peculiar warmth and a certain electric state of the atmosphere prepare the parts for this process, which always occurs on a dry day. The opinion, indeed, has been expressed that the pollen of the male conveys hydrogen to the ovules of the female, that oxygen is received from the atmosphere, and carbon, in the form of carbonic acid gas, from the roots, and that when the pollen is destroyed by the rain, or from any other cause, the carbon alone is found in the ear, and that this is the well known "smut" in wheat. That pollen of the stamen is essential to impregnation is at least certain; and it is almost as certain, from what has been stated, that the total destruction of the reproductive power of a particular race of wheat must be effected before the influence of another can be felt. Two races being placed together, therefore, a cross can only be certainly effected by clipping the anthers from all the stamens of one variety, and leaving the work of impregnation to be effected by those of the other exclusively. This may be securely done by any person capable of distinguishing between the two races; but, perhaps, the safer guide to this distinction consists in sowing the two in separate drills very near each other, say 9 or 10 inches apart; and, to render the work still more sure, there should be no other growing wheat within at least a quarter of a mile of that experimented upon, the affinity between the pollen and the ovules being of almost incredible force. A series of experiments can only be made, therefore, by the co-operation of several experimenters, or of a few occupying farms of considerable magnitude; yet they ought to be conducted according to a plan of perfect unity of design."

"Watchful care should then be taken to protect the patches or drills from disturbance by vermin or fowls, while still in the ground, and afterwards from insects and birds. The use of gauze nets would be by no means superfluous, from the moment that the heads begin to form. As soon as the anthers show their first rudiments, in a race upon which the cross is to be made, they should be carefully removed, or clipped with a pair of sharp scissors, leaving the female organs undisturbed. Thus both races would be impregnated with the pollen of one. When matured, the utmost care should be taken to gather the seeds of the crossed race by itself."

When the agriculturist deems it advisable to change the varieties of wheat which he has been cultivating, the new varieties should be imported from the north. The reason of this is very manifest; the north being colder, requires a longer period of time to mature and ripen the grain than it does here, consequently the new variety when grown here will arrive at maturity and ripen *earlier* than in the north; whereas, in the south a greater degree of warmth obtains and wheat ripens earlier than here, consequently when southern wheats are introdnced here, they seldom succeed, or are continued by the cultivator, but most generally after one or two trials, are abandoned. For this reason, many of the wheats introduced from Europe, through the Patent Office, do not succeed in Ohio—they are generally found to be too tender for our winters, and more liable to "winter-killing," rather than any other malady. The following, from an esteemed correspondent, is in strict confirmation of the views advanced. The extract will perhaps be better understood when it is known that the Isothermal line of Turkey, and the entire northern shore of the Mediterranean, is the same as that of Tennessee, Arkansas, &c:

"In September, 1855, sowed a package or two Turkish Flint Wheat—mostly winter-killed—harvested a little more than the seed sown—this was sown in September, 1856. It looked well up to the falling of snow;

that went off early in February, and every plant was winter-killed, while the Genessee Flint Wheat, sown by the side of it escaped entirely. During the past two seasons, having experimented with five kinds of imported winter wheat, received from the Patent Office, I found none of them comparable with the Genessee Flint. I trust, however, that they have done better farther south, as some of the samples were very fine.* There was one variety (from Japan†) with a very red chaff, short chaff, short head and straw, that blossoms some ten days earlier than any other kind I have grown, but it has been mostly winter-killed. If it were hardy and productive, (and it may prove so farther south,) it would be an invaluable variety for cultivation in those sections of the country where the midge prevails—from its earliness it would escape their ravages."

All the varieties imported from Europe which have become *standard* in Ohio, were brought from high latitudes. The most popular wheat at present in Ohio, is the Mediterranean, so called, which is of Danish or Norwegian origin, from whence it was introduced into Holland, and from the latter kingdom into the United States, under the name of "*German Wheat*," in a short time it was known as the *German Fly-proof Wheat*,‡ then by the singular but indefinite cognomen of "*Fly-proof Wheat*," and lastly, it is now extensively known as the Mediterranean variety. The following, from one of the "old" volumes of the American Agriculturist, furnishes the history of its introduction into the United States:

"Several years ago, (about 1819,) an American gentleman who was traveling in Holland, while one day dining with a number of Hessians, was asked why, with our fine climate and soil, we so often failed in having good wheat crops? He replied that it was doubtless in a great measure attributable to an insect which it was supposed was introduced into the United States in the wheat sent from Holland during the Revolutionary War, for the subsistence of the British army, which was known in this country as the Hessian Fly. The Hessians admitted that some kinds of wheat in that country were liable to injury by insects, but that there was a species in very general use that resisted their attacks. The American gentleman was presented with some of this wheat which he brought to

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*But even if these varieties were acclimated at the south and proved to be excellent varieties, they might not be desirable in Ohio; they certainly would mature and ripen *late*, thus becoming liable to rust, midge, and other maladies incident to late varieties, as well as being liable to *winter-kill*, and otherwise deteriorate.—(*Klippart*)

†The Isothermal line of Japan is about the same as that of Tennessee.—(*Klippart.*)

‡*Fly-proof or German Wheat.* A gentleman who was supplied by us with a part of the lot received from Virginia, informs us that there has been a great improvement in the appearance of the grain since its introduction on his farm.—*American Agriculturist.*

this country and sowed upon his farm in Delaware. It was subsequently introduced into Virginia by James H. Taliaferro, Esq., and its ability to resist the attacks of the fly successfully tested. The name Mediterranean, given to this wheat, has no applicability whatever.*

The agriculturist will be disappointed in the best variety of wheat, if the crops are not kept pure. Not unfrequently is there grown in the same field white and red, as well as smooth and bearded, side by side. Early and late varieties are mixed together, and while the one is "*dead ripe*" and is shedding its grains, another variety which occupies perhaps an equally large area is just in the "*milky*" state. It is very manifest that the flour from this mixture cannot possibly be as desirable as that of either variety when pure, and harvested at the proper season.

As there are so many varieties of wheat of similar external appearance as even to baffle the most experienced eye, there seems to be but one secure method to ensure the growth of pure sorts of wheat, namely, to grow them from single grains, or from single ears, and to follow up the plan, by afterwards sowing only the produce of the most productive, so as to form a stock. A curious but satisfactory proof, which repeated experiments have confirmed, is that the grains of wheat when sown thickly, impart a certain degree of warmth to each other and to the soil, which hastens their growth two or three days earlier than a single grain.

A knowledge of the precise moment of flowering may prove of the greatest importance to an intelligent farmer, there being an interval of a week or ten days in the period of flowering of some of the sorts. Hence, a judicious selection, with due care as to the time of sowing the variety that will soonest come into flower, would enable him not only to keep his crops pure, but as they would ripen in succession, enable him also to bring in his crops in rotation, as each variety ripens, without being hurried by his whole crop being fit for harvesting at the same moment, which is now too often the case.

A single grain picked up on the high road by chance, and perceived to be of an entirely different form and larger in size than is generally seen,

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*Several years since, Mr. M. B. Bateham, of Columbus, O., introduced several of the choicest varieties of wheat from England, but none of them succeeded, because the change in climate was entirely too great; the change in the actual amount of heat could, perhaps, have been withstood, had there been no diminution in moisture, but our climate is *dry* as well as hot, while that of England is cool and moist. If these varieties had been taken to Canada, where the climate is dry and cool, and the temperature the same as in England, there is no doubt that they would readily acclimate, and then, when acclimated, be transferred to the United States, would perhaps prove a desirable acquisition.

though sown a week later than the other varieties, was the first to ripen and was cut a week earlier than other varieties.

"Two years ago," writes John Le Couteur, "a farmer requested me to view a *very pure* crop; there was no mixture in it! In merely walking round the crop, which, in fact, was both pure and fine, in common parlance, I selected from it ten varieties. A crop of this variety, the Duck's Bill, then originally procured from Kiel in the Baltic, which I saw this year as a second year's produce, is so intermixed as to make it difficult to pronounce what variety it is intended for. The Duck's Bill is very subject to shake out from the ear if it is over ripe; and has proved to be only fit for making pastry, as it is too tenacious for the purpose of making household bread; hence the necessity of not only having wheat crops pure, but of knowing their particular qualities and properties.

It is very extraordinary that some sub-varieties have a predisposition to sport, or alter their appearance.* A fine red sort was sown with others, pure apparently, and of three hundred and fifty ears, the produce of forty-six grains, there were two hundred to the original sort, which were a red, compact, hoary or velvety kind, twenty-one ears of a smooth red, eighty-six of a whitish, downy appearance, and forty-three smooth-chaffed white ears.

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*The following detail is copied from Le Conteur's work on the wheat plant.

But it had escaped him to consider it in its properties, with relation to the food of man. This practical view the author took of it, and he determined to attempt to discover which were the most farinaceous and productive varieties, by comparing their characters and produce one with another. The usual mode with the generality of farmers is to procure any seed, that any neighbor, enjoying the reputation of being a good farmer, may have to sell. A more intelligent class take care to procure their seeds from a distance, to require that it is fine, perhaps even pure; they also have thought of changing or renewing their seed occasionally. A still more intelligent number having procured the best seed they could obtain, of those sorts which observation and experience, have led them to know as being best suited to their soil and climate; having further observed, that mixtures in their crops prevented their ripening at the same moment, and having endeavored to remedy this defect, by making selections by hand, of those varieties which appeared to them to be similar and thus have greatly improved their crops in produce and quality. A few farmers have proceeded a step further, and from having observed a stray ear of apparently unusually prolific habits, have judiciously set it apart, and have raised a stalk from it. Hence the Hedge Wheat, Hunter's, Hickling's and twenty more that might be named; but it is contended that it is not sufficient merely to have grown them pure for a short time; it is necessary to keep them permanently, so, if after a comparative examination as to their relative product in grain and meal, they shall be proved to be the best; or otherwise to discard them for more valuable varieties.

This was the chief consideration which led me to make comparative experiments in order to obtain the best seed. Hence, as a first step toward improvement, Professor LaGasca having shown me four ears of those he considered the most productive, I sorted as many as I could collect, of precisely the same varieties, judging by their external appearance. Such was my anxiety to attempt to raise a pure crop, that in the month of November, 1832, I rubbed the grains from each ear, of all the four sorts I had selected, throwing aside the damaged or ill-looking, and reserving only the plump and healthy.

The first selection was apparently one wholly of a Dantzic sort—white and smooth eared. In the process of rubbing, I was surprised to find that, though most of the grains were white, they differed greatly as to form, some being round, some oval and peaked, some plump but very small, some more elongated, some with the skin or bran much thicker than others. There were also many with liver-colored, yellow, and dark grains, among the white.

The second sort was from a square, compact variety of wheat, the grains very plump, round,

DESCRIPTION AND CLASSIFICATION OF VARIETIES OF WHEAT.

WHEAT, botanically *Triticum*. A large and very important genus of grasses, of the terminally spiked order. About thirty species, besides a great multitude of varieties, at present are included in this order; about as many more formerly belonged to it, but now are grouped with the new genus agropyrum; and several others which formerly were included in it, more properly belong to the genera *secale*, schlerochloa, and brachyopodium. All the present tritica are hardy exotic annuals—four of them varying in height from 6 to 24 inches, and possessing very little interest; the remainder varying in height from $2\frac{1}{2}$ to 6 feet, and ranging in value from inferior economical plants, cultivable only in their native regions to the richest cereal grasses of all the temperate parts of the civilized world. All, or almost all the agropyra are hardy perennials, and either worthless or mischievous weeds; most have a hight of between 6 and 18 inches; four of them including the notorious couch-grass with its several varieties are natives of Great Britain, and from thence have been introduced into this country, and nearly all the rest were and are indigenous in continental Europe.

The distinctive characters of the genus triticum in the old or extensive sense of it, are terminally spiked inflorescence—two-valved and quite or nearly equal glumes—alternate two-rowed, many flowered spikelets, trans-

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of a coffee-like form, very thin-skinned and white. There was a pale red inferiority among it, much thicker skinned, but without any perceptible external appearance in the ear.

The third was a downy or hairy variety, one of the "Velantes" of the French, and "Triticum Cœleri" of Professor LaGasca; a velvety or hoary sort, which is supposed to be very permanent in its duration, as relates to keeping pure. I found, however, that there were a few red grains, some yellow, and some liver-colored sorts among this, in small proportions it is true, but being of prolific habits, subsequent experience has taught, that they would soon have destroyed the purity of the crop if cultivated without constant attention.

The fourth selection was from a variety of red ear with yellow grains, more peaked than the "Golden Drop;" these were all plump and well grown, but though of productive habits, afford less flour and more bran than the white wheat varieties. I discovered a red variety among it, bearing white grains, which I suspect to be very prolific and hardy. I gave a sample of it to Sir John Sinclair, who greatly encouraged me to prosecute my researches, as being of the highest importance. There were also red ears bearing liver-colored grains, but these were chiefly lean and ill grown. I generally, but not invariably, found that the grain of white wheat was the plumpest, or possessing the greatest specific gravity, or largest quantity of meal. The aspect of the grain in that dry season led me to think that white sorts of wheat will succeed best on dry soils and in warm climates, and that red and yellow, or the darker colored, prefer wet seasons or moist soils.

The care I took in making these selections, and the great number of sorts I found, of all shades and colors, forming varieties and sub-varieties, as they are named by Professor LaGasca, confirmed my conviction that the only chance of having pure sorts, was to raise them from single grains or single ears. It is but fair to add, that even the pains I took in making those first selections, amply rewarded my labors, as the product of my crops was increased from an average about 23 or 25 bushels an acre to 34, and since I have raised wheat from single ears or carefully selected sorts, I have increased my crops to between 40 and 50 bushels the acre. Hence, I have no doubt, that with extreme care, in obtaining the best and most suitable sorts of wheat, that land in high tilth, with fine cultivation, may be made to produce 60 or 70 bushels the acre.

verse or so placed that the edges of the florets are towards the rachis—and two palæ surrounding the seed, the external or lower one armed or pointed, and the internal or upper one cleft at the point. The rachis (spine) or shaft is jointed; the spaces between the joints are called the internodii; the spikelets rising one above another on each side of the rachis, constitute the spike, or ear, or head; the glume or lowermost shield of each spikelet corresponds to the calyx of non-gramineous plants, and each of the florets to a corallo; some certain florets in each species, in general, are fertile, while others are barren; and the aggregate inflorescence of the several species differs very widely in the length and form of the rachis, the size and shape and packing of the spike, the comparative length of the glumes, and the number and fertility of the florets, and above all, in the various properties of the seeds. The distinctive characters of many of the species are sufficiently obvious and invariable to serve the purposes of the most stringent classification; but those of some others, particularly of such as are very extensively cultivated and as run much into varieties, either shade off so greatly through these varieties, or are so liable to change under the influences of climate and soil and culture as to render the drawing of any precise line of demarkation between different species in some cases exceedingly difficult, and in one or two quite impossible.

Some wheats of an apparently peculiar nature have been introduced—as the Egyptian, the Polish, the Liberian, the Zealand and the Talavera—and additions are being constantly made to the stock from various parts of the world; but although differing in the proportions, which they contain of nutritive matter, as well as in some particulars connected with their growth, yet they have all sprung from one origin—and, being composed of similar elements are consequently applied to the same purpose. Botanists indeed class some of them as a distinct species; thus for instance the Egyptian produces several ears from the same stem, which is not the case with any other sort; but when repeatedly sown upon poor land, its supernumerary ears gradually disappear and it at length loses all appearance of variety. In like manner, other kinds of wheat grown in soils and climates more favorable to vegetation than our own, have, when first introduced, succeeded very well and had apparently become acclimated, yet in a series of years have degenerated, while other sorts imported from a more northern climate, or taken from an inferior quality of soil, have on the contrary improved.

The same circumstance occurs to those species generally distinguished as winter and spring wheat; for although they seem from their time of growth to be a different nature, yet one can be, at pleasure, transformed into the other by the common means of culture. Thus if winter wheat be sown in the month of February, or the beginning of March, a portion of it will ripen, though the lateral shoots will be weak and the crop will only be moderate. If, however, the seed thus produced be sown the next spring it will throw out stronger stems, will tiller with more luxuriance; and if the operation be repeated in the following year, it will then be found converted into the nature of summer wheat. If, on the contrary, spring wheat be sown in the month of October, and the next winter prove severe, the crop will perish, or can only be saved if it be completely covered by a heavy fall of snow. Should the weather continue mild, the seed will then, however, produce a tolerable crop, which will ripen earlier than autumn wheat; the seed obtained from it will in the following year take longer to ripen than that of the former season; it will also tiller better and partake so much more of the nature of the winter species, that, if sown in the month of May, it will not produce a crop. Thus, also, however early the true winter wheat may be sown in autumn, it will not produce stems in the same year; but the real spring wheat will do so if sown at any time before midsummer. Similar remarks might be made, with more or less force, respecting other supposed specific characters—either such comparatively broad ones as those which distinguished the Egyptian wheats from the common cultivated wheats, or such comparatively narrow ones as those which distinguish the winter wheats from the spring wheats. Yet the instabilities and gradations in specific character, even though they were both greater and more numerous than they are, effect mainly the niceties of classification and address themselves principally to systematic botanists; and they neither prevent mutational characters from being as true indexes of intrinsic constitution and adaptations as fixed ones, nor ought to deter agriculturists from appreciating classifications which, whether serviceable or worthless to the purposes of exact botanical science, may in some way or other be decidedly useful to the purposes of farming economy.

In this volume will be found a translation from Metzger's European Cereals of the Classification of Wheats, as adopted by him; it is inserted in this report more for the purpose of acquainting the agriculturists of Ohio with the names, estimates and qualities of European wheats, in order to guard them from being misled by strange names which they may find attached to wheats, which may be distributed by persons enjoying positions of "honor and profit," than for any other practical benefit.

A brief account of Le Conteur's classification was deemed necessary. The extract from Prof. Emmon's Agricultural Survey is introduced rather on account of the tables of analyses of the various wheats grown on different as well as on the same soils, than for any practical knowledge of classification.

Finally, the varieties of wheat grown in Ohio were classified, or rather grouped in accordance with their most obvious distinctions, namely: color and form, *i. e.* the RED wheats form the first group, the WHITE ones the second, and the spring wheats the third. The group of red and white wheats are divided into BEARDED and SMOOTH varieties.

This system of grouping if not in accordance with systematic botany, is to say the least, the most obvious and comprehensive, and therefore the most practical.

Color, however is perhaps too unstable to serve as a basis of classification, because many wheats are even now changing from red to white, and in all probability the present "*amber*" colored wheats are those which in the course of the next quarter or half a century will become entirely white. There is little doubt however that the white wheats are legitimate descendants of the red ones: the red blue stem being the progenitor of the white blue stem: the bearded red Mediterranean being the parent of bearded white Mediterranean variety, and so of others. If color is disregarded in grouping there will then be that of form only remaining—all wheats then must be formed in one of two groups—bearded or beardless.

J. METZGER ON WHEAT.

Common True Wheat, (Frumenta).

Spike four cornered imbricated, awned or without awns, spikelets two or three fruitful, diffuse, valves ventricose and compressed under the apex. Seed oblong, ventricose truncate, farinaceous, rarely vitreous.

Common Bearded Wheat, (Triticum Sativum).

Spike soft, awned, white.

Club Wheat, (T. Compactum).

Spike soft, diffuse, without awns, white seeds, whitish.

Rough Bearded Wheat, (T. hordeiforme, Host).

Spike not soft, awned, white, seed whitish.

Hard and Red Club Wheat.

Spike hard, not awned, brownish, bald.

2. *Turgid Cone, or English Wheat,* (*T. turgidum*).

Spike regularly four cornered, always awned. Spikelets extended, 2 to 3 seedy, 2 awned. Glumes short and ventriculose. Awns standing regularly in 4 rows.

3. *True Beard Wheat,* (*Triticum durum*).

Spike oval and four-cornered, somewhat compressed, long, always awned. Awns very compact and standing in such a manner as to decline from each other. Glumes compressed, with elevated backs ending in a long and bent tooth. Seeds long, three-cornered, bright and glassy.

4. *Polish Wheat* (*Triticum Polonicum*). *Plate I., No.* 9.

Four-cornered and compressed spike. Spikelets 2-grained, and lying loosely on each other. Glumes compressed, very long, 2-toothed. Seeds elliptic, very long, somewhat triangular, bright, and glassy.

6. *Russian Spelt* (*Triticum amyleum*).

(Triticum dicoccum, *Schrank, Schubler, Newb.*)

Spike flat, of equal width. Spikelets standing closely above each other, 2-grained. Calix-chaffs hard, bent, ending in a long and bent tooth. Seeds long, mucronated, bright, and glassy. Seeds do not separate from the glumes at maturity.

7. *St. Peter's Corn* (*Triticum monococcum*).

Spike compressed, hard, awned. Spikelets bent, standing closely above each other, mostly 3-flowered, 1-grained. Seeds oblong, glassy.

a. Spike brownish and smooth.

SECTION I.

True Wheats Frumenta).

Seeds not attached to the chaff. Rachis not brittle.

1. *Common Wheat* (*T. vulgare*).

Spike four-cornered, compressed, both awned and without awns. Spikelets four-flowered, the 2 and 3 lower ones fruitiferous, 3-grained, very extended, longer than broad. Paleæ ventricose, truncate at its extremity, with an acuminate tooth. External valve awned, or acuminate, with a long awn-like tooth. Internal valve thin-skinned, inacuminate. Seeds oblong, ventricose, truncate, mealy, rarely glassy.

a. Wheat—Spring-Wheat (Triticum vulgare).

Spike soft, awned, white.

Weisser, gemeiner Bartweizen, Weisser Grannenweizen, Winterweizen, in *Germany;* Froment commun, F. barbue, F. cultive, Ble grison, Ble trois-mois, Touzello blanche barbue, ble de Chine, ble froment de Reval, in *France;* Trigo caudeal, Hembrilla, &c., *Spain.*

Halm, from 3 to 4 feet high, erect. *Blades*, or leaves, 4 inches broad, from 6 to 7 inches long. *Spike*, from 3 to 4 inches long, soft, compressed, uniformly broad, pyramidal. *Rachis*, fine-haired on its border. *Spikelets*, from 16 to 20, 2 and 3 seeded, diffuse, 3-awned. *Paleæ*, with an awn-like tooth, smooth, white,* striped brownish. *External valve* smooth, mostly glossy, awned. *Internal valve* as long as the external one, thin-skinned, flat, half embracing the seeds. *Awns* squarrose, declining from each other, almost as long as the spike, the upper ones shorter. *Seeds* oblong, ventricose, of average size, grayish-white, more glassy than mealy.

This wheat belongs to the species of Cerealia having less value, on account of its smaller grains, than club-wheat, and its cultivation has been abandoned.

aa. Common White Bearded Wheat (Summer Wheat).

This Summer-Wheat cannot botanically be distinguished from the variety just described, and which has been changed to a summer wheat by repeated spring sowings. It is known by a variety of names. From Sicily, where it seems to be generally cultivated as a summer wheat, by the names of Richezza, Schiaza, Longhese, Pilostella, Paulla, Frumentimischi, Castigliara, Finezza, Vaesia, Questalia amuscata, and in France by the name of Ble du Cap.

This wheat is not suited for our better husbandries, and is not equal to club-wheat. But it is nevertheless indispensable in some sections of Italy, where it is cultivated on account of its straw, which is used for the finest straw braidings.†

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* In wet weather before and after harvest, the awns will assume a darker color, and then the spike will appear similar to the variety *c.*

† This variety has been cultivated in Germany to a very slight extent for the straw, to be employed in braidery or plaitings, and has given entire satisfaction to the growers. It may not be amiss to give a brief description of the culture of this variety, and treatment of the straw when intended for braidery only:

At the usual period of sowing spring wheat, sow this variety on a thin soil, but sow it so thick that one grain almost touches another, and then harrow it in, so that it is slightly covered. The crop is then allowed to take care of itself until reaping time, which should take place whilst the grains are yet in a milky state, and the stalks commencing to turn yellow. The straws should be dried in the sun, and then removed to a shed or shelter in sheaves, there to be cleaned and assorted into sizes. For the finest braids, that portion of the stalk between the head or spike and first joint only is to be used—this portion generally is from 3 to 5 inches in length, and is valued according to its fineness; the straws are assorted generally into ten sizes. After the assorting is *b. Common White and Velvety Bearded Wheat* (*Winter and Summer Wheat*).

Spike soft, awned, white, velvety. Froment commun, barbu, blanc et veloute, *France.*

This species seldom remains the same. Some years it will lose the hairy coating of the awns, and thus pass entirely into the variety *a*, from which it may be distinguished as being a mere chance variety, which, however, is susceptible of some permanency by means of a careful selection of the seed and continued cultivation.

All that has been said of the variety *a*, may with propriety be said of this variety. It may be sown in autumn or spring.

c. Common Red Bearded Wheat (*Winter and Summer Wheat*).

Spike soft, awned, brownish, bald. Froment barbu, roux et glabre, Souzelle rouge, barbu, Saisette de Tarascon, Ble rouge, *France;* Cascola rosso dei Romagnoli, *Italy;* Barbilla, *Spain.*

Differs from the variety *a* only by the brownish color of the spikes, which, however, are colorless in wet seasons, and present an appearance very similar to that of the variety *a*.

d. Common Red Velvety Bearded Wheat, (*Winter Wheat.*)

Spike soft, awned, brownish, velvety.

This wheat often degenerates and transforms into the variety *c*. It, therefore, has as yet not acquired any permanency, and is to be regarded as a chance sub-variety.

e. Common Brown and Bearded Wheat.

WINTER WHEAT.—Spike soft, awned, brown, *Triticum aristatum*, Fox-Wheat, *Germany.*

Differs from the variety *a* by its dark brown and glossy spikes and awns. The latter are so remarkable as to be recognized on fields at a great distance.

This wheat belongs to the most valuable varieties of winter wheat, is not liable to the blight (to which the dark color of its ears are especially susceptible,) and is not attacked by birds and animals, on account of its strong awns. It is heavier than other wheat, and produces a first-rate flour. It thrives in almost any wheat-soils, is liable to winter-kill, but ripens eight days later than the variety *m*.

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completed, these selected straws are spread out upon a cloth and sprinkled with water, and in this manner bleached until they have attained the desired color—or rather want of color; during the bleaching process it must be carefully kept out of the rain and dew, but sprinkled during the heat of the day with fresh water.

If there are indications that the crop is growing too rank, it is mowed off before the stalk is developed; this mowing retards the growth and consequently diminishes the size of the plant.

f. Common Blue and Bearded Wheat.

Summer Wheat.—Spike soft, awned, bluish.

A somewhat unstable variety, with bluish ears, in form and size resembling those of variety *b*, and often transforming to the same.

g. Common Black Bearded Wheat.

Winter Wheat.—Spike soft, awned, black, velvety.

Is distinguished from the remaining, common, bearded wheats by its black and velvety ears, black awns, and prolific tillering, and exhibits a relationship to the Blue English Wheat.

This species of the cerealia winters well, for which reason the sowing in February will be best suited to the purpose; but as this cannot always be done on account of the weather, this beautiful wheat is of no value at all to German agriculturists.

h. White Club-Wheat with Whitish Seeds.

Winter Wheat.—Spike soft, not awned, white, bald. Seeds whitish, glassy. Touzelle blanche sans barbe, Ble Lamas *France*, Siciliana Sicily. Tosello, Grano gentile bianco dei Toscani, *Italy*. Kentish white cosh *England*.

Halm from 3½ to 4 feet high, blades ¼ inch broad, 6 to 7 inches in length. *Spike* from 3 to 4 inches long, a little tapering upwards. *Rachis* smooth, white, edges hirsute. *Spikelets* from 18 to 22, very extended, not awned, 2 to 3 seeded, in a thrifty state 4 seeded. *Paleæ* dentated, mucronated, white with some green stripes. *External valve* a little longer than the Paleæ, ending in a long tooth, white, smooth. *Internal valve* as large as the external one, thin-skinned, smooth; its bark flat. *Seeds* whitish, somewhat glassy, oblong, truncate, somewhat ventricose.

White Club-Wheat is cultivated in England, in the Netherlands, and in part in Germany, sometimes with other varieties of wheat, but oftener by itself, and in Italy and southern France through winter, and it belongs to those varieties of wheat in general cultivation.

Crops of seeds introduced into Germany from France and Sicily, were at first very sensitive of the cold weather; but after it had been cultivated several years, it had become acclimated, and did not suffer from frosts. White Club-Wheat is more liable to be affected by the blast than the red, a fact repeatedly observed of other white varieties. It may be regarded as a general rule that wheat of a light color is more liable to be blasted than that of a dark one.

A sub-variety has been produced by continued spring sowing—namely:

h. h. White Summer Wheat,

which cannot botanically be distinguished from the variety *h*. It is met with in some parts of Rhine, Bavaria and of Baden. There was very little blast observed in it..

(The white club-wheat with brownish halms, described in the "europaischen Cerealien," has been degenerating into the variety *h*, through continued cultivation, and is therefore omitted.)

i. White Club-Wheat with Yellow Seeds.

WINTER WHEAT.—Spike soft, not awned, white, bald, seeds yellow. Gelber winterweizen, *Germany*. Talavera, *Spain*. Froment blanc a epi blanc et a grains jaunes, *France*.

Differs from the previous variety *h* in its more prolific tillering, and especially in its more ventricose, mealy, and yellow seeds.

It is said to have been introduced originally into England, from Talavera, in Spain, and from England it has been imported into Germany and France.

We undertook its cultivation 17 years ago, but without favorable results. Although it was tillering in a first-rate manner during the first two years, it was afterwards decreased, and was suffering more from blast than any other variety, consequently its cultivation was abandoned. A few years ago the cultivation of it was again recommended; genuine seeds were ordered from England, and experiments renewed, which have so far been attended with excellent results. But we again observe a decrease in the tillering, and blast is repeatedly occurring.

We are certain this wheat would popularize itself above all other varieties if new seeds were procured every two years from England; but the importation in great quantities being attended with great cost, it may be difficult to introduce it generally and successfully.

k. White Velvety Club-Wheat, (Winter Wheat.)

Spike loose, not awned, white, velvety. Ble de Boheme, grains d'orees, *France*. Frumenta della nuova Inghilterra, *Italy*.

It is distinguished from the variety *h* by the strong and velvety coating of the spikes, and yellow, round, and farinaceous seeds. It is often mistook for *Triticum turgidum*, from which it is distinguished by the entire absence of awns.

Von Witten calls it *Triticum pilosum*, and says in regard to it: the wooly coating of the spikes serves as a means for absorbing the dew, and the dampness of the atmosphere from this cause it will produce a greater amount of grains in dry seasons and upon more elevated fields than other wheats. Besides, its grains are preferred to the best yellow wheat on account of their thin skin, and it is more reliable than the velvet wheat of the English, which, as is well known, is easily frozen, but the Triticum pilosum even during the hardest frosts, even after late sowing has not been injured. It ripens a little later than Brown Club-Wheat.

l. Yellow Club-Wheat, (Winter Wheat.)

Spike loose, not awned, yellow, bald.

This wheat is of no importance, because its color is unstable and very often changes into the Brown Club-Wheat and White Club-Wheat; consequently it is to be regarded as a chance variety.

m. Red Club Wheat, (Winter Wheat).

Spike loose, not awned, brownish, bald. Ble Lamas, Touzelle rouge, *France.* Fromento invernegno, Biondella, *Italy.* Trigo chamarro, Pelon, Toseta, *Spain.*

Is distinguished from the variety *h*, by its red-brown spikes, and yellowish and round seeds; it does not readily degenerate, and has acquired a certain permanency in consequence of long cultivation. It has been cultivated several hundred years in Southern Germany, and is highly esteemed.

n. Red Velvety Club Wheat.

WINTER WHEAT.—Froment commun sans barbes, Veloute et roux.

Differs from the previous variety only in the velvety coating of its spikes.

We have been cultivating it by way of experiment for 20 years; during the first years we found it degenerating, to winter-kill and to be of no permanence as a variety. By continued cultivation, however, the plants became acclimated, and the crops no longer degenerated, we may now class it among the better wheats.

o. Rough Bearded Wheat with Whitish Seeds, (Winter Wheat).

Spike compact, short, awned, white. Seeds whitish.

Porcupine wheat, *Germany.*

Halm, from 3 to 3 1-2 ft. high. Spike four-cornered, firm, truncate at its upper extremity. *Rachis* short, jointed, smooth, with fine-haired border. *Spikelets* from 16 to 18, diffuse, imbricated, from 3 to 4 seeded, and from 3 to 4 awned. *Palea* white, smooth, with an awn-like bent tooth. *External valve* smooth, awned, longer than the awn of the calix. *Internal valve* as large as the external one, thin-skinned, mostly dentated. *Awns* mostly as long as the spike, sometimes shorter, very squarrose. *Seeds* oblong, small, more glassy than farinaceous, whitish.

During the first years of our cultivating it, we were obliged to sow early in spring, because when sown in autumn, it would perish in winter in almost every instance. But by means of continued cultivation it has become a winter wheat, and has not been winter-killed for several years. It is not particularly liable to suffer from blast.

p. Rough Bearded Wheat with Yellow Seeds.

SUMMER WHEAT.—Spike hard, awned, white. Seeds yellow. Bengal or Binkel Wheat in *Germany.* Ble ordinaire a epi compacte et barbu, *France.*

This variety is distinguished from the previous one *o*, by its round, ventricose and yellow seeds, and by a greater sensitiveness to cold weather, in consequence of which, it must be cultivated during summer in our sections.

Von Witten says he has received it from Asia Minor, where it was especially cultivated on the islands of the Greek Archipelago. It is cultivated in some sections of Styria, according to *Wagini.* Aside from agricultural collections it does not seem to be cultivated anywhere.

q. Velvety Rough Bearded Wheat, (Summer Wheat).

Spike compact, awned, white, velvety.

Is distinguished from the variety *o*, by a velvety coating of the spikes. It is little known, must be sown early and is of no agricultural value.

r. Hard and Red Club-Wheat, (Summer Wheat).

Spike compact, not awned, brownish, bald. Cretish or Corfu Wheat, *Germany.* Ble de Crete, Froment d' Alsace; Ble mottu, *France.* Formento di Candia, *Italy.*

This wheat is distinguished from the variety *o*, by being awnless, and by its brownish spikes.

CULTIVATION OF COMMON WHEAT IN GENERAL.

1. *Winter Wheat.*

To this class belong especially the varieties *c*, *h*, *i*, *k*, and *m*, mostly cultivated in Germany, France and England.

The maladies from which wheat is suffering, are known wherever it is cultivated, especially the blast. As a preventive, says *Lobbes* of the Clevian country, they select the most perfect grains for sowing, in my country mingle them with slaked lime, pour soap suds on it, sow 24 hours afterwards—and yet they have blasted wheat.

I was similarly situated until I had been compelled to delay the sowing three times 24 hours after the preparation had been made, when the wheat had already commenced germinating. By this means it proved to be better than before. During 22 years, I have found one single blasted ear only, upon my fields, since observing the above method.

2. *Summer Wheat.*

To this class, as worthy of cultivation, are considered the varieties *aa*, *p* and *r*, but especially the variety *hh*.

Burger says: It needs a greater amount of manure, or a soil richer in humus, than winter wheat. It must be sown early in spring, so as to tiller before the warm weather comes, and to ripen in season. It must be sown thicker than winter wheat. The harvest is in general not as great as that of winter wheat, and it suffers oftener than winter wheat from the blast.

2. *Turgid, Cone, or English Wheat,* (*Triticum turgidum*).

Spike regularly 4-cornered, simple, end branched, awned. *Spikelets* white, 1-flowered, from 2 to 3-seeded, 2-awned, almost as long as broad. *Glume* ventricose, short, ending in a truncated tooth. *Keel* compressed, not very elevated. *Awns* in four regular rows, almost parallel to the spike. *Seeds* ventricose, mostly farinaceous, more rarely glassy.

a. White English Wheat, (*Summer Wheat*).

Spike awned, white. *Halm* from 3 to 4 ft. high. *Spike* nearly erect, 3 inches long, 4-cornered. *Rachis* short-jointed, compressed, white, and finely haired. *Spikelets* from 18 to 26, closely imbricated, 3-seeded, 2-awned. *Glume* very short, truncate, ventricose, smooth, white, abruptly dentated, appears as though covered with a white frost. *External valve* almost of twice the length of the glume, white, smooth, the two most external ones awned. *Internal valve* as long as the external, thin-skinned, flat, 2-toothed. *Awns* 1 1-2 times as long as the spike. *Seeds* ventricose, yellow, ovate, more farinaceous than glassy.

A very tender wheat, and in an economical view, of not much account.

b. White Wonder Wheat, (*Summer Wheat*).

Spike awned, white, branched.

Branched Wheat, *Germany*. Ble de miracle blanc, *France*.

This wheat is not a permanent variety, and originated incidentally from the previous variety, from which it is distinguished by its branched spikes, which appear when favorably cultivated, but disappearing again under unfavorable circumstances.

c. Black-Awned White Wonder Wheat, (*Summer Wheat*).

Spike awned, white, branched. Awns black. Differs from variety *b*, only in its black awns. Is likewise a variety emanating from the two previous ones.

d. White Velvety English Wheat.

Spike awned, white, velvety. Entenschnabel weizen (*Duck Bill*), *Germany*. Froment blanc de Montpellier, montin blanc, Ble d' abundance, Petanielle blanche, Froment reufle, Ble de Dauphine, Ble de Sicile, *France*. Grano Ravenese, Andriolo, Grano Grosso, *Italy*. Redondillo, Radonella, Grano Romanello, *Spain*. Endebeck's taru, *England*

Is distinguished from variety *a*, by the velvety coating of the spikes, by flourishing in winter, and by its greater productiveness. This variety is very permanent, never grows branched; at least this is our observation after several years' experiments. The spikes, however, would sometimes become a dark gray, reddish color, especially in damp seasons, which would disappear again in dry seasons.

Thaer says, wheat with haired spikes ought never to be cultivated upon damp soil, but upon a dry one.

e. Red English Wheat (*Summer Wheat*).

Spike awned, brownish. Red Duckhill, *Germany;* Petanielle rouge et glabre, Froment rouge de Montpellier, Gros ble a epi rouge et glabre, *France;* Redondillo, Pisana, Redonello, *Spain;* Red wheat, *England.*

This wheat is distinguished from variety *a* by its brownish-red colored and a little broader spikes, which often taper toward the apex; and also by its reddish awns.

f. Red Wonder Wheat (*Summer Wheat*).

Spike awned, brownish, bald, branched. Red smooth many spiked wheat, *Germany;* Redondillo, Pisana, Redonello, *Spain.*

Differs from the variety *e*—from which it is a sport—by a branched, and often very broad and monstrous spike, and has at present attained almost a permanency as a variety.*

This is a summer wheat that must be sown early; it ripens late, degenerates soon, and is of no agricultural value.

* This variety must not be confounded with Triticum compositum, of *Linneaus*, as was done by *La Gasca;* because that form has smooth awns, while that of *L.* is adorned with hair, and has been mentioned by us as the variety *h*.

g. Red Velvety English Wheat (*Winter Wheat*).

Spike awned, brownish, velvety. Egyptian, Giant, St. Helena, Bell, Tunis, Marok, Arabian, Turkish, and Welsh, *Germany;* Gros Turque, Ble de la Mexique, Gros ble, de Danzig Ble de *Sicile*, Petaneille rousse, *France;* Grano Grosso, *Italy;* Redondillo, *Spain;* Clock wheat, Rivet Great wheat, *England;* Qamh arabi, *Arabia.*

It is distinguished from variety *a* by thicker, red, and velvety ears, by its often squarrose awns, by its greater seeds, more ventricose chaff, its greater tendency to tiller, and standing the winter better.

No species of the cerealia tillers as freely as this wheat, and throws up as tall halms and as large spikes. It withstands the severest cold, never perishes in winter, and produces long, stiff, and reed-like straw, and a rich harvest in grains. It must, however, be sown in good soil.

h. Red Velvety Wonder Wheat (*Winter Wheat*).

Spike awned, brownish, velvety, branched. Many spiked, Egyptian, Smyrnian, Arabian, Morocco, velvet-branched, wonder wheat, *Germany;* Ble d'abondance, B. de Smyrne, B. de la Barbarie, B. de Miracle, Gros ble a epi rameux, *France;* Grano d'Egitto, *Naples;* Grano di Smyrna, Grano del Graspo, Grano Mazzachio, *Italy.*

Differs from the previous variety by having branched ears, giving it often a remarkable appearance; and from variety *f* by its strong and velvety ears, and hardiness.

It produces very irregular grains, but does not winter as well as the previous variety; it cannot be recommended for cultivation.

[Prof. Ch. F. Hochstetter says in regard to this variety: "The Wonder Wheat, or Wonder Seed (Triticum compositum, *L.*), differs from all other species of wheat, by having a branched spike, i. e., each spike has upon its base from 4 to 5 short lateral spikes. The spike has awns; the spikelets are closely imbricated, ventricosely swollen, they feel somewhat sharp, and contain 4 flowers, of these 2 to 3 are productive. This species may be cultivated as a winter wheat or as a summer wheat in our country, but is not entirely adapted to our climate, because it does not ripen perfectly, and the lateral spikes disappear in poor soil. Ninety grains ripen in a perfect ear, which have about the weight of Common Summer Wheat. It is also known by the name of *Joseph's Wheat*, and is cultivated in Africa and Italy to a considerable extent.]

i. Blue English Wheat, (*Winter Wheat*).

Spike awned, violet, velvety. Russian wheat, *Germany.*

Gros ble noir, Petanielle noir, Froment noir de Montpellier, Gros ble noir a epillets ecartes, *France.*

Is distinguished from the variety *a*, by its velvety coating and its blue color.

The Blue English Wheat is a winter wheat, not suffering injury from the coldest winter, although it would not bear our climate 20 years ago. It produces a great amount of straw and grains, and is less subject to blast than other wheats. Like all English Wheats, it ripens later than common Wheat.

k. Blue Wonder Wheat, (Winter Wheat).

Spike awned, violet, velvety, branched.

Is distinguished from the previous variety by its branched spikes, appearing occasionally only, in consequence of which we class it among the sporting varieties, and as deserving no further attention.

General Cultivation of English Wheat.

None of these English Wheats are worthy of cultivation, except the varieties *g* and *k*.

3. *True Bearded Wheat, (Triticum durum).*

Spike diffuse, but often hard, compact, generally roundish, apex somewhat compressed, erect, abundantly awned. *Spikelets* from three to four seeded, 1 1-2 as long as broad, mostly expanded. *Glume* long, much bent, ending in a broad and re-curved tooth, the sides compressed, its bark elevated and mucronate. *Awns* from two to three times as long as the spike, very quarrose, stiff and rough. *Seeds* long, three-cornered, rugged, mostly bright and glassy.

The varieties have been classed as "*diffuse*" and "*compact*" spikes, in the "Europaischen Cerealien," but it is now evident that these characteristics are annually changing, and most of them are assuming the compressed form; we have therefore abandoned the distinction of diffuse and compact spikes.

a. White Bearded Wheat, (Summer Wheat).

Spike white. White Barley wheat, white Welsh wheat, Sicilian summer wheat, Neapolitan summer wheat, *Germany;* Bianchetta, Civitella di Toscani, Grano di Valerno, Grano Castiglioni, *Italy;* Castiglioni amorata, Parmentella, Jaminia, *Sicily;* Chapato, Patianchulo, *Spain.*

Halm from 3 to 3 1-2 feet high, erect, pithy. *Spike* erect, compressed, sometimes a little diffuse, 2 and 3 inch in length, round, with long awns.

Rachis white, smooth, compressed, with fine hair on the joints. *Spikelets* from 12 to 18, 1 1-2 times as long as broad, 3-seeded, 3-awned. *Calix-Awn* white, smooth, bent, compressed, bark elevated, its tooth long and broad. *External valve* a little longer than the paleæ, white, smooth, awned. *Internal valve* as long as external, thin-skinned, mucronate, half embracing the seeds. *Awns* twice as long as the spike, and longer, squarrose, white, rough. *Seeds* long, triangular, bright, glassy.

It requires a rich, mild, and loose soil, a warm climate, and early sowing. No variety changes more by a change of cultivation than this. It changed very often during the first years of its cultivation in our section, but its spikes were afterwards more constant in color and size. It did not produce a very white flour.

This wheat is of no value for Germany, hence we cannot recommend the cultivation of it, nor of the following varieties.

b. White Beard Wheat with Black Awns (*Summer Wheat*).

Spike white, with black awns.

This variety is to be considered as emanating from the preceding one, often changing and never permanent.

c. White Velvety Beard Wheat (*Summer Wheat*).

Spike white, velvety. White velvet Welsh wheat, *Germany:* Ble carne a epis barbues et veloutes, Froment dur, Froment de Barbarie, *France;* Frumento Mazzachio, *Italy;* Tricho Cuchareta Pationcho, Aris prietas, Aris negros, Alonsos, Salmerones, Cascalvos, Finnanos, *Spain;* Majoronata, Majorea quistaliza, Cannizara, Racolfarta, *Sicily.*

This variety is distinguished from *a* by its velvety spikes.

This wheat has been mentioned 300 years ago by Tabernaemontan, who says of it: "The peasants of Alsace are cultivating it on the borders of forests, where it is not destroyed by the wild animals which inhabit the forests, on account of its long awns." But it is no longer found in that section.

d. White Velvety Beard Wheat with Black Awns (*Summer Wheat*).

Spikes white, velvety, with black awns.

A sub-variety of the previous variety *c*, not permanent, and appearing at times with white and again with black awns.

e. Red Beard Wheat (*Summer Wheat*).

Spike brownish, smooth. Red barley wheat, Red Welsh wheat, *Germany;* Ble carne a epis glabres, Ble rouge d'Egypte, *France;* Leucostachya

Blanguillas e Alagas, Cyanostachya Azulejos, Moratos e Xejonas, Chrysostachya rojales, *Spain.*

It is distinguished from variety *a* only by its brownish-red colored spikes.

f. Red Velvety Bearded Wheat.

SUMMER WHEAT.—Spike brownish, velvety, Red Welsh Wheat, *Germany.* Ble carne a epis barbues et veloutes, *France.* Grano Ravanense, *Italy.* Trigo Moruno, *Spain.*

Differs from variety *a* by its brownish red and velvety spikes, and by its red awns.

g. Blue Beard Wheat.

SUMMER WHEAT.—Spike violet, Blue Welsh Wheat, *Germany.* Ble carne a deux coulears Tangerock de Provenceaux, *France.*

Is distinguished from variety *a* by its blue color; in all other respects it is like it.

h. Thin-Eared Beard Wheat.

SUMMER WHEAT.—Spike thin, white, often reddish.

Halm 3½ feet long, erect, pithy. *Spike* considerably thinner than those of other varieties. *Rachis* in joints, white, with hairs on joints. *Spikelets* from 16 to 20, 3-seeded, 2-awned, ovate, loosely imbricated. *Glume* long, compressed, with a long bent tooth. *External valve* as long as glume; the two external ones with awns. *Internal valve* thin, flat. *Awns* almost twice as long as the spike. *Seeds* oblong, and whitish.

This wheat is very sensitive to cold; does not ripen perfectly, and is of no agricultural value.

4. *Polish Wheat,* (*Triticum Polonicum.*)

Spike soft, square awned, white. Wallachian, Astrachan, Egyptian corn, Gounner, Symaker, Siberian, Cairo, Double Wheat, *Germany.* Ble d'Egypte, Ble de Surinam, Ble de Magador, Ble de Pologne a epi divarique, *France.* Poland Wheat, *England.* Fromento di Polonia, *Italy.* Trigo di Polonia, *Spain.*

Halm from 4 to 4½ feet in length. *Blades* ½ to ¾ inch. broad, 6 to 8 inches in length. *Rachis* long, in joints, haired on the border. *Spikelets* from 14 to 18, from 2 to 3 seeded, 2 awned, 1 to 1½ inches in length. *Glume* 1 to 1¼ inches in length, ⅛ inch broad, compressed, with from 5 to 6 elevated stripes, 2 toothed, white, smooth, keel with very fine hair. *External valve* as long as paleæ, awned. *Internal valve* half as long as external, mostly unequal, slightly embracing the seeds. *Awns* unequal, mostly of half the length of the spike. *Seeds* ½ inch long and longer, of equal breadth, furrowed flatly, a little compressed or tapered, white, almost transparent, and glassy.

It occurs sometimes upon fields in Germany as an experiment.

Poland Wheat requires a warm climate, protected situation, loose and rich soil, and very early sowing in spring.

b. Branched Poland Wheat.

Spike soft, loose, awned, white, branched.

A sub-variety, appearing only as a chance variety—prolific tillerer, but deserving no further notice.

c. Velvety Poland Wheat.

SUMMER WHEAT.—Spike soft, awned, white, velvety.

It is distinguished from variety *a*, by a velvety coating of the awns which, however, often disappears in our sections, but regularly re-appears, in warmer years.

This wheat has acquired a permanent character in Spain, solely in consequence of the warm climate of that country. *La Gasca* gives a minute description of it.

d. Half-Awned Poland Wheat, (Summer Wheat).

Spike soft, a little awned, white.

Is likewise very unstable, appears at times with shorter and again with longer awns, and is therefore, to be considered a permanent variety in warm climates only.

e. Club-like Poland Wheat, (Summer Wheat).

Spike hard, compact, half-awned, white.

This wheat is distinguished from the variety *a*, by its compressed, erect, hard spike and shorter awns. But these characteristics are somewhat changing in our climate, and the spikes and awns are at times longer or shorter, but without entirely changing their original shape, in consequence of which we must consider it a constant variety. *La Gasca* thinks it a separate variety, and terms it *Triticum Cevallos.*

This wheat ripens in warm climates only, viz: in Spain, and with great difficulty in our country, consequently it is not deserving of any agricultural consideration. All the Poland Wheats do well in the most southern parts of Europe only, where they may be of a sufficient value; but they are of no value in the northern parts, and may, therefore, occupy no rank in an agricultural aspect, which has been made very evident long ago, by heavy losses, which have been incurred in attempts to cultivate it.

CLASSIFICATION OF WHEAT.

BY JOHN LE CONTEUR.

The attempt to class the varieties of wheat is necessary; it is a laborious and difficult undertaking, which should be performed by a more scientific person than the writer. But as no one has yet done so, as a branch of agriculture, in those plain terms which may be intelligible, not to the botanist, or scientific reader only, but to the great mass of farmers, I shall risk the trial for those sorts that are in usual cultivation.

I leave to botanists the seven species of Triticum named in that very useful work, Loudon's Encyclopedia of Agriculture. Also, the attempt at classification that is made in Sinclair's excellent book on Grasses, neither of these works explaining what I should consider to be the principal object in view, the nature and real qualities of each variety, as to their properties for making bread.

A gentleman who may be planting a garden, is desirous of having peaches, figs, pears, grapes, apples, and even gooseberries, of particular seasons, flavors, qualities and colors; these are all named, and so intelligibly classed, that if the nurseryman deceives him in one or two of them, he is set down as a person unfit to be depended upon; yet these luxuries, which do not directly affect the real prosperity of the country, are perfectly well understood, but the nature of the most precious of all those plants, which one of the most profound writers has called "the only produce of land which always, and necessarily, affords some rent to the landlord," appears to have been overlooked—perhaps because it was so plentiful and so diminutive. If Doctor Franklin's adage "take care of the pence and the pounds will take care of themselves" is true, it is not less correct to say to a husbandman, in the selection of seed wheat, "take care of the pecks and the quarters will take care of themselves."

To render the classification of wheat well understood, it should be so clear and simple, that any farmer should be enabled to state the precise variety he wishes to raise, by applying to the seed merchant, a branch of business which should belong to the corn trade. I should propose a classification as follows:

BEARDLESS OR WINTER WHEATS.

Class 1,	White	Wheats,	Smooth chaffed.
2,	"	"	Velvet husked.
3,	Red	"	Smooth chaffed.
4,	"	"	Velvet husked.

Class 5,	Yellow Wheats,	Smooth chaffed.
6,	"	"	Velvet husked.
7,	Liver	"	Smooth chaffed.
8,	"	"	Velvet husked.

BEARDED OR SPRING WHEATS.

1, White Spring Wheat.
2, Red Spring Wheat.
3, Yellow Spring Wheat.
4, Hoary Spring Wheat.

The sub-varieties should be given a number and name, which number should be first added to the local names given to each, for which one common name should be substituted.

ARRANGEMENT.

1st. The name of the wheat, and the particular soil and climate it may be suited for, the proper period for sowing it, whether it be liable to injury from drought, moisture, or frost, in its earlier or later growth, and its liability to disease.

2d. The period of flowering, or blooming and ripening.

3d. The height and nature of the straw, whether it be white or dark colored, brittle or tenacious, if liable to lay in wet seasons, or otherwise. If fit for fodder, thatching, bonnet-making, or other purposes.

4th. Nature of the ear, whether compact, or widely spread, its length in inches. This would of course vary in some soils, but it would be interesting to know such variations, and the produce per acre.

5th. The color of the grain, (this will also vary with a change of soil) whether coarse or thin-skinned, whether round or oval, large or small, whether liable to shake out or not.

6th. Nature of the flour and bran, with their relative quantity.

7th. Whether the dough rises well or not.

8th. Quantity of bread made from a given quanty of flour, its color, if of a dry or moist nature, and the length of time it will keep.

Smooth Chaffed.

IN CLASS 1.—NATURE AND HABITS.

No. 1. *Triticum Hybridum, Candidum Epulonum Leucospermum;* La Gasca. A variety from Dantzig—ear full and large, ranging from three and a half inches, to four and a half in length. Grain rather thin-skinned, large, roundish, hardy. Tillers well, blooms rather early, tall, four feet eight inches, tenacious white straw. Rather liable to lie in rich land, sheds if over ripe, produces excellent white bread, of a rather dry nature. Eighteen pounds of flour have made twenty-four pounds of bread — has produced fifty-two imperial bushels of sixty-three pounds to the acre.

No. 2. *Triticum Album Densum*, "La Gasca." I suspect it to be the "Froment Blanc de Hongrie" of the French, ear compact, square, from two and a half to three and a half inches long. Grain small, white, round, thin-skinned, hardy, tillers well, blooms a day or two later than No. 1, tall, four feet eight inches, stout white stem, sheds little.

No. 3. *Triticum Hybridum, Coturianum a Compactum La Gasca, M. S. S.* A seedling of 1832. Ear short and compact, not quite so square as No. 2, which it otherwise resembles externally, from two and a half to three inches long, grain plump and oblong, rather coarser skinned than No. 1, hardy, tillers remarkably. Blooms rather earlier than No. 2. Straw short and slight, four feet high, not at all liable to be laid. Sheds little, highly productive, having afforded fifty-eight imperial bushels to the acre.

No. 4. *Triticum Hybridum, Talavera Belvuensis.* Ear long, straggling and pyramidical, from four to six inches long. Grain large, oblong, and thin-skinned. Tillers moderately. Earliest to bloom, eight or ten days sooner than the three preceding sorts. Straw tall, slight and bending, and brittle if over ripe, liable to lie in rich land, highly farinaceous.

IN CLASS 2.—VELVET HUSKED WHITE WHEAT.

No. 1. *Triticum Koeleri*, La Gasca, 1832. Ear large, rather close. Downy or velvety. White, very plump, roundish, oval, thin-skinned grain. Tillers remarkably. Blooms rather early. Straw four feet four inches to four feet seven inches. Very white and fine, not liable to shed, retains moisture from its huskiness, therefore should be harvested when dry, has produced twenty-six pounds of superior white bread from eighteen pounds of flour, and has produced fifty-five imperial bushels of 64 lbs. the acre.

Such is the sort of classification I should wish to introduce, not one in a dead or botanical language, intelligible only to men of science, but one in the mother tongue, which every farmer may comprehend, and by comparing his class book with the crops, or varieties that are lurking in them, may ascertain which they were. This is merely a first suggestion, time and further experience, guided by the experiments this book may lead to, may prove the means of distinctly ascertaining and making known the habits and propensities of all sorts of grain.

PROF. EMMONS' CLASSIFICATION AND ANALYSES OF WHEATS.

A. WINTER WHEAT.

Improved White Flint Wheat.—This variety resembles very closely the White Flint. It is considered by Mr. Harmon as new; having been produced by himself, by a selection of the best seed, and liming and sowing it upon a limestone soil. It is larger than the White Flint; and yet the cuticle of the kernel is equally thin, delicate and white. It weighs, according to the statement of Mr. Harmon, when prepared for seed, 64 lbs. to the bushel. The specimen in the Agricultural Society's collection has a specific gravity of 1·310,* and was furnished by the improver of the White Flint, and hence may be regarded as authentic. The specific gravity, however, is rather less than I should have expected from the weight per bushel. Two bushels and eighteen pounds of this wheat produced 106·8 lbs. flour and 31 lbs. of bran: loss 1·2 lb., equaling in the whole 138 lbs.

White Provence Wheat.—This is a French variety, and is regarded as one of the finest kinds of wheat. It is without beards, and has a large white kernel with a thin skin. It grows rapidly, has larger blades, and sends out a greater number of straws from a root than most varieties. The straw, however, is weak, and does not support itself well. Specific gravity, 1·297. From its low specific gravity, I infer that it weighs less to the bushel than the White and Improved Flints.

Wheatland Red Wheat (Plate II., No. 1).—This is a variety which has been brought out by the skill of Mr. Harmon, from the Virginia White May kind. Its chaff is red; head bald and of a medium length. It is said to weigh 66 lbs. to the bushel. Its specific gravity is 1·321. The objection to this kind is its red berry: its recommendation is that it does not rust.

Tuscan Bald Wheat.—This kind, which was introduced from Tuscany in 1837, has been laid aside in consequence of its liability to be injured or destroyed by frost. Its flour is fine and white, and its heads well filled.

Skinner Wheat.—With awns; chaff white; straw short and stiff; weight 64 lbs. to the bushel. It is not in so much esteem as to displace other kinds.

* The true weight of wheat is determined by its specific gravity. The weight of a bushel of wheat will vary with the size of the kernel, and from other circumstances; while its relative weight, or that found by comparing it with an equal bulk of water, at a given temperature, depends upon its composition. The heavy varieties, or those with a high specific gravity, contain more gluten than the light: the latter contain the most starch.

GOLDEN-DROP WHEAT.—Awnless, with a red chaff and rather thick cuticle. It is inferior to other well known kinds in Western New York.

WHITE BLUE-STRAW WHEAT (Blue Stem of Ohio).—This kind has been received from Maryland. It is a beautiful kind, and yields a white and fine flour. Specific gravity, 1·344; with the cuticle removed, 1·379. It is worthy of observation that the specific gravity is increased by the removal of the cuticle.

AGUIRA WHEAT.—This kind was brought, two or three years since, from Spain, by F. Townsend, Esq., of Albany. It is a very beautiful kind, the kernel being large and white. Specific gravity, 1·394. Its weight approximates more closely to the celebrated English kinds, than any of the preceding.

VERPLANCK WHEAT.—In richness of appearance, this wheat excels most others. Its kernel is very large and white; the head long, large, and well filled. The straw is large, and tall in proportion, being at least four and a half feet. The grain, however, is light, as will be seen from its low specific gravity, which only attains 1·261.

B. SPRING WHEAT.

1. ITALIAN SPRING WHEAT.—This kind, which at first was esteemed, has so far deteriorated as to be neglected.

2. TEA WHEAT, SIBERIAN WHEAT.—As a spring wheat, it is regarded as a very good variety; giving a white berry and fine white flour. It is not subject to rust.

3. BLACK SEA WHEAT.—The advantages arising from the culture of this wheat, are, that it escapes the fly, ripens early, and rarely mildews. Its disadvantage is that it yields a dark flour of an inferior quality. Its specific gravity is 1·341. In Vermont, Massachusetts, and Maine, it is often sown, as it is less liable to a failure than the finer varieties.

5. BLACK-BEARDED WHEAT.—Awns long and stiff; heads heavy; straw large, and berry red and large; hardy.

6. RED-BEARDED WHEAT.—Awn red, and standing out from the head; kernel white; chaffed. Yields a good flour. A bushel weighs from 60 to 62 pounds. It succeeds best on stiff clay loams. It has yielded 44 bushels to the acre. Its beard is objectionable.

7. SCOTCH WHEAT.—(Plate II No. 5.) Its origin is unknown. Berry large, and resembles the Indiana; straw large.

9. TALAVERA WHEAT.—(Plate I No. 10.) Awnless; chaff white, straw long, white and stiff; heads large, long and well filled. Specific gravity 1,306. It is not sufficiently hardy to stand *severe winters.* It is frequently injured by the fly.

ADDITIONAL VARIETIES OF WHEAT WHICH HAVE BEEN SOMEWHAT CULTIVATED IN THIS STATE.

1. VELVET-CHAFF BALD.—Chaff greenish brown and dotted, without beard or awns.

2. WHEATLAND YELLOW.—(Plate I No. 4.) Chaff pale yellow, with short awns; heads large and berry large.

4. HUME'S WHITE.—Heads rather long and slender; chaff yellow.

5. BEARDED BALTIC.—(Plate I No. 6.) Heads thick and heavy; chaff yellowish brown, bearded; beards moderately long.

6. SKINNER'S CLUB.—Kernels clustered in whorls; chaff greenish yellow, bearded.

7. OLD BEARDED TUSCANY.—Kernels clustered, and with long beards, greenish yellow; heads rather long.

9. BALTIC DOWNY.—Chaff brown, quite downy; heads long, beardless.

10. OLD BLACK BALD.—Kernels irregularly clustered; chaff brown, bearded.

11. POLAND WHITE BALD.—Berry irregularly clustered; chaff greenish yellow, awned, or with shortish beards.

12. NEW VELVET-CHAFF.—Kernels very thickly clustered, bearded.

13. BLACK VELVET-CHAFF.—Kernels closely set and thick; chaff very dark.

14. BALD BALTIC.—(Plate II No. 2.) Kernels thickly set in regular rows; chaff light brown; heads thick, heavy.

16. EARLY VELVET-BEARD.—(Plate II No. 7.) Kernels clustered in whorls; heads long and yellow.

17. ITALIAN SPRING WHEAT.—Kernels clustered, irregularly arranged upon the spike; chaff greenish yellow, thickly bearded.

18. BEARDED VALPARAISO.—Kernels in rows regularly arranged; heads short and thick, bearded.

19. WASHINGTON WHEAT.—Heads very large and long; chaff brown; beards long; berry rather dark, but numerous, amounting to 70 or 80.

20. VERPLANCK WHEAT.—Heads quite large and beautiful; berry of the largest size.

21. CLUB WHEAT, PENNSYLVANIA WHEAT.—Heads short; kernels in regular rows, bearded.

22. SPRING RED-CHAFF.—Kernels clustered; heads long; chaff reddish brown, bearded.

23. SPRING WINTINGTON WHEAT.—Kernels thickly set, but irregular and large; chaff yellow, bearded.

ANALYSIS OF WHEAT, INCLUDING STRAWS AND CHAFF.

BY PROFESSOR EMMONS.

Many difficulties exist in the analysis of the grain of the cereals, and particularly in wheat and Indian corn. In consequence of this fact in part, I regret that I am unable to give a full account of the composition of the former. But this is not all. I have been poorly supplied with samples of the grain; and not living in a wheat district, I have been unable to procure it, either in a ripe condition, or in its different stages of growth. I made repeated applications both to the members of the Agricultural Society, and to other individuals, but only in two or three instances have my applications been successful. I availed myself, however, of several fine samples of wheat, furnished by Mr. Harmon. These, although the straw was in sufficient quantity for analysis, the grain itself was insufficient in amount to answer well that object. I have, however, made as good a use of the means within my reach, as was able; and I propose now to enter upon the details, as far as I am able at the present time:

I. *Winter Wheat from Genessee County. Received from Mr. Peters. The variety not given.*

Specific gravity	1·289

PROPORTIONS.

Grain	1000·00
Ash	1·450
Straw	100 000
Ash	2·660
Chaff	100·000
Ash	7·970

From these proportions, I obtained from the ash of the grain, Silica, 0·075; Phosphates, 0·810; from the straw, Silica, 1·285; Phosphates, 0·070; from the chaff, Silica, 6·435; Phosphates, 0·080.

The phosphates were obtained by precipitation by caustic ammonia, and hence the full amount of phosphoric acid does not appear in the grain.

I. *Analysis of the ash of Mr. Peters' winter wheat. Effervesces slightly on the addition of acid.*

Sand	3·525
Silicic acid	1·700
Phosphoric acid with part of the magnesia	60·725
Lime	0 050
Magnesia	2 880
Potash	7 180
Soda	16 920
Sodium	0·195

Chlorine	0 295
Sulphuric acid	0·895
Organic acids	2·400
Carbonic acid not determined	
	96·775 S.

2. Organic Analysis.

100 grs. gave as follows:—

Starch	61·400
Albumen	1·215
Gluten	4·460
Casein	trace.
Matter dissolved out of epidermis and other bodies insoluble in water and alcohol, by acetic acid	1·980
Matter dissolved out of epidermis and other bodies insoluble in water, alcohol and acetic acid, by a weak solution of caustic potash: comports itself like albumen	1·480
Epidermis after digesting in alcohol, acetic acid, and potash	3·410
Dextrine	2·400
Water	9·380
Oil	1·050
Extractive matter and sugar, and loss	13·225
	100·000 S.

This analysis is not complete: the extractive matter and sugar were not obtained.

PROPORTIONS.

Water	9·380
Dry matter	90·620
Ash	1·650
Ash calculated on dry matter	1·821 S.

II. *Black-Sea Wheat from Lewis County. Soil slaty, being based upon the Utica slate.*

1. Analysis of the ash.

		Removed from an acre.
Silica	4·300	0·970 lbs.
Phosphate of lime, magnesia and iron	45·376	10·240
Phosphate of the alkalies	28·395	6·363
Potash	10·830	2·444
Soda	8·110	1·830
Lime	0·010	0·002
Magnesia	0·020	0·004
Organic matter		
Carbonic acid	1·340	0·301
	98·221	22·154

2. Analysis of the earthy phosphates.

		Per centum.
Soluble silica	0 003	0·074
Lime	1·940	2·380
Phosphate of peroxide of iron	1·880	4·470
Magnesia	2·920	12·440
Phosphoric acid	12·825	30·760

III.—*Black Sea Wheat from the same County.*

Specific gravity 1·341. Kernel small, and but little lighter colored than the best kinds of rye. Soil based upon limestone.

Analysis of the ash.

Sand	3 700
Silicic acid	1 550
Phosphoric acid with part of the magnesia	62 075
Lime	0 050
Magnesia	3·435
Potash	8 045
Soda	14·790
Sodium	0 320
Chlorine	0·490
Sulphuric acid	0·340
Organic acid	2 000
Carbonic acid not determined.	
Effervescence very slight on adding acid to ash.	
	96 795 S.

IV.—*Analysis of Summer Wheat, received from Mr. Peters, of Genessee Co.*

		Removed from the acre.
Silica	2·633	0·687 lbs.
Sand	1·607	0 419
Phosphates of lime, magnesia and iron	48·000	12 528
Phosphates of the alkalies	19 440	5·073
Lime and magnesia	0·020	0·005
Potash	14 720	3 841
Soda	3·356	0 875
Chlorine	none.	
Sulphuric acid	0 544	0 141
Organic matter	8·480	2 213
	98·864	25.782

Per centage of water of Black Sea Wheat grown on different soils.

On limestone	10 52
On slate	10·72
On alluvial gravel	10·27
On sandy soil	11 10

The variety known as Harmon Wheat, grown upon clay loam based upon the rocks of the salt groups, gave water 11·82, after long drying in the water bath. The last had assumed a brown color, and appeared partially charred, although it had never been exposed to a temperature above 212° Fahr. From the preceding observations, and others of the same kind, I am led to believe that this grain has always in combination, about the same quantity of water, and that soil and varieties do not cause it to vary much either way from 12 per centum of water. This amount of water, however, although it is comparatively small, has probably a decided influence upon its preservation in transportation to foreign countries. The hygrometric power of grains and flour has not been determined. The per centage of water may not of itself form an obstacle to its keeping; and if it is not in a situation to imbibe more, it may perhaps remain for years in a sound state.

V.—*Black Sea Wheat from Lewis county. Grown upon the Trenton limestone.*

ANALYSIS OF THE ASH.

Silica and sand	14 520
Earthy phosphates	43 333
Alkaline phosphates	23·646
Potash	12·629
Soda	5·068
Magnesia and lime	0·030
Chlorine	trace.
Sulphuric acid	trace.
Carbonic acid	none.

VI.—*A Winter Wheat from the same county. Grown upon sandy soil. Variety not given. Furnished by Mr. Beach.*

1. ANALYSIS OF THE ASH.

Silica	9·120
Sand and coal	10 000
Earthy phosphates	48·273
Alkaline phosphates	15 501
Potash	23 407
Soda	4 044
Lime	0 020
Magnesia	0.002
Sulphuric acid	trace.
	100 367

ANALYSIS OF THE EARTHY PHOSPHATES.

Soluble silica	0·08
Lime	1·98
Phosphate of peroxide of iron	4 95
Magnesia	6 64
Phosphoric acid	28·31

VII.—*Winter Wheat from the same county. Furnished by Mr. Beach. Grown upon a gravelly soil.*

Analysis of the ash.

Silicia and coal	12·134
Earthy phosphates	37·072
Alkaline phosphates	21·313
Potash	22 496
Soda	7·348
Chlorine	trace.
Sulphuric acid	trace
Magnesia and lime	0 031

Note.—I was desirous of repeating all those analyses in which so much foreign matter, as coal and sand, existed. Experience subsequently enabled me to avoid this objectionable state of the ash; still the results are correct for all the elements except silica. In regard to this, I have been satisfied that it varies from 1·50 to 5 per centum; and it is probable, in those varieties grown upon soils of Lewis county, that they reach the maximum per centage. The grain has a thick cuticle, and is rather dark; and it is in these kinds that the silica is in the largest proportions.

VIII.—*Straw and Chaff of Wheat from Mr. Peters.*

1. Analysis of the straw.

		Removed in a ton of straw.
Silica	49·100	29·255
Earthy phosphates	19 600	11·678
Lime	3·460	2 061
Magnesia	0 324	0·193
Potash	22 245	13 253
Soda	5·195	3·095
Sulphuric acid	8 876	0·521
Chlorine	0 121	0·072
	100 921	60 128

2. Analysis of the chaff.

		Removed in a ton of chaff.
Silica	80·C0	143·893
Earthy phosphates	8·80	15·710
Carbonate of lime	4·70	8·390
Magnesia		
Potash	1·80	3·213
So a	3 20	5·712
Sulphuric acid	1·21	2·160
Chlorine	trace.	
	100·31	179·078

PROPORTIONS OF GRAIN, STRAW AND CHAFF OF SEVERAL VARIETIES OF WHEAT.

	Actual quantities.	Per centum.
1. Old Red-chaff Wheat.—		
Grain	7·24 grs.	100·000
Chaff	2·21	30·524
Straw	11·54	159·392
2 Talavera Wheat.—		
Grain	12·40	100·000
Chaff	2·92	23·548
Straw	14·44	116·209
3. Indiana Wheat.—		
Grain	556·50	100·000
Chaff	129·50	23·270
Straw	611·00	109·811
4. Improved Flint Wheat.—		
Grain	11·30	100·000
Chaff	2·72	24·070
Straw	13·23	117·079
5. Harmon Wheat.—		
Grain	1207·50	100 000
Chaff	300·00	24·844
Straw	1166 50	96·604

To determine the foregoing proportions of grain, etc., I took from a small bundle those heads and straw which remained perfect, a certain number, and shelled the grain, and weighed each part by itself. This method of determining the proportions of grain, chaff and straw, has been found as correct, if not more so, as weighing large quantities in the usual way. Due care must, of course, be taken to avoid losses in separating the grain.

IX.—*Improved White Flint Wheat.*

ANALYSIS OF THE STRAW.

Silica	42·60
Carbonate of lime	8·90
Phosphates of lime, magnesia and iron	9·30
Potash	22·76
Soda	5·28
Magnesia	1·58
Sulphuric acid	5·85
Chlorine	1·86
	98·13

X.—*Old Red Chaff Wheat.*

ANALYSIS OF THE STRAW.

		Removed in a ton of straw.
Silica	70·00	78·40 lbs.
Coal	0 25	0 28
Phosphates of lime, magnesia, and iron	8·89	9·95
Carbonate of lime	1·80	2 01

Magnesia	0·15	0·16
Potash	12·12	13·57
Soda	4·19	4·69
Sulphuric acid	2·25	2·52
Chlorine	1·75	1·94
	101·50	113·52

The straw of the Old Red Chaff is stiff and rigid; and from its characters alone it would be inferred that it contained a greater per centage of silex.

XI.—*Wheatland Red Wheat.*

Analysis of the straw.

		Removed in a ton of straw.
Silica	15·75	84·84 lbs
Phosphates	8·21	9·19
Carbonate of lime	1·05	1·17
Magnesia	0·25	0·28
Potash	7·20	8·06
Soda	2·10	2·35
Chlorine	0·24	0·26
Sulphuric acid	2·21	2·47
	97·01	108·62

XII.—*Soule's Wheat. Specimen taken from the State Agricultural Rooms. Fine plump berry.*

		Calculated on dry matter.
Starch	62·29	68·360
Sugar and extractive matter, with a little acid, formed during the analysis	6·40	7·023
Dextrine or gum	1·21	1·328
Epidermis	7·20	7·903
Matter dissolved out of epidermis and other bodies insoluble in water and boiling alcohol, by a weak solution of caustic potash	6·82	7.485
Oil	1·02	1·119
Gluten	4·51	4·949
Albumen	1·67	1·833
Casein	trace.	trace.
Water	9·79	....
	100·91 S.	100·000

The gluten in the above analysis is small, though I think correct. The matter insoluble in water was digested in successive portions of boiling alcohol for six hours, till nothing more was taken up. The matter insoluble in water and boiling alcohol was digested in a weak solution of caustic potash, which took up over 7 per centum of the dry grain; which, if albumen, increases that body to a large per centage. The gluten and starch agree nearly with the winter wheat from Genessee, but the albumen and epidermis are much greater.

PROPORTIONS.

Per centage of water	9 790
Per centage of dry matter	90 210
Per centage of ash	1 720
Per centage of ash calculated on dry matter	1·906 S.

XIII.—*Provence Wheat.*

ANALYSIS OF THE STRAW.

Silica	68·60
Phosphates	4·70
Carbonate of lime	2·35
Magnesia	1·35
Potash	5·55
Soda	5 63
Sulphuric acid	2·83
Chlorine	1·34
Organic matter	4·20
Carbonic acid	1 40
	97·95

XIV.—*Hopetown Wheat.**

(Length of straw, 44 inches.)

1. Relation of grain, straw and chaff.—	Actual quantities.	Per centage.	
Grain	12·07	42·30	
Straw	14·23	49 86	57·70
Chaff	2·24	7·84	

Specific gravity of the grain 1·391

2. Per centage of water and ash.—	Water.	Ash.	Ash calculated dry.
Grain	12·5	1·76	2 01
Straw	13·7	4·16	4 82
Chaff	11·5	10·36	11·70

3. Produce, and mineral matter of an acre.—		Mineral matter.
Grain	22·16	43·5
Straw	25·94	120·4
Chaff	4·11	57·6

		Removed from an acre.	
4. Analysis of the ash of the grain.—		lbs.	oz.
Silica	3·20	1	6·6
Phosphoric acid	44·44	19	6·0
Sulphuric acid	trace.		
Carbonic acid	none.		
Lime	8·21	3	9·2
Magnesia	9·27	4	3·3

* Journal of the Royal Agricultural Society.

Peroxide of iron	0·08	0	0·9
Potash	32 14	17	13·8
Soda	2·14	1	8·8
Chloride of sodium	none.		
	99 97	43	9·7

5. Analysis of the straw and chaff.—

		Removed from an acre	
Silica	67·10	119	6 8
Phosphoric acid	6 05	12	8·7
Sulphuric acid	5·59	91	5·2
Lime	4 44	7	14·4
Magnesia	3·27	5	13 0
Peroxide of iron	1·54	2	11·8
Potash	10 03	17	13·6
Soda	0·85	1	8 6
	99·97	177	11·5

The foregoing extract, exhibiting the proportions of water, grain, composition, etc., of an English variety of wheat, has been copied for the purpose of comparison with wheat of New York growth. A comparison can be made by any person who feels an interest in this matter. I do not, therefore, propose to enter upon a detail of difference or similarity; observing, however, that in the statement respecting the phosphates and phosphoric acid, I have given the phosphates of the earths and phosphates of the alkalise, by which it will be perceived that the earths, the lime and magnesia, as well as iron, are in combination with phosphoric acid. This fact does not appear in the extract which is given.

The real composition of wheat appears only when an analysis is made of its parts, as bran (which is the cuticle), and its flour. Time, however, has not permitted me to make those analyses. I can therefore make only the following very brief statement:

Shorts, which is mostly a coarse bran, gives,

Ash	5 115 per centum; which contains
Silica	0·140
Phosphates of magnesia, lime and iron	2 380
Fine middlings lost in a water bath	12·78 of water.
Bran	12 37 water.

Which proportions are rather greater than that given by wheat.

The specimen of winter wheat furnished by Mr. Peters	9·72 water.
Summer wheat	9 62

Proportion of ash and water in the straw of four varieties of wheat.

		Mineral matter in a ton of straw.
Indiana, water	3·50	
Ash	4·40	99·90 lbs.
Old red-chaff, water	7·50	
Ash	5·22	117·60
Improved white-flint, water	9·50	
Ash	4·50	160·80
Talavera, water	8·00	
Ash	5·46	122·30

WHEATS IN OHIO.

RED BEARDED WINTER WHEATS.

BLIZZARD is a sub-variety of the *"old red bearded"* variety; it is cultivated in Ross county.

CALIFORNIA.—(See plate III No. 9.) This variety was introduced by J. Buffington into Lawrence county ten years ago. It is hardy, and ripens before the Mediterranean, consequently it escapes all injuries from the fly, rust or midge. The yield is considerably more than that of the Mediterranean; and is regarded in Lawrence county as a prime red wheat.

CHINA VELVET is a velvety bearded variety of red wheat. It has been cultivated some 8 years in Washington county, where it is seldom attacked by either rust or fly, and produces from 15 to 30 bushels per acre. It ripens at the same time that the Mediterranean does in that county, namely, the first of July.

CHINA was introduced into Clark county by Jeremiah Lazell, Sr.; it yields from 15 to 36 bushels per acre, according to soil, cultivation and season, and ripens at the same time that the Mediterranean does, namely, about the first of July.

CLUB.—Was introduced into Stark county three years ago by Hon. Thos. W. Chapman, of Navarre. It yields from 15 to 25 bushels per acre, is subject to "rust, fly and weevil" (midge), chiefly on account of its late ripening, namely, about 8 or 10 days later than the Mediterranean. Undoubtedly a southern wheat.

EARLY RIPE, OR GOLDEN CHAFF.—This very popular variety was introduced into Fairfield county some ten years ago. Six Stager introduced it into Mercer county three years ago. It yields from 20 to 40 bushels per acre; it improves by high culture, is not subject to rust or fly, and ripens with the Mediterranean, about the first of July. It should be cut before fully ripe, as it sheds very readily. The berry is rather lightish red.

Egyptian Wheat.—Has been highly commended in the news journals, and is known under the various names of Egyptian, Syrian, Smyrna, many spiked, reed, and wild-goose wheat. It derives its latter name from a story, which is current in the north, that four or five kernels, from which the American stock has proceeded, was found in the crop of a wild goose, which was shot on the west shore of Lake Champlain. It is called *reed* wheat from the great strength of its straw, which serves to prevent its being prostrated in the field. It does not yield so much flour or meal as other kinds of wheat; and the flour is scarcely superior to that obtained from the finest barley. We find it described in some authorities as Mummy Wheat, or Wheat Three Thousand Years Old. The following is a brief popular alleged history of it: It is said that some years ago a gentleman having occasion to unroll an Egyptian mummy, found inclosed with the body a few grains of wheat, which afterwards, upon being sown with the modern Egyptian wheat, was found to be entirely dissimilar. The former contained nearly a hundred stalks, ranging in length from nearly five to upwards of six feet, the leaves broader than usual, and fully an average as to length. The grain was in two rows or triplets, and on some, twenty triplets on a side, or forty on the ear. The ear contained a few barbs or awns on the upper end, and was open and distant between the grains. It flowered nearly a fortnight before any of the varieties sown at the same period. The modern Egyptian is dwarf, not more than four feet high, closely set and barbed in every part of the ear, and its general resemblance to its ancient progenitor is not greater than that of barley to wheat. Egyptian wheat, found in the tombs of the 18th Dynasty—i. e., from B. C. 1822 to B. C. 1476—has germinated when sown in Germany, and is frequently found in the tombs of Egypt. It has been grown by P. Poorman, in Stark county.

Mediterranean (see Plate II., No. 11).—This variety is now perhaps more extensively cultivated than any other variety ever has been in this State. Its general history we stated on page ——. It was introduced into Ohio as much as thirty years ago,* but was not extensively cultivated nor held in great esteem, because it was liable to fall or lodge, as it yet does in Erie and Mahoning counties, but continued cultivation has given it a stiff straw in most of the other counties. The berry, which at first was long and dark red colored, has become plumper and of a lighter color. Millers everywhere attest with great unanimity to its improved flouring qualities. There is little doubt, but no direct proof, that by cultivation this

* James Rollen introduced this variety into Mahoning county, under the name of "*Black Sea Wheat.*"

variety has deteriorated into the white bearded variety of Mediterranean, which is now grown in Darke and some other counties. Being a hardy variety, and less liable to change from climate and soil than some of the finer varieties, there is little doubt that the variety called Quaker Wheat, in Preble county, owes its paternity to the red Mediterranean, cultivated and perhaps acclimated to a more southern latitude. In Warren county it is deteriorating.

A Good Crop.—Our respected fellow-citizen, William Carmichael, Esq., raised this year upon twenty-one acres of land, one thousand and twenty-six bushels of Mediterranean wheat, being a fraction below fifty-one and a half bushels to the acre, averaging sixty pounds to the bushel. This is a very great yield, larger, we believe, than was ever made before on this shore, and we question whether the State can beat it. This shows what *good farming* will accomplish. The land on which this wheat was raised is not better wheat land than two-thirds of this county, but has been greatly improved by the use of marl and marsh mud.—*American Farmer* (*Baltimore*).

The desirable qualities of this variety are, (1) it withstands the attack of the Hessian fly better than any other, (2) it is not liable to winter-kill, (3) it improves by cultivation, (4) and because it ripens early, but from no other cause does it escape the rust and the midge. In several counties, where it was sowed late, it was found as susceptible to rust as any other variety, and its long and stiff beards did not protect it from the midge. It perhaps yields less now than it did 15 or 20 years ago, although when properly cultivated it not unfrequently weighs 65 pounds to the bushel. Another desirable quality is attributed to it, viz: that it will do well on a poorer soil than any other variety. A very careful farmer from Mahoning county, writes that he has raised 20 bushels to the acre on a soil in which the blue stem invariably failed. (5) The certainty of the crop rather than on account of any of its qualities is perhaps the only reason why it has not only been continued in cultivation by the best farmers but has become the most popular wheat in the State. Its period of ripening varies from June 15, (statement of Hon. A. L. Perrill, Lithopolis,) in Fairfield county, to July 15, (statement of Geo. Pow, New Albany), in Mahoning county, but a majority of the correspondents name July 1st, as the general period of ripening.

Missouri.—Is a velvet bearded variety, and was introduced into Lawrence county a few years since by S. Reccord. It has yielded thirty bushels to the acre, but does not improve with culture; being very late, it is subject to all the diseases to which wheat is liable.

Mt. Olympus.—Was introduced into Madison county from Patent Office The yield was good; straw and head very heavy and dark; four rowed, with heavy beards resembling barley; it was considerably affected by the midge.

Red Chaff Mediterranean, is perhaps an improved or sub-variety of the red bearded Mediterranean, introduced two years ago from Lancaster county, Pa., into Montgomery county, O., by S. Rohrer, who claims that it is superior in every respect to the old variety, but Mr. David French, of Miami county, thinks it inferior.

The Bearded White.—Bald, white, and bald red Mediterranean varieties, will be found described under appropriate heads.

Old Red Chaff (see Plate III, No. 8).—This was once a very popular variety, but is now sadly on the decline. It has been cultivated in Clermont county, for upwards of 50 years. Its yield is fully equal to the Mediterranean, producing a much finer berry with a lighter colored and thinner skin. Of late years it appears much more liable to rust than formerly, while it suffers severely from the midge. Farmers would now sow more largely of this variety, were it not so difficult to procure clean seed. It ripens about the same time with the Mediterranean. Red chaff beardy wheat was introduced into Muskingum county, by John Dent, in 1808. But the millers set their face against it; called it a coarse, rye-like wheat; would not make good flour, and gave several cents less per bushel for it. But it has some hardy and productive qualities which induced the farmers to hang on to it, and it ultimately so improved in character that Mr. William Galigher, an intelligent miller of Zanesville, remarked in reference to it, some seven years since, that he considered it the wheat of this valley, and he would not care if there was not a bushel of any other kind raised. That it was more nutritious, &c. By reference to the Patent Office Report for 1848, page 263, you will see it stated that a specimen of flour analyzed by the Government chemist, manufactured by Beaumont & Co., of Zanesville, produced a higher per centum of gluten, or nutritious matter than any specimen examined by him in any of the Eastern or Western States. And I have little doubt but that flour was manufactured of red chaff, as it was then the principal wheat raised in the vicinity. The Mediterranean, when first introduced, was subject to precisely the same objection as the red chaff, but it is very rapidly improving.

Quaker Wheat.—This variety, which undoubtedly is a sub-variety of the red bearded Mediterranean, was introduced into Preble county, about thirteen years ago by D. Daily and Geo. D. Hendricks, who obtained seed in East Tennessee. Three years ago, W. C. Davis introduced this variety into Montgomery county from North Carolina. This Quaker Wheat originally had a red chaff, which by careful and thorough cultivation has been changed into a white chaff. It has become quite a popular variety in Preble and the adjacent counties. In appearance it much resembles the Mediterranean (see Plate III, No. 7). The berry is rather of a finer quality than the Mediterranean.

This variety owes much of its popularity to the fact that it ripens at the same time that the Mediterranean does, (June 25 to 28), thus securing it against the rust and midge—it withstands the severity of the winter equally with the former, and yields more abundantly.

RED CHAFF, BALTIMORE RED CHAFF.—This is perhaps a sport or variety of the Old Red Chaff. Forty years ago it was introduced into Holmes county by J. Mackey. It has been cultivated for more than 30 years in some of the northern counties; it is a good wheat but has a very weak straw, and consequently liable to lodge; the yield is about the same as the Mediterranean, and as it ripens about the same time as the latter, is no more liable to attacks of the midge, fly, or rust. It is generally being superseded by the Mediterranean, although most of our correspondents are of opinion that the berry improves by culture.

ROCK.—Ten years ago H. Rogers introduced this variety into Hamilton county, where it is steadily gaining friends as it improves by cultivation. It possibly is a variety of the Mediterranean, as it ripens at the same time, but yields rather a larger product, and is equally exempt from all the injuries incident to this cereal.

RED BEARDED.—This is a sub-variety, if not a synonym of the *Old Red Chaff*, differing from it no more than might reasonably be expected by culture, soil, &c. It is one of the varieties introduced into the State at an early day. Gen. J. T. Worthington writes that it has been cultivated upwards of 40 years in Ross county. Twenty-five years ago Thomas Gardner introduced it into Lawrence county. It is a variety well known to all the "early settlers" throughout the entire State. It does not yield as well as the Mediterranean, ripens rather later and is liable to be attacked by rust.

STUBBLE.—This variety once gave promise of great popularity, but being rather late, it could not so well as some other varieties withstand the attacks of insects, rust, &c., and is now, we believe, entirely abandoned.

SIDLE.—This is one of those sports which so frequently occur in the culture of wheat. There is no doubt that this variety owes its paternity to the *Old Red Chaff* and for all practical purposes may be regarded as an improvement on the old variety. It was introduced into Muskingum county about sixteen years ago, the seed having been brought from Chester county, Pennsylvania. It has been affected very slightly by culture, soil, &c., has yielded 33 bushels to the acre, is hardy, not liable to be attacked by midge or rust. It ripens fully ten days later than the Mediterranean.

SHOT.—This variety was introduced into Seneca county five years ago by Wm. Barrick, one year afterwards it was introduced into Montgomery county. It produces a better yield than the Mediterranean; ripens at the same time, but in Seneca county is subject to injury from insects, which it escapes in Montgomery.

VELVET OR CRATE (Plate I, No. 8.—Twenty-five years ago this variety was introduced into Muskingum county, where it has yielded 35 bushels per acre. Twenty years ago it was introduced into Defiance county, but does not yield as well there. It ripens fully ten days later than the Mediterranean, and is subject to rust, but remains stationary, *i. e.*, it neither improves nor deteriorates by culture. But the flour from it is very coarse and dark. It requires a strong soil—has long awns—the chaff and bran both are of a reddish cast.

WHITE CHAFF.—This variety has been cultivated during the past 15 or 20 years in Preble county. It yields about 15 bushels per acre; degenerates by cultivation, is seriously affected by midge and rust, and ripens several days later than the Mediterranean. It is considered as being "*worn out;*" in other words, there are many varieties which yield more and are not so precarious, so that the variety in question has been abandoned.

YELLOW BEARDED.—This variety was introduced into Defiance county some 15 years ago, by Mr. Churchman. It yields about as well as the Mediterranean, ripens at the same time that the latter does (July 4), and is equally exempt from injuries by insects, rust, &c.; and more than all yields a greater proportion and better quality of flour.

SMOOTH RED WINTER WHEATS.

BLUE CHAFF.—This variety has been cultivated in Tuscarawas county during the past forty years. On good high lands with a sunny slope it has frequently yielded 35 bushels to the acre. It improves by culture; is somewhat subject to rust, fly and midge, but ripens nearly a week later than the Mediterranean.

BAKER.—Has been introduced within the past 4 or 5 years in Clark and Champaigne counties; it yields about 18 bushels per acre under ordinary culture; is slightly subject to rust and attacks of the midge and ripens at the same time that the Mediterranean does.

Carolina, Early Ripe, Whig, Kentucky Red.—(See plate III, No. 4.) This variety is known as *Kentucky*, or *Early-ripe*, in Darke county, where it was introduced eighteen years ago by J. Hunter and J. P. Turpen. From there it was taken twelve years ago into Knox county under the name of "*Whig*" wheat, at the same time it was taken into Greene county; about the same time it was introduced undoubtedly from Kentucky direct into Logan county, under the name of "*Kentucky*," or "*Early-ripe*." Eight years ago it found its way into Tuscarawas county, under the name of *Carolina wheat;* six years ago John Maidlow introduced it into Putnam county, probably from Knox, under the name of "*Whig;*" Moses Hoagland introduced it into Holmes county several years since, and lastly Mr. Keys introduced it into Wayne county five years ago. Our correspondents, with great unanimity state that it thrives best on good, rich fallow grounds; yields under ordinary culture about 20 bushels per acre. In all the above named counties it appears to have escaped the midge, resisted the fly, and suffered slightly from rust, but in Logan it was from its first introduction so exceedingly liable to attacks from fly, midge and rust, that in a few years it was entirely abandoned; after 15 years culture in Butler county, it deteriorated so as to become entirely worthless. Forty-three bushels per acre have been harvested in Putnam county. It improves by culture, and ripens at the same time that the Mediterranean does.

Early York is cultivated to a slight extent only in Clark county; it is subject to all the wheat diseases incident to the country; yields under favorable circumstances 36 bushels per acre—ripens about a week later than the Mediterranean.

Garden.—This variety was once cultivated to a considerable extent in Stark, Wayne, Portage and other northern counties; but as it ripened very late it was of course subject to attacks from the midge, and was found to deteriorate rapidly. It yielded about 20 bushels per acre under good culture, but was unprofitable to the miller; the bran was thick and heavy, and the flour full of specks.

Golden Straw.—Was introduced into Tuscarawas county in 1849 by S. Kuhn, and about the same time by A. Standift in Mercer county; fifteen years ago it was introduced into Lawrence county by T. Gardner; by Peter Fleck and Hon. Thos. W. Chapman into Stark county, in 1854; ten years ago it was taken to Holmes county by J. Watts, and some six years ago it found its way into Coshocton county. The straw is short and stiff and is consequently not liable to lodge; it does best on rich sandy loams; the grain is not properly a red wheat, but an amber colored one, somewhat resembling the *old fashioned* flint wheats; in Holmes county it is rather of a yellowish cast. It ripens rather later than the Mediterranean; yields about 20 bushels per acre; does not improve under ordinary culture, and is but little subject to injury by rust or fly. It is rapidly growing into favor, and eventually may perhaps supplant the Mediterranean, although it has won no advocates in Ross county.

Kentucky.—See *Early Ripe*.

Mediterranean, Maltese, Malta, Smooth or Bald Mediterranean, was introduced into Preble county twelve years ago by C. Wysong; four years ago a Mr. Snyder introduced it into Seneca county, and Jacob Roher two years ago into Miami county, from Lancaster, Pa. It has also been cultivated two years in Muskingum, Perry and Washington counties. The correspondents state that it improves by culture, ripens early, generally escapes fly, midge and rust. Mr. D. P. Eghert, of Warren county, has furnished the following in relation to this wheat: "It is the most productive; is very hardy and adapted to all the different qualities of soil, stands up well on rich soil, is less liable to rust and not often injured by the fly. The grain is a better color than that of the bearded Mediterranean and not unfrequently weighs 66 pounds per bushel. This variety of wheat was brought from Preble county some four years ago. Our informant stated that it was first procured by picking a few seeds out of the straw remaining in a crate of China ware, imported from England or some other foreign port. It is now sown by more than half of the farmers in the neighborhood of Lebanon. J. M. Sellers produced 45 bushels per acre from this variety, so also have several others. I cheerfully recommend it to farmers as the safest variety to cultivate."

May or Alabama.—This variety was introduced into Gallia county 20 years ago, by J. H. & A. S. Guthrie, from Virginia—into Crawford county some ten years ago, and into Champaign county two years since, from the Shaker Settlement. It ripens about the same time that the Mediterranean does, but is easily winter-killed—thus betraying its southern origin; yields 18 to 20 bushels under ordinary circumstances—it does not come highly recommended.

Watkins Red May Wheat is extensively grown in the neighborhood of Richmond. It weighs heavy 64 pounds to the bushel; it matures very early, is not liable to rust, and is not injured by the fly. In 1842 it was cut as early as the 26th of May. It is not remarkable for production, but a very certain crop. It is necessary to seed heavy; does not tiller well, and will not do well on poor land; it has a smooth head and makes good flour, and is highly valuable to those parts of Maryland which suffer so much by the ravages of the fly and rust.

Mountain Sprout.—Has been cultivated during the past ten years in Perry county. The berry is light red, and ripens about ten days later than the Mediterranean. It has generally escaped the fly, rust and mige, when the Virginia blue stem growing on neighboring fields was almost entirely destroyed. Under favorable circumstances it has yielded forty bushels per acre.

Red Blue Stem.—(Plate I, No. 5.)—Many of the more recent varieties of smooth red wheats were no doubt derived from this standard variety. We find it cultivated in Stark, Tuscarawas and Carroll counties, fully forty years ago. It was no doubt brought there by immigrants from Pennsylvania. Twenty-five years ago Wm. Hughs sowed some in Holmes county; it has been a standard variety for the last 25 or 30 years in Harrison, Hocking, Coshocton, Morgan and Sandusky counties, as well as in those above named. There is perhaps no variety which repays good cultivation so well, or yields so little when indifferently cultivated as does this variety. When properly managed and in a favorable season it has yielded as much as 40 bushels to the acre,—(Stark, Tuscarawas, Carroll and Harrison counties,) but on the other hand in quite a number of counties in ordinary seasons it yielded no more than 8 to 10 bushels. It ripens three to six days later than the Mediterranean (bearded,) is slightly subject to fly, rust and midge. We have learned of a single instance only where it was winter-killed, and that was on a bleak knob in Harrison county. A very intelligent correspondent from Tuscarawas county says that "the county would be many thousand dollars richer if no other variety of red wheat had ever been introduced." It makes as good a quality of flour as does any red wheat.

Red Chaff.—(Plate I., No. 7.) This is one of the oldest and most substantial varieties, and is perhaps one of the earliest varieties cultivated in the west. The straw is long, and stands up well, chaff slightly brown. It makes a beautiful white flour. It ripens about a week later than the Mediterranean; yields about the same as the latter does, but is subject to blight, fly, rust, mildew, midge and winter-kill. It has been grown in Hocking county during the past several years.

Red Watson.—Was introduced into Coshocton county about twenty years ago. If sown seasonably it will ripen about the fourth of July, but is subject to fly, rust and midge—it is a heavy wheat, yields well in flour, and is therefore much approved by millers. The red and white Watson were mixed when first introduced, and for several years were thus cultivated until some one hand-separated several sheaves, since which time the pure red has been gradually extending in cultivation and driving out the mixed and white—the latter is no longer in cultivation.

Red Straw.—Has been cultivated for the past six years in Defiance county. It ripens cotemporaneously with the Mediterranean; is very little subject to disease from any cause; yields about the same as the Mediterranean—is perhaps a sport of the red blue stem.

Swamp Creek.—Has been cultivated four years in Preble county.

Soule's Red Chaff (Plate I., No. I).—Was introduced into the northern part of the State several years since, but is now very generally superseded by the Mediterranean.

Tennessee.—This appears to be a new variety; it appears to be hardy, not subject to attacks of insects or rust, does best on thin land, ripens as early as the Mediterranean, yields from 12 to 30 bushels. It has been cultivated some five years in Ross county, where it has made a favorable impression. It is possible that Tennessee has been substituted for Genessee, and that this variety is after all some one of the New York red varieties. This inference is based upon its early ripening.

Turkey.—Has been cultivated in Muskingum county during the past twenty years; during that period it has deteriorated very much; at one time an average yield was 30 bushels per acre, but now much less. In consequence of it ripening about ten days later than the Mediterranean, it is liable to rust and midge.

Velvet (Plate I., No. 3).—Has been cultivated some three years in Muskingum, and is undoubtedly a sport of some of the old standard red varieties from Maryland or Virginia. It is subject to rust from its late ripening, being fully ten days later than the Mediterranean. It yields about 35 bushels per acre under good culture, and is said to resist the midge. It has been cultivated several years in Fayette county, where it is said to have deteriorated very much.

Virginia Blue Stem (Plate I., No. 5).—This variety is simply the Red Blue Stem acclimated in Virginia and then transferred to Ohio. Being taken to Virginia from Pennsylvania, and then cultivated in this State, it has by this change of locality become a later variety,—ripening fully four days later than the Red Blue Stem, and from ten to twelve days later than the Mediterranean. It has been cultivated in Perry county during the past five or six years, where it is much subject to fly, rust and midge.

Whig.—See Early Ripe.

Wabash.—Was formerly cultivated in Montgomery county, but was abandoned on account of its susceptibility to disease.

Yellow Fly Proof.—This variety was introduced into Stark county fifteen years ago, by Hon. Thomas W. Chapman, of Navarre, who has assured us that it is not liable to be injured by fly, rust or midge; that under ordinary cultivation it yields 25 bushels per acre. It ripens rather earlier than the Mediterranean.

Yellow Lamme.—Has been grown in Hocking and Montgomery counties, but is now abandoned on account of late ripening. The berry is yellow. It is a southern variety.

Yorkshire (Plate I., No. 2).—Was introduced by emigrants from England some years ago, but it was soon abandoned, both on account of its inferiority, and liability to disease.

Zimmerman.—This variety has been cultivated several years in Ross, Darke, and Tuscarawas counties; it is an amber rather than purely red wheat; ripens a week later than the Mediterranean; improves by culture; yields 30 bushels per acre, and is somewhat subject to fly. It succeeds best on good corn ground.

BEARDED WHITE WINTER WHEATS.

Canada Flint (Plate II., No. 10), or, as it is often called, the Cummings wheat, from the name of the gentleman who introduced it, is a valuable English variety, that is rapidly taking the place of the common flint wheat, and produces from one-fifth to one-third more per acre than the old flint wheat in equally favorable circumstances. It is a fine grain, bearded and very hardy; is more liable to shell in harvesting than ordinary wheat, hence should be cut earlier.

Club.—Was formerly cultivated in the northern counties, and considered a good variety, but it deteriorated in quality, and was so liable to injury from fly, rust and midge, that it is now almost entirely abandoned. It ripened almost two weeks later than the Mediterranean. A Logan county correspondent says: "It came highly recommended, but left with a bad character."

Genessee.—This name is applied to a red bearded, and a white smooth or bald variety, as well as to the white bearded. The name properly pertains, we think, to the white smooth variety. The variety under consideration was introduced into Montgomery county eight years ago, by H. Lewton. It ripens before the Mediterranean, does not suffer from fly, rust or midge, and is said to be very productive.

Kentucky White Bearded, Canada Flint, Hutchinson.—This variety was introduced into Erie county last fall. It is considered as less valuable than the White Flint. The bran is thicker. It spreads but little, and therefore requires more seed. This, however, cannot be regarded as an objection to the wheat. Its straw is strong; and hence, on rich loamy lands, it will succeed better than those with a weaker straw. The straw, too, having more substance, the grain matures or fills out after it has been cut. It is early and very productive.

Mediterranean.—A variety known by this name was introduced into Darke county three years ago, by Henry Snell, and into Holmes county two years since, by Joseph Beam. The name is not happily chosen, and there is not much propriety in naming this a white Mediterranean, except it be distinctly shown that it either came from the European neighborhood from which the *red* was originally obtained, or else that the red was changed into this white—an instance which nearly occurred several years on the farm of Hon. A. L. Perrill, of Lithopolis, Fairfield county. This new variety is said to ripen earlier than the *red*, to improve by cultivation, and to yield from 20 to 30 bushels under ordinary circumstances, and to be exempt from injuries of the fly, rust or midge.

New York.—Three years ago this variety was introduced into Montgomery county, by J. B. White. It is said to ripen *very* early, yields well, and is exempt from the usual diseases and injuries.

Olympia.—This variety was disseminated several years since throughout the country by the Patent Office department, if we are not mistaken, as having come originally from Abraham's farm in Palestine. However excellent it may be in Holy Land, it has proved worthless in Ohio; it is exceedingly long bearded, the chaff is black, resists fly and midge, escapes rust, yields under good cultivation (G. S. Innis) ten bushels per acre, deteriorates rapidly, and ripens nearly three weeks later than the Mediterranean.

Rock.—Was cultivated some time since in Union county; it had a beautiful white berry, but because it ripened late was subject both to midge and rust. But the more serious objection was, if the season was wet about the time of ripening, a great proportion of it was damaged by sprouting. The grain protruded through the glumes, and was thus exposed to the influences of the weather.

Rochester.—There is but little doubt that this variety, as well as the Genessee and Hutchinson, are the offspring of an old variety of "*Flint*," which years ago was and perhaps is yet cultivated in the Genessee valley, N. Y. The following description of the original "*White Flint*" is applicable to the Genessee and the other varieties above named: "It is of Spanish origin, color white, heads awned, medium length and well filled; straw white, clear and strong at the root, by which it is prevented from lodging; kernels very adhesive to the stalk. It is cultivated with success on loamy soils, and is very susceptible to injury from frost or insects. The kernel is very hard, from its silicious cuticle, in consequence of which it is less injured by fall rains, and will stand in the shock a long time without sprouting." The Rochester has been cultivated during the past fifteen years in Trumbull county. It ripens cotemporaneously with the Mediterranean, and yields full as well. It is more hardy than the old *White Flint.*

TURKISH WHITE FLINT.—Two years ago D. McMillen, Jr., of Xenia, Greene county, received a package of this variety from the Patent Office. It ripens as early as the Mediterranean; not affected by fly, rust or midge; improves by culture. The beard is long and large, and the straw firm. The chaff is purplish; the grain very hard, and rather difficult to be separated from the chaff.

VELVET.—Was introduced into Butler county two years ago, by Stephen Clawson; it ripens rather earlier than the Mediterranean, is vigorous and healthy, appears to withstand attacks from insects and the severity of the winter, escapes the rust, and yields about 20 bushels under ordinary culture.

VELVET CHAFF.—Was abandoned in Franklin county ten or twelve years ago. It yielded, under good culture, 40 bushels per acre, but deteriorated; it was very liable to injury from insects, smut, and rust.

WHITE, WHITE CHAFF AND WHITE BEARDED appear to be synonymous. It has been cultivated during the past 30 years in Portage county —in Stark, Wayne, Columbiana, Carroll, and about 25 years ago J. Newhouse introduced it into Holmes county; in the above named counties it is known as "*white beardy,*" in Butler county, where it has been cultivated during the last 12 years, and in Darke 10 years, it is known as "*white chaff.*" It improves by cultivation, yields under ordinary circumstances about 20 bushels per acre. In the northern portion of the State it ripens later than the Mediterranean, but in the southern counties earlier. In the north it is subject to injury from the fly, but resists it in the south.

WHITE FLINT was cultivated some years since in Geauga county, but deteriorated in quality, diminished in quantity, and ripened the latter part of July—it is now generally abandoned.

HUTCHESON.—This variety was introduced into Summit county three years ago, by Wm Hutcheson, from Union county, Pa. It ripens rather later than the Mediteranean, yields as high as 35 bushels per acre. It has not been affected by fly, rust, or midge; has a short stiff straw, and the berry much resembles that of the white blue stem. It is rapidly growing into favor.

SMOOTH WHITE WINTER WHEATS.

Alabama, White May (Plate I, No. 2).—This variety has a white chaff, the heads somewhat heavier than the white flint. For the beautiful and large proportion of superfine flour to the quantity of grain, the White May is unequalled; but for late sowing on unfavorable soil, it is not as valuable as the flint; it will do well sown any time in October, or on very rich land in November, and answers as a spring wheat sown in February or March.

It has been cultivated in Clermont county, during the past fifteen years. As it ripens very early it is not much subject to rust or injury from the midge, but is attacked by the fly. It is said to deteriorate. It has been cultivated some three years in Franklin county, but does not appear to be received with much favor. One year ago Stephen Clawson introduced it into Butler county. It is cultivated in Warren county, where it is in great favor, said to be fly proof, but liable to winter-kill—best adapted to light soil.

Blue Stem (Plate III, No. 3).—This variety holds much the same relation (so far as popularity is concerned) to the white wheats, that the Mediterranean does to the red. It is more generally cultivated than any other white wheat, there being scarcely a county in which it was not introduced, under some name or other. There is no doubt that this variety is the offspring of "*flint*" wheat, modified and improved perhaps, by climate, soil, and culture, and known throughout the State by the various names of "Flint," "New York Flint," "Genessee," "Durst," &c. The parent variety is evidently of northern origin, but that introduced into the State is from various sources, as Pennsylvania, Maryland, Virginia, Kentucky and New York. That introduced into Washington county 14 years ago by Dr. Johnson, from the Patent Office; into Summit 10 years ago by Wm. Lemmon and Wm. L. Palmer; into Clermont 14 years ago by Wm. Sargent; into Muskingum 8 years ago; into Monroe 10 years ago by Alex. Sinclair; into Mercer 10 years ago by R. W. Steanes; into Preble 5 years ago by J. Patterson, from the north and has never been acclimated south of the Ohio River; but that introduced into Summit by J. Philip 8 years ago; into Holmes 10 years ago by A. Bell; into Morrow 15 years ago by A. Nevis; into Ross 10 years ago by Wm. Betts, are of the eastern acclimated variety; while that in the other portions of the State may with safety be regarded as of that variety which had been acclimated in the South. These conclusions are based upon the following premises: that in those counties first named, or of northern origin, ripens at the same time the Mediterraneon does in the respective counties, and improves in quality, and but little subject to injuries by insects or rust; the second named or of the Pennsylvania acclimatization, invariably ripens fully a week later than the Mediterranean, and improves by cultivation. That regarded as of southern acclimatization, ripened about ten days later, was very sensitive to cold, much subject to disease and deteriorated so rapidly that, in Montgomery, Logan, Licking, Crawford, Erie, Franklin and Hocking, and many other counties, it was entirely abandoned. The correspondents from Washington, Tuscarawas, Trumbull and Ross, and some other counties, say it is the best variety of white wheat, all things considered, that they ever have had. Fifteen counties report it as yielding under good culture, forty bushels per acre. Mr. R. H. Rogers, of Venice Mills, Erie county, says: "I have known a field of 40 acres produce 40 bushels per acre." Twenty counties report 30 bushels as the yield under ordinary circumstances, while twenty-five counties report 20 to 25 bushels as the average product.

The engraving is a good representation of an average sized head. The straw is tall but stands well, the berry is short and plump, with a very thin skin, chaff white, and the straw near the head, when ripe, is *blue*—hence the name "*blue stem.*" The flour is of the very best quality. This variety always commands from 10 to 15 cents per bushel more than the Mediterranean.

Boone.—Was introduced into Muskingum county about ten years ago by Wm. Boone, from Pennsylvania. It yields, under good culture, 30 bushels per acre, resists the attacks of fly and midge, escapes the rust, and is improving in quality. It ripens at the same time that the Mediterranean does.

Club (Plate III, No. 11). This variety was one among the earliest cultivated in the northern portion of the State, where it was introduced 30 years ago; the farmers in Carroll, Stark, Columbiana and Mahoning, have grown it more or less during the past 25 years, and emigrants from these counties have introduced it into the western and north-western counties, but it is being superseded by less precarious varieties. It yields about 18 bushels per acre, under ordinary culture, ripens from 10 days to 2 weeks after the Mediterranean. The berry has a thin skin, makes excellent flour, but the plant is very susceptible to injury from the fly, winter-kill and midge. The engraving exhibits a head grown in Franklin county (June, 1858), under very favorable circumstances—this is proof (if any is required) that it possesses considerable "*constitution.*"

Canada Flint, York Flint, and White Genessee (Plate III, No. 5), are sub-varieties of the old white flint. Canada flint was introduced into

Adams county by J. W. Adams, four years ago; it yields, under good culture, 40 bushels per acre; is not liable to injury from fly or rust; improves by culture, and ripens a few days after the Mediterranean. It is also cultivated in Preble county.

CUYAHOGA.—Introduced into Greene county by D. McMillen, Jr. It, in all probability, is a sub-variety of the flint. It yields about 20 bushels per acre, is slightly liable to disease, improves by cultivation, weighs well, has a white chaff, and ripens at the same time that the Mediterranean does.

CALB.—In 1845 Mr. Henry Calb of Putnam county noticed a few heads of a distinct variety of wheat in a field of Red-chaff. These heads were saved and sowed separately. The wheat proved to be a very desirable variety both for quality and quantity, making the best flour in the neighborhood and yielding for a number of years 28 bushels per acre. At first it successfully resisted fly, winter-kill, midge and rust, but now is subject to all those evils. It is also deteriorating—it ripens a week later than the Mediterranean.

CHINA.—Was introduced in Defiance county from the Patent Office, eight years ago; it yielded a fair quantity of good quality flour. Fly, midge, rust, climate, soil and culture appear to affect it less than white wheats generally—it has yielded 30 bushels per acre, and ripens a week later than the Mediterranean.

CONGRESS OR ROCK.—(Plate III, No. 6,) was originally a *flinty* variety, whence came name "Rock," (if our information is reliable.) Ten years ago A. S. Guthrie introduced this variety into Gallia county from Virginia. Dr. Edwards, a member of Congress from Ohio introduced it among his constituency and acquaintances in Ohio, (whence it has been called Congress Wheat.) It is grown in Lawrence county, where Thomas Gardner introduced it six years ago, and who furnished the head from which the engraving is made; in Butler county by Benjamin Symmes, five years ago, in Fairfield by M. Landis, six years ago. It improves by culture, is very little subject to disease; yields about 25 bushels per acre, and ripens cotemporaneously with the Mediterranean.

EARLY RIPE OR RARE RIPE.—(Plate III, No. 2.) This is a new variety just introduced into Stark county by Harris Raynolds, Esq., of Canton, who sent the head from which the engraving was made. Joseph Mosher of Mt. Gilead, Morrow county has also just introduced it. From the appearance of the head one might be led to suppose that it was a hybrid produced by the club crossed upon the blue stem. It has a beautifully plump, thin-skinned berry, which yields an excellent quality of flour. It ripens several days before the Mediterranean, consequently it escapes the rust, and is not affected by the midge.

FLINT, OLD WHITE FLINT, BULL WHEAT.—(Plate II, No. 4.)—Appears to have had three distinct origins, so far as Ohio is concerned, viz: in Trumbull and other north-eastern counties it was introduced from N. Y State some fifteen years ago—there it ripens with the Mediterranean; is not much subject to disease, and is considered a good variety. In Stark, Harrison, &c., it was introduced as much as 30 years ago from Pennsylvania, and is now almost literally *"run out."* But in Franklin and other more southern counties it was introduced from Kentucky; ripened about the 25th of July, and was in consequence, soon abandoned entirely. Ten years ago Samuel Cole introduced it into Darke county, where it is doing well; at the same time it was introduced into Tuscarawas. This flint is of Spanish origin. The head is of medium length and well filled—straw white, clear and strong at the root, by which it is prevented from lodging; spikelets very adhesive to the rachis, and kernels very adhesive to the glumes. It succeeds best on loamy soils and is rather susceptible to injury from frosts and insects. The berry is very hard from its silicious cuticle (hence its name,) in consequence of which it is less injured by fall rains, and will stand in the shock a long time without sprouting.

GENESSEE, GENESSEE FLINT, GENESSE WHITE FLINT.—(Plate III, No. 5.) Perhaps the first of this variety introduced into Ohio was in Warren county, by Thomas Ireland, in 1842. From there it no doubt spread through the valleys of the Miami; in many of which it forms the main crop of white wheats. It is best adapted to high and gravelly lands, and rarely if ever succeeds on a bottom soil. In Franklin county it is regarded as a much surer crop than when first introduced eight years ago. It ripens about a week later than the Mediterranean and appears to be less liable to disease than white wheats generally. It is a very fine grained wheat, and yields more flour to the bushel than any other variety. It frequently has yielded 40 bushels per acre.

Mr. D. P. Eghert of Warren county, says: "Four years ago I procured several bushels of this variety from Michigan and sowed by the side of some of the same variety, which I had been cultivating for several years, and found that the Michigan had much the finest head and yielded from 3 to 5 bushels more to the acre than that which I had formerly raised. I can account for the change only by supposing that this is a more congenial climate for it than Michigan."

GOLDEN STEM OR INDIANA.—(Plate II, No. 6.) Was introduced from Indiana; has a large white kernel; cuticle thin; weight per bushel sometimes 64 pounds. It ripens a few days later than the Mediterranean, but it shells out easily when ripe. It has yielded 33 bushels to the acre, but is not adapted to strong soils. It is more liable to sprout in the stack than any other kind. It was introduced into Pike township, Stark county some six years ago. Ten years ago it was introduced into Guernsey county. Mr. C. P. B. Sarchet says: "The Golden Stem and Mediterranean are principally raised in this county, and are regarded the most certain. The golden stem does not grow so tall nor is the stalk as stiff as the Mediterranean—it is liable to drift and fall when raised on very rich soil. It weighs 60 pounds per bushel, and in this market commands from 5 to 10 cents more per bushel than other varieties. It is the most cultivated.

GERMAN.—Was introduced into Hocking county some time since, but it does not come well recommended.

GOLDEN CHAFF, is perhaps a synonym of SHOT, and is probably a sub-variety of SOULES; was introduced some fifteen years ago into Ross county. It ripens about a week earlier than the Mediterranean. Gen. Worthington says it is the earliest variety of wheat grown in the county, consequently it escapes rust, midge, &c. It yields from 8 to 16 bushels, of a small round berry, per acre: it is not much cultivated.

GOLDEN STRAW, WHIG, RIVER BOTTOM.—Was introduced three years ago into Stark county, by J. Fleck; four years ago into Morrow county by D. C. Bingham of Mt. Gilead. Joseph Mosher of Mt. Gilead, says that it is an early variety, is not liable to disease; improves by cultivation and yields from 20 to 40 bushels per acre. It is in all probability a sub-variety of the "*Flint*" family. Mr. Fleck says it is very liable to disease.

GARDEN.—Was very extensively grown some 12 or 15 years ago, in Stark, Columbiana, Summit and Mahoning counties; but is being superseded by more reliable varieties. It ripened early in July, was rather liable to disease. Twenty-five bushels per acre is the highest yield of which any account has been returned to this office. It is yet cultivated in Trumbull county.

GANDER.—Has been cultivated in Muskingum county during the past 12 years. It ripens cotemporaneously with the Mediterranean; is not affected by the fly, rust or midge; improves by culture, and has been known to yield thirty-five bushels per acre.

HOOVER.—This variety originated in Stark county, on the farm of J. B. Hoover, and is a sub-variety of the blue stem. It ripens a few days later than the Mediterranean. Is liable to injury from fly, but yields about 20 bushels per acre.

INDIANA.—See *Golden Stem.*

JUNE.—The MAY wheat is known by this name in Huron county.

LAMBERT (Plate III., No. 1).—In 1849 Isaac Lambert, of Hardin county, found three heads of smooth wheat, uninjured by rust or midge, in a field of Old Red-chaff bearded, which was seriously injured by both the above maladies. From these three heads have sprung the famous crops of Lambert wheat in that region. It ripens earlier than the Mediterranean. The glumes appear to have a large amount of silica in their composition, which is perhaps one reason that it is regarded as proof against the midge, by which, thus far, it has not been affected. It has yielded 20 bushels per acre. The berry is small and opaquely white. Were it not for the fact that it is regarded as proof against the midge, almost every one would prefer, both for quality and yield, the White Blue Stem.

MICHIGAN.—Is a sub-variety of the Genessee Flint, introduced into Franklin county some twelve years ago, but was soon abandoned. It is also abandoned in Montgomery county, where it was cultivated several years since.

MALTA, OR WHITE SMOOTH MEDITERRANEAN.—Has been introduced into several counties in the State, as Franklin, Washington, &c., some two years since. It is not really a white wheat, but properly belongs to a class which I have not made, namely, "*amber colored wheats.*" It ripens at the same time that the *red* Mediterranean does, and like almost all white wheats, appears to be liable to disease. It yields, under ordinary circumstances, 20 bushels per acre; but is thought to be rather too thick skinned to prove profitable for flour. Mr. Arnold, of Darke county, thinks it is a better wheat, in every respect, than the red bearded Mediterranean.

MAY (Plate I., No. 2. See ALABAMA).—During the past ten years it has been cultivated in Butler, Warren, and Clinton counties. It ripens several days earlier than the Mediterranean; has a very fine grain, and has been known to yield 45 bushels per acre on first-class soil. Although it is considered fly proof, it is very liable to injury from late frosts, and is upon the whole best adapted to light soils. Mr. Egbert states that the wheat weighs from 64 to 67 pounds.

ORANGE.—Introduced four years ago into Seneca county; ripens four or five days earlier than the Mediterranean, consequently escapes the effects of rust and the ravages of the midge; improves by culture, and has yielded as high as 30 bushels per acre.

PIRK (Plate III., No. 10).—I can do no better than to give the annexed letter entire, from Mr. Freeman G. Carey, one of the Professors in Farmers' College, near Cincinnati:

"Its history is as follows: It was obtained from England about ten years since, and brought into our neighborhood by Judge Moore, of Cheviot, Hamilton county: through him disseminated through that immediate neighborhood. I obtained it of him through Mr. Wardell, of that place, who had been raising it with success upon a thin soil for several years before he introduced it to my notice. He gave it the name of the 'Purkey' wheat. On sending some of it to Mr. Browne, of the Patent Office, he gave me as the more probable name the 'White Pirk,' as he said there was no such name as 'Purkey' wheat, and it answered to the description of the name as above corrected.

"Its constitution is unmistakably good, growing most vigorously even upon thin soils, and withstanding the effects of cold and drouth better than any other variety wherever tried. It has been known to yield fifty bushels to the acre, and has from fifty to eighty and even over that number of grains to the head. It will yield from five to ten bushels to the acre more than the Mediterranean, sowed side by side. It has weighed 72 lbs. to the measured bushel, and never falls below the standard. Its chaff is light; kernels compact on the rachis; head short, bald; the straw white and strong, often a little purple or inclining to red a few inches below the head—quite a characteristic mark; not liable to fall, as is the Mediterranean, and is well suited to rich or lean soils. It has been known to yield 44 lbs. of flour to the standard bushel; and is a premium flour in appearance as well as in fact, having a rich cream-like color, and will ordinarily bring fifty cents per barrel more than any flour in the market.

"Another desirable quality in this latitude is that it ripens early, about the time of the Blue Stem, and a little in advance of the White Genessee of New York. We have never analyzed it in any other way than at the table, where its merits are often discussed with a good relish."

River Bottom.—See Golden Straw.

River Rhine.—Was introduced about the year 1845 into Tuscarawas county, but as it ripened late it was liable to all the ills to which wheat is subject, and the culture of it is now abandoned.

Shot (see Golden Chaff).—The wheat, as well as the description, is so much like the Golden Chaff, that for all practical purposes it may be regarded as a synonym only.

Soule's (Plate II., No. 3).—This wheat has been cultivated during the past fifteen years, chiefly in the northern and central counties. When first introduced into Stark county, fifteen years ago, the straw was short and very stiff, but now it has a much longer straw; correspondents from Trumbull, Tuscarawas, Summit, Wayne and Holmes say it is not as relia ble as the White Blue Stem. In Ross it has been abandoned on account of its liability to rust; in Greene they complain that it has too soft a grain; but in Sandusky, Williams, and other western counties, it is very popular. In Stark it has produced better average crops than any other variety, but is now deteriorating. It ripens nearly a week later than the Mediterranean, and appears to be more able to resist fly and midge in some localities than in others. The Summit and Holmes county millers praise the excellent quality of its flour. It yields from 15 to 40 bushels of a very large sized wheat per acre. Some writers regard this variety as a hybrid between the Old Red Chaff and White Chaff, bald.

SIBERIAN.—Fifteen years ago, Benj. Travis introduced this variety into Defiance county. It did well for several years, yielded some 35 bushels per acre. It deteriorated rather rapidly; it ripens fully a week later than the Mediterranean, and is consequently liable to rust and midge.

TEXIAN.—This variety was introduced by Mr. C. Lets, Esq., and has been cultivated some three years in Knox county; it yields 25 bushels per acre under ordinary circumstances; is said to be fly proof, but yields to rust. It ripens some days after the Mediterranean.

TURKEY.—Is a wheat introduced by the Patent Office, and is met with in various parts of the State. It appears to have succeeded best in Stark county, where it has been cultivated during the past six years. It ripens rather later than the Mediterranean; is not liable to fly, winter kill, rust or midge; so far as change in form and quality are concerned, nothing perceptible has yet taken place. It yields (in Stark) an average crop of 20 bushels of excellent wheat per acre.

VIRGINIA.—Was introduced many years ago into Montgomery county, but is now entirely abandoned.

WABASH.—See GOLDEN STEM.

WHITE MOUNT.—Has been cultivated during the past six years in Meigs county. It yields an average crop of 18 bushels, ripens later than the Mediterranean and is liable to be attacked by rust.

WHITE NAPOLEON.—Has been cultivated for some time in Darke county, where it seems to yield a heavier crop than either the White Flint, Genessee, Blue Stem or Mediterranean. It is said to be nearly fly and rust proof, and ripens a few days after the Mediterranean.

WHITE.—There is grown in many counties a wheat which is described simply as a "*white smooth wheat.*" It has a stiff straw, stands well, escapes the fly and midge, and appears to be almost rust proof, but it is exceedingly liable to smut. Mr. Higgins introduced it into Highland county seven years ago, and about the same time, or a year later, we find it in Washington county. If sown early it improves, ripens rather later than the Mediterranean, and yields from 18 to 35 bushels per acre.

Wild Goose.—Has been cultivated in Union county, but has failed to be deemed worthy of cultivation; it is an exceedingly late variety; and has nothing to recommend it.

SPRING WHEATS.

To convert winter into spring wheat, nothing more is necessary than that the winter wheat should be allowed to germinate slightly in the fall or winter, but kept from vegetation by a low temperature or freezing, until it can be sown in the spring. This is usually done by soaking and sprouting the seed, and freezing it while in this state and keeping it frozen until the season for spring sowing has arrived. Only two things seem requisite, germination and freezing. It is probable, that winter wheat sown in the fall, so late as only to germinate in the earth, without coming up, would produce a grain which would be a spring wheat if sown in April instead of September. The experiment of converting winter wheat into spring wheat, has met with great success. It retains many of its primitive winter wheat qualities, and is inferior in no respect to the best varieties of spring wheat, and produces at the rate of 28 bushels per acre.

Grain which ripens in cold weather, late in August or September, will be heavier ordinarily than that which is hastened to maturity in hot weather. By grain is meant spring wheat. From this it might be inferred that spring wheat should be sowed late, without reference to the grain worm; and yet before the appearance of that insect, it was found that early sown wheat was ordinarily the best. This may be remedied and late sown wheat rendered a certain and uniform crop. When the wheat grows rapidly with a large straw and broad leaf of a peculiar deep green color, having the appearance of that which grows about burnt places, the straw will rust, and the grain blast. Grain sown the first of May or June will be more luxuriant, with a greater growth of stalks and straw than when planted early. It follows, therefore, that so long as spring wheat is obliged to be sown late to avoid the grain worm, there is more certainty of a crop to sow it on medium soil which will yield from 15 to 18 bushels per acre, than to sow it on very rich land.

The best method of improving the varieties of wheat, will be by selecting one or more heads that combine the greatest number of desirable qualities as regards the berry, flour, length and shape of ear, quality and stiffness of straw, hardihood and liability to disease, and cultivating from these alone.

The average of the wheat crop of England per acre has been estimated at 23 bushels. In the United States the average would range between 12 and 15 bushels per acre. Fields of fifty bushels per acre are as common there as 35 are here; climate may have some influence in this great productiveness, but skillful farming more. In a large part of England, the soil on farms constantly cultivated has for many years been increasing in fertility, and the idea of exhaustion of soils, under proper cultivation, is scouted as absurd.

A superior variety of spring wheat, is the CHINA OR BLACK TEA WHEAT, and by some is called Saltarian Wheat. The origin of this beautiful wheat is this: Some twelve years since, there was found by a merchant in Petersburgh, Rensselaer county, N. Y., 6 or 7 kernals of this kind of wheat in a chest of black tea, which was sown. It now has the preference of all the different varieties of spring wheat. The straw is very stiff and has never been known to rust. It threshes very easily. It should be cut rather early as it is liable to shell if left till fully ripe. The quality of the flour is equal to any other spring wheat. It is said to yield from 15 to 40 bushels per acre.

HUNGARIAN SPRING WHEAT, from the Patent Office, is in all probability a winter wheat.

BALD SPRING WHEAT.—First brought from Lord Selkirk's settlements on North Red River, and introduced by James G. Soulard. This wheat when sowed on the 15th of May, came to maturity perfectly without smut or rust, producing at the rate of 30 bushels to the acre.

TEA WHEAT OR SIBERIAN BALD.—As far as flouring is concerned, a correspondent says: "I can speak from experience, and say the true Tea Wheat is A. No. 1. It can't be beat by any spring wheat that I ever ground, for quality and quantity. Black Sea Wheat is the poorest flouring kind that has come under my observation; the berry is hard, and flours a little better than Canada Corn. It bears no comparison with Tea Wheat for flouring."

BLACK SEA WHEAT.—The grain is not as light colored as other varieties, but the berry is always plump; the quality of flour is more harsh, and not as white. Its recommendation is that it invariably yields a good return, from 20 to 40 bushels to the acre, and is not subject to the rust.

WHITINGTON WHEAT.—This is a very beautiful spring wheat. The berry is large, plump, and very white, the skin apparently thin, the head seven inches long, and the straw stout and bright. The origin of this wheat was three ears selected from a field on the mountains of Switzerland, and obtained a medal at the Liverpool Agricultural Meeting, in

1836. It is said that it grows upon poor soils, and that 12 bushels sown have produced 300.

CANADA CLUB AND FIFE.—Canada Club is beardless, white chaff, fine white berry. Straw stiff, hard and wiry—more so than any other spring wheat. It has been supposed that the Canada Club and the "Fife" are the same variety. A gentleman residing in Canada, where the latter was first introduced says: "They are decidedly distinct varieties. If sown in the same field on the same day, the Club will ripen a week earlier than the Fife, and the latter will grow and mature well in low, moist, rich soils, (nearly swampy) while the former if sown in such soils, seldom or never does any good. Hence our farmers sow Fife on their lowlands, and Club on the high and dry. There is also a marked difference in the appearance of the straw while growing, the Club having the usual straw green shade, while the other has a distinct bluish bloom upon it. The kernel or berry, is much the same in size and general appearance in both varieties. The main difference consists in the Fife being lighter colored. There is also a considerable difference in the appearance of the heads—the kernels on the Club are closer or more compact than in the Fife. In height they are nearly alike—both are heavy in the bushel, frequently going up to 65 lbs. The straw in both sorts, is of medium length, but that of the Fife is much the stiffest; hence, it seldom lodges, although sown on heavy, moist soil. It has never been known to rust, which is not the case with the Club. Both descriptions yield well; on suitable well tilled land, 30 to 35 bushels per acre are common crops, and much more is frequently obtained. The general impression is, that all things being equal, the Fife yields the best. I cannot say where the Club came from, but the history of the Fife is well known. The person who introduced it lives only a short distance from me. While on his way to this country a few years ago, Mr. Fife obtained about a peck of wheat from a *Russian* vessel unloading at Glasgow —hence the names "*Fife*" and *Scotch*. From this small beginning it has spread until each year now witnesses the growing of millions of bushels of it. It has been a favorite from the start, and it does not seem likely soon to lose its good character. From 1 1-2 to 2 1-2 bushels per acre is the quantity sown—the latter quantity when the seed is very strong, and when the seed is sown broadcast—the former where the drill is used. Before concluding, permit me to say that you may hear of a new variety of Canadian spring wheat, under the name of 'Swamp Wheat.' I do not know it for a fact, but I guess it is only some of our 'Fife' wheat taken from home and baptized afresh."

Rock.—This is of Spanish origin. It has been cultivated in this country about forty years. It is not a fine, but is a successful variety.

Red Bearded (Plate II., No. 9).—This succeeds on stiff clayey soils. The beard stands out from the head; reddish chaff, white berry, and yielding good flour.

Italian Spring.—This was much prized when first introduced, some twelve or fourteen years ago, but it has rapidly run out, and is much neglected.

Talavera (Plate I., No. 10).—Without beard; chaff white; long, stiff straw; head large and plump. This kind is subject to the attack of the fly, and is not sufficiently hardy to stand severe winters.

Hedgerow.—This variety has been somewhat cultivated. Of its origin, or whether it is elsewhere known by other names, I am not informed. Of late years its cultivation has been entirely neglected, in consequence of its liability to rot. In the west it has not suffered to so great an extent. It is distinguished by its short heads, which are filled out in such a manner as to give them a rectangular form. It is bearded; white chaff; bright strong straw; round plump berry.

Poland White Bearded (Plate I., No. 9).—A variety which some years since was in very great favor, but at present very little if any spring wheat of any variety is cultivated. If Ohio cannot produce good winter wheat, it certainly is folly in any other State to attempt it.

Spring Club (Plate II., No. 8).—Was introduced into northern Ohio many years ago, but made no favorable impression on agriculturists or millers.

Indian Wheat—its Value and Culture.—I notice an inquiry in the Country Gentleman, in regard to "Indian Wheat." This grain was introduced into this town about twenty-three years ago, from Canada, I think; since when it has been constantly cultivated by some of our farmers, and now *nearly every* farmer raises it, although a very few, after trying it a year or two, discontinued it, some because they thought it would overrun their whole farm, and some because "the women" could not use it, neither of which do I consider valid objections. It will live in the ground over winter, so that it may be sown at any time from the harvesting of one crop to the gathering of the next; but we usually sow it after all the other crops are in, and harvest it before it is so ripe as to shell off from the straw—it being necessary to cut it when the dew is on. Our farmers often keep the same piece to Indian wheat for several successive years, and it seems to do as well so. If the soil is too rich, it "runs to straw" too much. The average crop is from 45 to 50 bushels to the acre, about the same as oats, although both often produce 75 to 110 bushels per acre on our soil. The average weight is about 48 lbs. per bushel, and 16 to 18 lbs. of superfine flour per bushel. The canail I consider worth more per pound than oats for stock; it is quite bitter and seems to act as a tonic, and sharpens the appetite much. I think this grain is worth full one-quarter more than oats for horses—possessing, to a good degree, the property of corn that makes *fat*, and that of oats that produces *muscle*.—*Country Gentleman.*

GROWTH OF THE WHEAT PLANT—PROCESS OF GERMINATION.

Having discussed the chemical doctrines of vegetable life, so far as the wheat plant is concerned, in our preceding remarks, we will now proceed to describe the process of germination, development, and maturation during which, and by the agency of which, those inorganic elements, destined for the food of men and animals, after preparation by means of the plants, are collected and combined. It is the especial province of plants so to combine and arrange the inorganic elements of which all animal bodies are composed, as to fit them for reception into and assimilation in these organisms, and every matter connected with such important functions cannot fail to be an interesting subject for investigation.

The ripe, well formed and fully developed wheat grain, magnified to twice its average size, is seen in Fig. 12: the short straight line shows the natural length of the grain. The looks of such a grain are so familiar as to require only a passing notice. At one end of the berry, which is somewhat egg-shaped, with a longitudinal groove at one side, a number of short hairs or bristles are seen, and at the other, the scar or point at which the grain was attached to the parent stem. Near this point on the convex side of the grain, is a spot marking the position of the organs of germination, or the germ itself, known in common parlance as the "*chit.*" This germ spot may be studied by the aid of Fig. 2, which is a magnified view of a wheat grain with the bran removed from where it covers the germ externally. *a* marks the body of the grain where the greater portion of the starch or flour is deposited, *h* the edge of the outer covering of the grain, *d* the proper envelope of the germ. *e e e* is the germ, and as the use of this is a subject of interesting inquiry, we will dwell upon its form and office for a moment. The same principle which obtains in the germination of a grain of wheat obtains also in the germination of all other seeds, and the only discoverable difference between the germs of one plant or seed and those of another, is a slight difference of anatomical arrangement, which has given rise to the grand division of plants, by botanists, into monocotyledonous and dicotyledonous classes.

The cotyledon is best studied perhaps in the bean or pumpkin, and is in the seeds of these and many other plants made up of the halves of the seed which adhere to the plumule, or first sprout, which emerges from the ground in the form of thick, green, ovate leaves, and being two in number, they give origin to the name *dicotyledon*. The use of these cotyledons is to give nourishment to the developing germ until able to draw its food from the earth. Plants, among which is wheat, having no division of the seed into halves as the bean, acorn, &c., are styled monocotyledons, from this fact—but whether the cotyledons be single or double, it has physiologically the same purpose to accomplish, that is, supplying the germ, which represents in itself the yet to be perfect plant, with the nutrient materials stored away in the form of starch, gum, oil, &c., in the grain or seed, and upon the perfect performance of which function the health of the new plant mainly depends. The germ fig. 2, *e*, *e*, *e*, representing the future plant, consists of three principal parts. First, the portion yet to be developed as the plumule or ascending sprout *e*, *b*,—second the part *e*, *e*, from which the radicle or first rootlet is developed, and third, a band bisecting the germ, which is the crown of the roots, or division line between the roots and stalk, and which in some plants represents the stem or trunk of the future tree. *f*, *e*, *g*, is that part which becomes developed as a root, first *e*, the radicle, which after a short life, having served its purpose as root, is generally re-absorbed, being a rudimentary part, and then *f*, *g*, the first two permanent roots spring forth, the whole presenting in a few days after exposure to the proper conditions, the appearance indicated in fig. 3.

A grain of wheat being deposited in the earth, water is supplied to it from the soil, which it absorbs, and all the contents of the berry soften, swell and undergo certain changes, chemical, and chemico-vital, which result in the process of germination, being begun and carried on. The germ described, fig. 2, being supplied by moisture, calls into activity the life-forces which hitherto lay dormant. The starch, gluten, salts, &c., contained in the seed as a store of nutriment for the beginning plant, are softened, chemically changed, dissolved and fitted for absorption into it, and are taken up by it as required to complete its embryotic, so to say, growth.

After a short time the developing germinal plant, and the parent grain assume the appearance presented in fig. 3, in which *a* refers to the plumule, *ascending axis*, or first green leaf, *h*, *h*, *h*, to the origin of the primary and two secondary radicles F, E, C, E. The part of the grain marked B is that which contains the larger part of the starch and other food of the plant, while D is the part containing all that is *absolutely* necessary for germination. C, E, the primary radicle is marked by several protuberances, *o*, *o*, *o*, *o*, called *spongioles*, fig. 65, whose office it is to absorb water, and the materials dissolved in it, from the earth, for the sustenance of the plant, and terminates in a like spongiole E., by the changes of and additions to which the root continually grows until maturity is reached. Along the course of the secondary roots F, E, terminating like the primary root, in a spongiole, are seen little branching rootlets *e*, *e*, *e*, each of which also terminates in a spongiole fig. 64. A second plumule, A fig. 3, starts out from the base of the radicle and shows the commencement of that process known as stooling or tillering which results in a vast multiplication of stems arising from one grain—this process does not take place however until the plant is firmly fixed in its place.

At this stage, fig. 3, the young plant begins to absorb from the earth the materials for farther growth, consisting of water and the various organic and inorganic matters dissolved in it, which the plant requires for food; and hence the important practical application of the knowledge of the chemistry of the soils and plants growing upon them, to which we have adverted, that is, to choose soils in which the necessary materials are found, or to supply them if lacking for any given kind of vegetable product.

In fig. 5 we have a largely magnified view of the sumit of the plumule fig. 3, *a*, which becomes developed in the wheat into the first perfect leaf. This delicate point is made up of little cells flattened by pressure, and applied to each other in nearly parallel lines, and by the breaking down or absorption of the adjacent walls of these cells, at the sides which occupy the axis of length, and by means of farther depositions and alterations, they form little ducts for the transmission of sap or the *blood* of the plant.

After a certain time passed, from the deposit of the seed in the ground varying with the depth at which it was sown, the condition of the soil and air as to heat, moisture, &c., the seed representad as it is sown, Fig. 2, and the same shown in the process of germination Fig. 3, presents the appearance shown in Fig. 57 or Fig. 58. In Fig. 58 we have an example of wheat deposited at a proper depth, averaging about one inch and a half. It is vigorous and thrifty, and shows this in the perfection of its roots and top. A. the stem, is now above ground, surmounted by two leaves instead of the single plumule, which is now developed into the first perfect leaf which serves as an involucre to the second, which has emerged from it as from a sheath, and where it at first replaced the first plumule of the germ. Within the convolutions of the base of this leaf we will hereafter find another, and thus from the center, springs forth each new leaf, and the part of stalk belonging to it forming a joint at each leaf, until at last the top joint or that bearing the head is developed.

In Fig. 57, *aa.* are to be seen two new plumules, and these like the first one, become, under favorable circumstances as to depth, new stalks, and are again succeeded by others, until a large number of stems, connected together it is true, at the root, but capable of separation into independent stalks having their proper roots, are produced, and thus undergo the process of *tillering* or multiplication of stems from one root, Fig. 56. This is a very important function in the production of cereals, and by means of carefully and frequently repeated divisions of the different stems to promote *tillering* to a great extent, over fifteen hundred grains have been obtained from a single seed. It is to favor this process that drilling is used instead of broadcast sowing and harrowing, as the exact depth of deposit most favorable to this process, differing somewhat in different soils, can be easily secured for every grain sown, while the harrow, covering the grain very unequally, gives it either too great or too shallow a depth, preventing in either case the accomplishment of this desirable object. The depth proper to secure this process is about two inches in light porous soil, and not more than one or one and a half inches in stiff clayey soil.

The effect of too great a depth in sowing is shown in Fig. 58. The stalk B. surmounted by its first two leaves is small and unthrifty as contrasted by a plant sown at proper depth, Fig. 57. The great distance which it was necessary for the plumule to traverse, before emerging into the air and sharing the vitalizing influence of the light has entirely exhausted the store of nutritious materials, furnished by the seed before it could attain sufficient development to be considered a healthy, vigorous plant, and therefore, its future growth is retarded, tillering, as seen in Fig. 56, is entirely prevented, and the stalk is more in danger of disease and accident and its loss in the field is irremediable.

At *a.* Fig. 58, just below the surface of the earth, is seen a nodule or enlargement of the stalk, and here new roots are generally thrown out if the vital force of the plant is not too far spent in reaching the surface, and the sickly, puny root, which should have sustained it is lost, as it dies and rots. Nature is ever on the alert to preserve every one of her progeny, and in this instance endeavors to repair as far as possible the evils resulting from ignorance or accident.

During the early part of the growth of the wheat plant, or during the fall and early winter, the absorption of silica in the form of a soluble silicate of potassa, is principally effected, and is a matter of vast importance in the physiology of the plant, and it is, perhaps, owing principally to this fact that winter wheat generally succeeds better than spring wheat, which is not so favorably conditioned for absorbing this necessary constituent of the stalk, leaves and seeds, in all of which it is deposited during the last sixty days of growth, forming a large part of the thin pellicle or epidermis of all these parts, and greatly aids in protecting them from various accidents and diseases.

The manner in which this silica is deposited in the epidermis of wheat is represented in Fig. 48, which is a largely magnified section of a wheat glume, *aaa*, being thin scales of silica.

Winter-killing, a subject of frequent complaint among agriculturists, is perhaps of next importance in considering the growth of wheat, and is caused in the manner described as follows: When wheat is too deeply sown, the roots are comparatively few, as mentioned when speaking of that subject, and the plant is, consequently, more liable to perish than if it could afford, on account of a great number, the loss of a few roots. When the ground freezes during the winter, and particularly when it freezes and thaws many times, as is sometimes the case in Ohio, it becomes cleft at each freezing, and the ends of the roots extending across this cleft are torn asunder, and in this manner the means of sustenance are denied to the plant during the spring, and on account of this rupture of its roots, it either perishes entirely or only retains vitality enough to carry on a sickly, feeble, unprofitable development.

Fig. 47, which represents the cracking of the ground in a stiff clay soil during drought, but may serve to show one of the modes in which frost operates to break and destroy the roots, but the more common manner in which the plant is destroyed is by being elevated by the expansion of the ground at each successive freezing, until the roots are either broken or extruded entirely from the soil.

The most effectual mode of preventing this accident, so far as the skill of the husbandman is concerned, is to plant at a proper depth to favor the development of a large mass of roots, and also the process of tillering. This depth is perhaps most certainly secured by using a properly constructed drill. If a grain be properly covered, the crown of the roots is well developed, as in Fig. 64, and the roots and rootlets are multiplied in number, and are nearer to the surface of the earth, and do not traverse so large a mass of soil downwards, and are, therefore, proportionally less liable to rupture during heavy frosts, and can, at the same time, better spare the few which may be broken. By referring to the subject of draining, the reader will observe that properly constructed drains are also recommended as beneficial adjuvants in the prevention of winter-killing.

Nature's preventive is an early and durable blanket of snow, and besides, the kind of soil has much to do in preventing or causing winter-killing. But these natural accessory causes are not within the control of the farmer.

When spring arrives, a new era in the growth of the wheat begins. During the fall and winter, it does not arrive at a point of development sufficiently advanced to shoot forth a stalk, but has been solely occupied in developing roots and leaves, and elaborating some of the materials, as silica, for future use.

But as soon as the frost has left the ground, and the warmth of spring permits, a new impetus is given to the growth of the plant,—roots are prolonged in every direction, to gather materials from the earth,—leaves expand and increase the power of the plant to effect those chemico-vital changes necessary to convert the inorganic elements and their compounds, which form its food, into its own tissues of growth and reproduction.

Carbonic acid, water, ammonia, potash, lime, and the oxides of the necessary metals, are collected as dissolved in the water of the soil, by the *spongioles* of the roots and rootlets, and conveyed by means of little tubes or canals, such as mentioned when speaking of the plumule, Fig. 5, to the leaves, there to be exposed to the influences of light, heat, and oxygen, and from these are returned and deposited in all parts of the plant, as its proper development requires.

We will mention, while passing, that an idea very strongly advocated a few years since, and supported by seemingly conclusive experimental evidence, to wit: that plants gathered the materials of their growth principally from the air, directly, and not from the ground, is a fallacy. Air holds very nearly the same relation to plants as it does towards animals, that is, elements in it, combined or simple, are ultimately necessary for the subsistence of either organism, but except oxygen, all these elements must be in a state of combination before the animal can feed upon them, and even the oxygen is required to be combined with carbon before the plant can use either as food.

Ammonia, nitric acid, sulphuretted hydrogen, carbonic acid, and water, are supplied, by the air in a great measure, for the growth of plants, but they are not absorbed directly from the air, and hence by the leaves, which are analogous in function to the lungs and kidneys of an animal, as was formerly supposed, but by the roots from the ground.

These elements of aerial supply must first, before being absorbed into the plant, come in contact with its roots, which they do by being dissolved in the water of rains, and thus carried into the earth. Some, it is true, as carbonic acid, may originate in the earth from the decomposition of vegetables or minerals, but, wherever found, being heavier than air, it falls to the ground, and soaks into the earth if properly porous very readily, or it is carried in and mingled with water, by the rains, and thus the plant is reached from the air, first through the earth, by these materials.

Wheat is an endogenous plant, that is, one in which the materials of growth are not deposited as in an oak tree, in successive rings upon the outside, but the deposit is made in the centre of the axis of growth, and the bulk of the plant is made up of the cells here formed, deposited, changed in place, towards the outside, and in character to agree with the object to be obtained.

Arising from the centre or axis of growth, then, corresponding with the root or base of the perfect leaf, each new leaf and joint of the stem grows upward rapidly after the spring is sufficiently advanced to afford heat and regular moisture. But if sown on a stiff clay and the spring should be very dry, the soil will *bake* and crack apart, as at *a*, *e*, and *b*, *e*, fig. 47, and where the roots are thus severed the plant necessarily dies. Every succeeding joint and corresponding leaf is protected by those preceding, which form an involucre for it, until when the head begins its growth it is surrounded and protected by a number of leaves and leaf stems, which always surround their proper joint, and the shaft or stalk arising from it, for some distance upwards. Within this involucre of leaves the head is formed, first by the deposition of materials to form the different parts of fructification, the glumes, or bracts the stamens and pistils, and then the bran of the seed and the seed contents, successively. At first these parts are quite indistinct, being formed of delicate cells deposited somewhat in the form of scales, but as growth proceeds they soon become distinct,—the glumes or chaff enclose the organs of fructification, consisting of the ovary, style and stigma, which are the female organs of generation collectively designated as the pistil, and the stamen or male organ divided for description into filament, and anther, the latter of which is the essential organ, and at a proper time splits and emits a powder called pollen, which is the fructifying principle of plants.

Fig. 63 is an enlarged view of the organs of fructification of a wheat grain, taken during the process of impregnation. *f, f,* shows the edge of the glume, *d* is the *ovary*, *e* the *pistil*, *a* a ripened anther, after having discharged its pollen, *b, b,* are filaments, *c, c,* are anthers just splitting to emit their pollen, which occurs before they emerge from the glume.

Fig. 62 represents an earlier stage of the same process, and fig. 59 a later stage. In this figure *d* refers to the ovary, surmounted by three anthers in their early stage, *e*,—two anthers, *b*, have completed their function entirely and have emerged from—the glume or husk, while the anther *a* is just in the process of emitting the pollen and emerging from the glume. The filaments of these anthers are marked *e*. The pistils were omitted in this drawing to avoid confusion. These views are, perhaps, sufficiently explained to make the subject understood.

Fig. 60 represents a small portion of the pistil highly magnified, upon which the little grains of pollen marked *f. f, f,* are lodged like fruit upon a tree, and in fig. 61 we have a still more highly magnified view of a section of a *stigma* consisting of little tubes *b, c,* leading to the *ovary*, and terminating at their outer extremity in little notches, into one of which a pollen grain *d*, is just entering in its descent to the ovary, where the process of fructification is completed.

When this process is accomplished the deposit of the materials forming the body of the grain begins, and when completed the watery portions which existed in the state known as "*in the milk*," because the starch is suspended in a milky solution, are then gradually absorbed, the grain ripens, dries and is then fit for preservation or reproduction. The little groove on one side of the berry mark the position of the filaments of the stamen.

This is the process made up of many steps and liable to be interrupted by many causes, by which the incalculably important product wheat arrives at perfection, and notwithstanding the many dangers to which it is exposed, nature has so wisely fortified herself against these as to secure the continuance of this plant in spite of them all. Thus are all creatures directly and indirectly guarded, and in the species almost certainly preserved.

DISEASES AND ENEMIES OF WHEAT.

As we have now given somewhat in detail the history of the wheat plant, its habitat, its physiology and chemistry, and mode of culture, we will proceed to notice at greater or less length those diseases and dangers to which it is subject during its growth, or after maturity, and which serve to diminish the certainty with which the agriculturist might otherwise depend upon an abundant supply of the "staff of life" in proportion to the ground cultivated, and the quantity of seed sown. But as many of the causes acting unfavorably upon the production of the wheat crop have been mentioned with more or less perspicuity in our foregoing remarks, we need not again dwell upon these items, when especially under consideration, at so great a length as we should do if they were not already somewhat familiar to the attentive reader.

The causes affecting the wheat plant deleteriously, may be enumerated as follows: Terrestrial, atmospheric, agricultural, and constitutional; and these several causes and the special application of the terms here used require a few words of explanation, or must, to prevent confusion, be defined as to our application of the words:

Under the term terrestrial causes, we would include all that pertains to the soil, and its aptitude or otherwise for the culture of wheat, on account of original constitution or subsequent changes, accidental or intentional. These causes have been already discussed sufficiently fully in the foregoing pages to render superfluous more than merely to mention here that they have relation to the chemistry and constitution of the soils, making them more or less fit to afford sustenance to the wheat plant itself, or to promote the production of plants and animals inimical to it.

Atmospheric causes affecting the wheat plant consist in the general aggregation of aerial phenomenon called climate, and those special departures from the usual climatic course, which give to the character of an entire year the peculiarities which are referred to as the season of such or such a year, and which modify the climate to such an extent that climatic aptitude for wheat culture varies greatly in the same place in different years.

Agricultural causes include all those separate and often distinct modifying influences affecting successful agriculture which depend upon the preparation of the grounds, their protection from obviable causes of injury to the crop during the entire process of culture, and even in the storehouse and granary after the growth of the crop is completed.

Under constitutional causes are grouped together the pathological conditions of the plant itself, and the vegetable and animal parasites and enemies by which it is endangered at any period of its existence from the moment of germination until germination again, some of which are entirely obviable and most or all of which are capable of great modification in their deleterious effects by the application of skill on the part of the agriculturist.

As many of these causes already mentioned have been discussed in other portions of this report, we will here only advert to those prominently which have not been elsewhere examined.

The conditions of the earth as to constituents and preparation have been pretty fully discussed in those parts of our report devoted to the subjects of agricultural chemistry, draining, &c., and need not be repeated in this place, and all that is here necessary is, to remind the agriculturist that due regard being had to the condition of the soil chemically, and to the proper draining, plowing, and other preparatory processes, the per centage of chances in favor of a good and certain yield are greatly increased. And we must advert again to the fact that draining is an important part of the preparatory work for a good crop, as by draining, *winter-killing* is rendered less likely to occur, and a more constant and equable supply of moisture is secured, as draining prevents excesses at some periods of the year and deficiencies at others, both of which conditions of supply are injurious to wheat.

The atmospheric causes which affect the productiveness of the wheat plant are mostly so far removed from the control of human skill that but little can be accomplished to secure the crop from injury by the operation of these causes, among which may be mentioned untimely frosts, storms of wind, hail or rain, lack of snow, sudden and violent changes of temperature in the winter, &c., all of which are entirely removed from the control of man, and their effects can only be slightly modified by having regard to the proper mode of cultivation.

Icterus or Jaundice, is the name of a condition of the wheat stalks, which occurs most commonly upon rich argillacious, imperfectly drained lands, after the cool rains of spring. The stalks turn yellow and many of them perish in such seasons as yield a superabundance of moisture in the spring, because the roots are elongated and enfeebled in such circumstances and do not transmit a sufficiently concentrated and nourishing sap to the plant and they die for want of a proper pabulum to sustain their growth which has been made rapid at the expense of their vigor. Proper draining and cultivation will in a great measure obviate this malady. If the earth be too compact and tenacious on account of the superabundance of clay in its composition, repeated plowings and manurings, with such manures as render the earth porous and mellow are of great advantage, and if carried sufficiently far will entirely prevent the disease above named.

Blight or Withering.—A dry state of the atmosphere, and a clear sky and great heat of the sun immediately following light showers, at the period when wheat is "in the milk," *i. e.*, when the albumen and starch are still in a liquid state, or a prolonged drought at the same period, are ordinarily the causes of a condition of the grain known by the above name, which consists essentially in a too early desiccation and maturity of the grains by means of which, not having continued in a state of growth long enough to be well-filled by a deposition of the proper contents of farina, although the skin of the grain was already fully developed, it assumes a shriveled appearance, and does not yield largely of flour. Such wheat is called *blasted*, *blighted*, *withered*, or *badly nourished.* This diseased condition is almost or quite unavoidable.

Lodging.—Wheat upon rich moist soils, although growing luxuriantly, does not produce so firm and elastic stalks as upon drier or poorer soils, because of the too dilute condition of the sap, producing large but watery, or succulent stalks, leaves them more feeble. If heavy winds succeed rains, while such stalks and head are yet heavy with the retained rain drops, they bend or break near the roots, and mat together, not being strong enough to raise up again, become in part over-heated, retaining their moisture and in part dried by the rays of the sun, and if the ground be not free from weeds, these overgrow them, and they are then attacked by rust almost without fail, and the crop is lost. If only bent the stalks resume their erect posture so soon as the water is shaken off and the wind ceases blowing.

Rolling light soils after sowing, to give them more consistence, and properly draining the richer moister lands, will prevent the occurrence of lodging to a great extent.

Tornadoes, hail storms, and very heavy rains often break down and destroy fields of wheat when approaching maturity, but for these evils there is no remedy applicable, beyond the careful and skillful culture which may favor the development of strong healthy stalks, and the selection of such varieties of wheat as produce a short firm straw for cultivation in those localities which are more particularly liable to the occurrence of heavy storms. But these principles have already been sufficiently discussed in our preceding remarks, and we will pass on to a consideration of the next branch of this important subject, the diseases and accidents to which wheat is liable, to wit: agricultural causes of failure to secure a good crop.

Many of the agricultural causes of a deficient crop have already been pointed out and their remedies suggested, and but few of these remain to be mentioned. In our remarks upon the wheat region, manuring, the chemistry of agriculture, &c., we have pretty fully demonstrated that a proper selection of the seed, and preparation of the ground, together with a nice discrimination of the season of sowing, go far towards securing a profitable return for labor applied, but this is not all, for some few accidents to which wheat is liable, are so strictly agricultural that they deserve a special notice here or elsewhere in the remainder of this disquisition. The only one we will advert to here, however, is

Germination of wheat in the straw.—The importance of a discussion of this subject may be inferred from a statement made by reliable authority, M. Emilien Dupont, in his "Essai sur . . . le ble," to the effect that the loss of one-third of the wheat crop of Lower Canada, in 1855, was due to this cause alone.

When wheat has reached entire maturity it constantly has a natural tendency, in favorable circumstances, to undergo the process of germination, and if, at the time of harvesting, the wheat be exposed to the conjoined influences of warmth and moisture, even while yet in the straw, germination will occur, and those changes of the contents of the grain already adverted to, and which impair or destroy entirely the fitness of it for the purposes of bread making, must necessarily occur. Agriculturists who are not careful to avoid these influences, that is, those who permit their wheat to lie a length of time on the ground, and exposed to the dews and rains of the season and the heat of the sun, will find their grain sprouted, and even a comparatively small portion being thus affected, the quality of the grain is greatly deteriorated.

This evil, so greatly injurious to the interests of the community at large, as well as the individual producer, is one which it is comparatively easy to obviate, as will be seen by the following directions and reasons for these directions to prevent its occurrence.

Heat and moisture conjointly operating cause germination in grains entirely matured, and it is only required to prevent the concurrence of these causes and conditions to prevent the evil, and the means are suggested almost spontaneously to the intelligent farmer.

The time at which wheat is cut is a matter of importance for two reasons,—the first is that an earlier or later cutting has an influence upon the germinating tendency of the grain while necessarily remaining in the straw, and the second is that it also determines in a greater or less degree the falling out and loss of the grains in the various handlings to which wheat is subjected, until at last threshed out in such manner as to secure the product.

The most reliable information we have been able to obtain, leads us to adopt the opinion that grain cut a short time before complete maturity secures a better yield than when cutting is postponed until such perfect maturity has been reached, because, first, the grain is not so liable to shed out during the processes of harvesting, and because, second, the maturation of the grain goes on in the straw while this is drying, and is completed when desiccation has been completed, and it cannot germinate until this maturation has been perfected, at which time, if the cutting have been early, the straw will be sufficiently dry to permit its deposit in barns or stacks with safety. The grain may be cut with advantage to the quality as well as quantity of the product while the husk or chaff has still a number of green streaks or markings upon it, and this early cutting is a certain preventive of sprouting in the sheaf for some days at least after cutting, and should for the purpose of gaining time, and saving grain and making it of better quality even, always be performed.

After cutting, an immediate shocking up of the grain in such a manner as to favor desiccation and prevent the influence of moist heat should be practiced, and if properly performed, shocking will secure the grain against this evil for an indefinite period of time. The most economical modes of making shocks are perhaps the following:

Conical shocks are made by placing one sheaf upright, arranging four others around this, in a slanting position, and then filling the intervals between these with four others, and then capping the whole by a large sheaf bound near the butt of the straw and spread equally over all. The nine shock sheaves should not exceed one foot in diameter each.

Diamond Shocks.—Take ten sheaves and place them in two parallel lines, join their heads and give them a slant. Then join twc other sheaves by a good band and place them on the others in such a manner that they may incline the heads towards the ground and spread over all the other. The shocks of this latter fashion are perhaps better able to resist the winds than the former, because they afford it a free passage through the space between the butts of the grain. If the grain is bound thus at the time of cutting it is necessary that it should not contain many weeds, otherwise it will be necessary to leave it in the swath for a few days.

SWATH SHOCKS.—Swath shocks have this advantage over sheaf shocks that they may be made at any time and in any condition of the grain, dry or moist, clean or full of weeds. They are made in the following manner: take a stake about four feet long, sharpened at one end, and pierced with two holes at the upper end, one above the other, so that two poles about three feet long may be put into them in the form of a cross—place the swath grain in this cross, slanting it more and more until a cone of four or five feet in diameter at the base has been formed, then withdrawing the poles and lifting out the stake, put on a cap formed of a reversed sheaf. If there be fear of winds the cone may be surrounded by a band of straw a little below the heads.

In well made shocks grain may be safely kept for months, in all weathers, and its preparation does not require much more time than the labor of binding, which is then done.

Having now adverted to the terrestrial, atmospheric and agricultural causes effecting injuriously the productiveness of the wheat crop, in the present or preceding portions of this article, we will now proceed to a consideration of those causes of injury which we have seen fit to call constitutional, or those to which the wheat plant is by its nature exposed, and which although susceptible of very great modification, by properly applied knowledge are nevertheless, in the present state of agricultural science not wholly remediable by human ingenuity.

The simple diseases of wheat inherent in the nature of the plant itself, and not produced by something superadded, are but few and unimportant, but by nature wheat is exposed to the attacks of diseases whose ravages are very great, which are caused by agents which are independent existencies, so to say; that is, by organisms which affect the plant by feeding upon its nutricious juices and destroying either its vitality or perverting its development to such an extent as to make it unfit for the accomplishment of the purposes for which it was designed. These agencies are known as parasites, that is organisms which draw the materials for their nutrition and growth from some other organism, which they either injure or destroy by robbing it of its vitality for the support of their own being. These parasitic organisms are divided into two classes, vegetable and animal, and a description of the more prominent and important of the individual varieties belonging to these two classes, will make up the remainder of what we have to say in regard to the most important of all vegetable production, the wheat plant, and although we will be compelled to condense what might, from its importance fill many pages, into a comparatively small compass, yet we hope to be able to point out such practical and useful indications of the causes and cures of these maladies as to lead agriculturists to study more carefully the nature of these diseases, and their appropriate remedies, in order to make the production of the wheat crop a more certainly remunerative investment of time and labor than it is now.

Before entering upon a consideration of the diseases of wheat, caused by parasites, it seems proper to make a few remarks upon the subject of the

Degeneration of Wheat.—It has long been held in a traditionary manner that wheat degenerates, and that there is an inherent tendency so to say for wheat to change in variety in certain circumstances, but this is an error. The causes which operate to enable chess to supplant wheat are alike active to cause one variety of wheat to supercede another, and a reference to the arguments upon the subject of chess will be a sufficient guide as to the principle involved.

The more prolific varieties of wheat when mixed with the less prolific, bringing forth proportionally more grains, will in a few successive crops give a preponderance to the more prolific varieties, and in the end supercede entirely the others, and thus without one variety being transformed into another, the character of the crop may be entirely changed in a few years, by the presence at first of so small a number of grains of the less desirable but more prolific varieties, that their existence was unnoticed in the seed altogether.

The only means of preserving a variety of wheat pure, is to be exceedingly careful in the selection of unmixed seed, and if this be done continually no deterioration or change of variety can occur. The time will come, perhaps soon, when such a nice appreciation of the aptitude of different varieties of wheat for particular soils, will be attained, that, to obtain such varieties as are suitable for particular localities, wheat nurseries will be established for the purpose of procuring and preserving all desirable varieties of seed wheat, as is now done to secure proper seed from which to raise plants of other genera.

Besides this mode of change in the variety of wheat grown upon a single farm or in a particular district, there is another mode in which wheat is gradually changed by the influences of soil, climate and manner of cultivation, as from red to white, from winter to spring, or awned to beardless wheat, and for such changes, if not desirable, a change in the mode of cultivation, as to manuring, plowing, time of sowing, &c., will prevent their occurrence, or if skilfully directed efforts are applied, favor such alteration in the character of the plant as may be desired; but, the easiest method, perhaps, of keeping up a particular variety of wheat is to import seed as often as deterioration is becoming evident, from some northern district where such variety grows habitually. Wheat assumes the character of a new variety, but very slowly indeed, under the influences of climate and soil, but yet such a change may in time be effected, as we have reason to believe that all varieties of the plant are the result merely of causes continuing for a long time in operation, and producing all the kinds of wheat now in cultivation from one or two original varieties, but no specific change has ever occurred in this plant, and all its varieties remain mere varieties, and could be reproduced again and again if lost by a compliance with certain conditions, now known or yet to be known.

VEGETABLE PARASITES.—Every creature which fixes itself upon another creature for support or nourishment, has received the name of parasite. Parasites pass through all or only a part of the phases of their existence, upon the individuals where they have been deposited in the shape of eggs, grains or spores. True parasites are those which live at the expense of the juices elaborated by the plants which support them, as the mistletoe, broom-tape, and a great number of mushroons, &c., while the false parasites are those which merely find a point of attachment and support upon the plant to which they adhere, and which thus live as well upon one individual as upon another, as the ivy, and various other creepers.

Among the false parasites we do not know any that have been remarked as causing damage to a great extent, although they are sometimes attached to grain, but it is not so with true parasites. But as most of these are cryptogamic plants, we will say a word in regard to the mode of reproduction of these singular plants, before entering into details, in order to make the following explanations intelligible to the reader.

Botanists divide vegetables into two great classes, viz: those in which the organs of reproduction are visible or apparent, which they call phanerogamic, and those in which these organs do not appear and seem not to exist, which they call cryptogamic. For a long time the reproductive processes of several families of these latter, such as the *uredines*, *mucedines*, &c., was unknown; there was even a hesitation in deciding as to several individuals of these families whether they belonged to the vegetable kingdom even. But since the invention of convex glasses, and the attentive studies of the learned physiologist, Benedict Prevost, it can no longer be doubted that the moulds, the rusts of plants, &c., are real vegetables, which, although they do not conform entirely like others, yet do not the less follow the same general rules of birth, growth, and death, and of reproduction by seeds. And from the point of view of a philosophic study of nature, the mould which is cut with the edge of the knife in opening a loaf of bread, which is a little stale, while showing its roots, stems and branches, its flowers, and grains, productions which could not have come into being except from a seed which has resisted the action of fermentation in the dough, and the heat of the oven, does not any less announce to you the supreme artist, than those beautiful productions which make the charm of the fields and the beauty of the garden.

If the dust of *caries* or any other *uredo* be spread upon the surface of water, maintained at a temperature of 10° or 12° Reaumur (55° to 60° Fahrenheit), each globule of the dust will be seen at the end of a few days, swelled to double its previous diameter, and then sprouting a tubercle five or six times as long as *it* is in diameter. This tubercle then divides at its extremity, into six, eight, or even ten branches, sometimes sessile and sometimes ramified. These branches still later present apparent articulations, or rather internal grains infinitely small, and at the same time the globules will appear withered and show reticulations, which without doubt previously contained the grains or sporules now developed, and which we cannot refuse to regard as the seeds of the plant. The globules, then, which form the caries, rust, &c., of plants, are cryptogamic plants half grown, and which must be placed in other circumstances to complete their development. This being established, we will occupy ourselves with a separate consideration of caries, smut, and rust, the only parasitic plants recognized as injurious to grain.

To the foregoing concise description of parasites we will add, as a curious example of animal parasites, the following description of "Rust in Oats," not because of its being the appropriate place for considering this branch of the subject, but merely to give an example of the second class of these enemies to the farmer and destroyers of his labors.

Rust in Oats—What is it?—Throughout the whole southwestern portion of the Union, the oat crop has suffered from a terrible blight, which from its resemblance to the fungus substance that sometimes attacks wheat by that name, has been called *rust*. So far as we are informed, rust in oats has hitherto been unknown. We have never heard or read of anything of the kind, in any section of the country. The fact that it is thus unusual opens a wide and interesting field to the naturalist, and in this case to the entomologist, as it invites investigation in a channel, so far as we can ascertain, heretofore unexplored.

While in West Tennessee, a short time since, we took occasion to examine the blade of the oat under a microscope (kindly furnished us by a friend), and were greatly surprised with the phenomenon which the glass revealed. Since then we have followed up those examinations, by the aid of more powerful instruments, at the Medical College in this city, in company with several scientific gentlemen, among whom were Drs. Briggs and Buchanan, of the medical faculty.

The cause of all this destruction of the oat crop is a living worm, too small to be plainly seen with the naked eye. A single blade or leaf of the oat sometimes contains hundreds of them. They lie encased in the tissues of the leaf or blade, where they have been germinated, beneath the epidermis or thin pellicle over the exterior portion of the blade, and, as they progress in development, the skin of the leaf is raised into curious puffy blisters. The growth of the worm subsequently ruptures these, and it escapes to feed on the plant. When first released from their covering, they are of a beautiful, clear, red color, almost transparent, but soon begin to change color and form, getting more opaque and dark in appearance until, in the course of transformation, they become a black bug, with legs and wings, when they attack the head or grain of the oats.

Under the microscope, the dust which remains on the leaf closely resembles that on the wings of butterflies.

How this innumerable army of infinitesimal worms originated is yet a mystery. It is a singular fact, however, that wherever the greatest quantity of rain has fallen, there the oat crop has fared the worst. In our recent trip through West Tennessee, we saw but a single field of oats, between the Mississippi and Tennessee rivers, which was not a failure, or into which it would not be folly to put a scythe-blade. That field was near Denmark, in Madison county, and was sown very early. It is well known that more rain has fallen in West Tennessee this season than in any other part of the State; hence the extreme wet weather must have had some agency in the production of this animalcule. It is also well known that moisture and heat will produce and multiply animal life, millions per hour, and therein we judge is the secret of this destruction of the oat crop. It is one of those cases of natural phenomena which occur only at a certain stage in the growth of plants, and under peculiar states of temperature and weather. It may happen next season, or it may not occur again for many seasons.—*Southern Homestead.*

Vegetable Parasites.—We will now direct attention to that class of parasites which are of vegetable nature, and which are particularly noxious to the ceralia which are objects of cultivation. These parasites are all minute plants of the cryptogamic class, and are mostly microscopic, being in their individual magnitude so minute as to escape the scrutiny of the unassisted eye, but are yet in a state of aggregation not only discernable, but by their destructive influences upon the products of the farmer's efforts to secure a good return for his toil so terribly important, as to be but too well known when circumstances have permitted or favored their development in an unwonted degree. These minute vegetations are like all other plants produced from seeds or their equivalents, but unlike non-parasitic growths they can only flourish when they find a vegetable which affords them a point of support, and already elaborated organic elements for their nutrition, while the others almost exclusively draw their nourishment directly from the earth and air, and combine its elements into their tissues and products.

Without attempting a classification of the vegetable parasites which are so prominently injurious to the wheat plant, we will describe some of the individual varieties, and first, that one which produces the disease known as

MILDEW.—It often happens that a field of wheat which presented every appearance of a good return, is found near or at harvest, to have been attacked by this disease, and suffers by it to the extent, or loss, or damage of one-half or more of the crop. We copy below from Morton's Cyclopedia, a description: "*Mildew*, a word which is applied in various instances where plants or other substances, as paper, linen, glass, &c., are spotted with mould or other minute fungi. The word, in its stricter sense, if it be true that it is but another form of the German *mehl-thaw*, or meal-dew, should seem to indicate such moulds as those which are so prevalent on the leaves both of trees and herbaceous plants, forming white, mealy patches; but it is by no means confined to them, and, indeed, is more especially given to a particular disease in wheat, altogether distinct from that with which vines and hops are so frequently infested. We will then first consider the white species, which exhibit, in general, very similar phenomena, though botanically distinct; and then briefly advert to the disease of wheat which is, in particular years or districts, so severe a scourge.

"The first kind, then, which is known to French gardeners under the name of *blanc* or *blanc de rosier*, &c., is very widely distributed in one or other of its forms. Few natural orders of plants are altogether exempt from its attacks, but it is especially in peas, vines, hops, roses, and peaches, that it attracts the attention of the cultivator. Forest trees, too, as for instance the maple, when infested by it, are sometimes as white as if they had been washed with a coat of lime. The first stage of growth exhibits round, white, mealy spots, which are produced principally on the upper surfaces of the leaves, but extend likewise to the stems and also to the floral envelops. There is some difference of opinion as to their origin; some botanists maintaining that they are first developed within the tissues, and make their way through the stomata; while Leveille and Decaisne, in a late article in the *Revue Horticale*, maintain that they always originate externally, and that a previously diseased state of the tissue invariably exists. To this view, which has been stated more especially with respect to the mildew of the vines, we are not at present prepared to accede, as it is contrary to every observation that we have made, and to those of a very talented friend who had no previous knowledge of the subject, and, consequently, no prejudices to overcome.

"Be the origin, however, what it may, the spots consist of delicate creeping threads, which usually radiate from the stomata, and give rise to erect articulated flocci, the ultimate articulations of which, at length become greatly constricted and fall off in the shape of more or less elongated spores; these have the power of germinating and reproducing the plant. In this stage of growth they accord exactly with the genus *Oidium*.'

"The wheat mildew, (fig. 20), which is a very different structure, is a disease of much more statistical importance in this country; its ravages, as in the harvest of 1850, being most extensive, and its effects, both in respect of produce and value, being most disastrous. The reduction of produce may safely be estimated, in mildew years, at one-half in badly affected crops; while the value of the produce is reduced from a fourth to a third. Unfortunately for this, the most formidable of the diseases to which corn (wheat) is subject, no remedy has hitherto been discovered.

"Wheat mildew is due to the attack of a parasitic fungus, which is developed beneath the surface from a branched mycelium, and makes its way through the cuticle in the form of a little black or deep brown sori, composed of clavate threads, divided above into two cavities, filled with a grumous mass and a large oil globule. In an early stage of growth, the swollen heads of the filaments are undivided, and it is then known to botanists by the name of *Uredo linearis*. A true *Uredo*—*Uredo rubigo vera* (Fig. 54) is frequently mixed with it, and therefore, has been supposed to be a mere form; an opinion to which we were once inclined, but which does not appear to be tenable. The discoveries by Corda and Leveille, of the mycelium of this and other allied plants, has completely established the fact of their being really fungi, and not mere alterations of the cellular tissue, as supposed by Unger; and this is confirmed by the circumstance that the spores may be readily made to germinate. Unfortunately, however, nothing is known as to their mode of propagation. The fact of mildew increasing so fast in foggy or damp, warm weather, is as consistent with the notion of the tissues being pervaded by something capable of propagating the fungus—whether in the shape of mycelium or granular matter, for the spores, from their greater size, could not possibly be there—as with the notion of propagation without; for in germination it is the spores themselves which germinate. Indeed there are very few wheat crops, be the reason what it may, in which mildew may not be found very extensively; but only in such atmospheric circumstances as are favorable to its growth does it arrive at such a state of perfection as to become injurious. Mildew is rare on other cereals, except wheat, but may be found most extensively on grasses and seeds, so as to make any preventive or palliative pains which may be taken, almost hopeless. An able pamphlet was, indeed, written some years since, by Mr. Tycho Wing, the late very talented agent of the Duke of Bedford, Thorney, holding forth great hopes to the few farmers if they would clear their ditches of weeds and other grasses; and as the fields are usually cultivatad to the very margin of the drains, there, if anywhere, such measures might be expected to be efficacious. It was very evident in 1850, and indeed has been a matter of experience formerly, that the lighter soils are more subject to mildew than those which are stiff and heavy, and that the earlier kinds of wheat are least affected. Heavy crops are always more subject, from the greater stagnation of air, than those which are light; but as the disease is seriously injurious only in certain years, and sometimes for several years together scarcely attracts notice, the farmer will not, probably, in the end, derive any advantage from attempts to guard against a heavy crop. Indeed, the best cultivated farms, at least in the district with which we are more immediately acquainted, suffered most during the late harvest; and we fear, therefore, must be looked upon as one of those unavoidable disasters which reduce the average of the farmer's profits, and which he must, therefore, previously take into calculation, be his skill what it may.

It has long been supposed that the berberry has a great influence in the production of the mildew, probably from the fact of its being very generally attacked by a fungus with rusty spores, which are supposed to communicate the disease. The structure of the two genera is so very different that this is scarcely probable, and when it is considered that the berberry, in many districts is wholly unknown, and in others far from common, the strongest evidence alone can be considered as sufficient to establish the fact. Still competent authorities are much divided in opinion, and though in this country the notion has not met with much encouragement from scientific men, it is perhaps worthy of remark that a commissioner appointed expressly to examine the subject, by the *Royal* Agricultural Society of Lille—a town which has nurtured several excellent botanists—come, after due examination, to the conclusion that the matter is not without foundation."

How far the remedies we shall point out for the prevention of other maladies belonging to the wheat plant may be applicable in case of mildew can only be determined by future experiment and observation.

Besides the above parasite there are several others of so much importance, that we will devote some pages to a description of them,—and the more particularly is this necessary, because they are more prevalent in this country than the one already mentioned. These diseases are all included by Corda in his work upon the subject translated for the American Journal of Agriculture and Science, by E. Goodrich Smith, under the German name "*Brand*," a blight, blast, or mortification, and are caused in all the cereals by a family of fungi "which natural historians call by the family name of the *Cæomaceæ*," one branch of which the *Uredines*, being more noxious than any others will claim almost exclusive attention. The *Uredines* infest all species of cereals and gramineæ, and give origin to the different appellations of *rust*, *smut*, &c., of which we will consider next in order the one called *caries*.

Uredo caries, *De Candolle*, Fig. 52.—Caries, which is also called mildew, *caroncule* (an excrescence,) *fouedre!* and still more frequently *ble noir* (black wheat,) scarcely ever attacks any other grain than wheat. This malady is due to a mushroom of the family *Uredines*, takes its origin in the interior juices of the plant itself, and does not appear to be capable of exterior communication. Half developed heads of grain have been sprinkled with caries, at different periods, and have never on that account shown any indication of the malady. The grains which have been affected by caries, preserve very nearly their volume and their form, but the heads which bear them are known at a glance. They are straight, paler than the others, and the envelops of the grain, in which alone the malady is concentrated, are ordinarily so much spread, that they show this uncovered. The pericarp of the grain in place of enclosing flour, only contains a black material, greasy to the touch, and which attaches itself to the finger when rubbed. The spores of the caries are round, reticulated, provided with pedicles proceeding from a pulpy body which replaces the interior substance of the grain.

The dust of caries unlike that of smut, emits an unpleasant odor resembling that of the sea or of spoiled fish. This nauseous odor may even be detected in the bread made of wheat attacked by caries, the color of which it also heightens. The seminiform grains of the caries being in immediate contact with the grain in the head, attach themselves ordinarily to the hairs which garnish the extremity of the berry opposite the germ, and thus resist the action of the flail and even the winnowing fan, and it is only by means of an apparatus armed with brushes, to which the grain, in certain mills is subjected, that this dust can be removed. The flour, although made much better by this operation, preserves some traces, nevertheless, of this dust.

The stalks of wheat which will produce carious grain may be known as soon as they have sprung up, their leaves are of a deeper green than the others; somewhat later their stalks are tarnish (ternes-paded?) If a head which is attacked be examined before it escapes from its envelop, the stamens will be found flabby and the stigmas without fibrilla, and the embryo having already the odor of the caries. And as soon as the heads have shown themselves it is easy to distinguish those which are attacked from those which are healthy. They are bluish, they have their husks more tightly closed, the embryo preserves its stigmata, and the anthers adhering to it are flabby and without pollen (dust.) Soon afterwards by the progress of vegetation the carious heads become larger, and become bristly, the grain increases in size, the pulpy substance which it contains takes an ashy color which soon passes into a brown.

There are frequently found sound heads upon affected stalks, sound grains mixed with carious grains in the same head, and finally grains half sound and half carious.

The following is, according to De Candolle and Benedict Prevost, the mode of procedure with caries upon the grain to which it is attached, or with which it is accidentally brought in contact in the field.

The grain swells more promptly when the ground is moist and the weather warm. The caries swells at the same time, sprouts its tubercles or branches and finishes its evolution in a few days. It is then that the buds or seminiform sporules absorb with the nourishing juices of the plant, traverse its canals, and raising themselves slowly to the point destined by nature, even to the germ of the new grain, where they are separately developed, the only place where the circumstances necessary for their multiplication concur. The nourishment destined for the substance of the grain is absorbed by them, thus even a portion of that which should have formed the stamens and the pistil, which are consequently only imperfectly developed, but, what is a singular thing, that which serves for the growth of the pericarp (or bark of the grain,) and of the husks is not diminished but is on the contrary, augmented. Thus all the germs of the carious head enlarge by means of the caries itself, while there are a number in the healthy heads which are blighted. Hence the grains of the former are generally more numerous than the latter.

Caries attacks sometimes one-fourth, one-half, or even three fourths of the grains. If the air in the vicinity of the sea seems opposed to rust, it appears on the contrary, very favorable to caries. In the counties of Kamarouska, Temisconata, Pimouski, &c., Lower Canada, this scourage decimates nearly every harvest, the products of the wheat farmer. But we may also say that no effort has yet been made to counteract this malady. And it is known that of all diseases of wheat, this is the easiest to control, because it has never been known to resist proper soaking of the seed in lime water.

If in a field the seed of which has been properly lime-water soaked, there are still traces of caries found it is only due to seminiform sporules which may have remained in the ground at the time of harvest and which particular circumstances have developed at the time of germination. Hence again the wise precaution never to sow cereals upon a stubble field attacked by caries.

One of the most efficacious and least expensive lime-water soakings is the following: dissolve 1½ lbs. of sulphate of soda (glauber salts,) in two gallons of water. When the salt is well dissolved moisten or sprinkle the heap of wheat with a broom, taking care to stir it with a shovel until all the heap is moistened and the water begins to drip or run out at the bottom, then dry the heap with lime recently slaked and mixed with ashes, so that each grain shall be well impregnated and encrusted. Seed prepared thus may be kept a number of days or may be sown immediately.

Sulphate of copper (blue vitriol,) may also be taken in place of glauber salts, in the proportion of 1 lb. to 2 gallons of water. This latter liming would be more certain than the former even, because the sulphate of copper being an active poison, would protect the seed from the insects which are in the habit of attacking it in the ground; seed prepared in this way may cause the death of birds which eat it, the fact has been tried and tested a number of times.

To the foregoing description of this parasite we will only add a few confirmatory or explanatory remarks. This parasite is known by its effects, under different appellations in different countries; it is called *Bunt*, Norton's Cyclopedia; *Pepper Brand*, Penny Magazine; *Uredo Caries*, De Candolle; *U. foetida*, Bauer; *U. Litophila*, Ditmar; *Tilletia caries*, Tulume, and other species peculiar to particular plants, have been named and described by various authors, under different names. (See Figs. 21, 22, 25, Plate IV.; 23, 24, Plate V.; and 26, Plate VII.) It has prevailed extensively and injuriously, but its nature and the means of preventing it being better known, it is to be hoped that its ravages may be entirely stayed in a few years, or at least to such a degree as to make them of very rare occurrence.

By reference to the accompanying plates, a quite clear idea may be formed of the microscopic appearance of this parasite, as these figures were all drawn from more or less greatly magnified views of the plant in different stages of its development.

Fig. 22 represents the spores of the *Tilletia caries* in various stages of growth. Fig. 23 the mycelium or filament. Fig. 24 germinating spores. Fig. 21 spores in situ. Fig. 25 part of the integument of a spore. Fig. 26 Fusisporium inosculans; all more or less magnified.

In reference to the preventive means we have already recommended, we will merely add that a writer in the Country Gentleman coincides in the recommendation we have given, to soak the seed wheat in a solution of blue vitriol, in the proportion of one pound of the salt, to so much water as will cover four or five bushels of wheat.

The mode in which this soak operates is not only to destroy the germs or spores of the Uredo upon the surface of healthy grains, but prevents those grains which are diseased from germinating, and thus, even when the spores of the parasite are not themselves destroyed, the production of the stalk upon which they must depend for future development being prevented, they cannot find the conditions necessary for their growth, and thus perish—while the vigorous and healthy wheat grains remain unaffected by the soak, and having no spores of the Uredo to support, produce only healthy heads. Thus it is not simply by destroying the spores of smut, but by preventing the conditions upon which their development depends, that the ravages of the disease are restrained.

Uredo foetida, Pepper brand, Bauer—described in the Penny Magazine of 1833, coincides in general description and habits with what we have described as above as U. Caries, but the accompanying figures seem to point to another fungus of the same family. Whether these are distinct or are only seemingly so, on account of differences in the manner and time of observation, we are unable to state, and the determination of the question is of the less importance, as the same means of prevention are equally effective whether there be two varieties or but one, as we are inclined to suppose, of this *Uredo*. Fig. 49 represents a group of this fungi on their spawn, magnified 160,000. Fig. 55 is a young fungus of the *Uredo foetida* not quite ripe, at which time it can be separated with its pedicle *b* from the spawn (magnif. 1000 diamet). Fig. 50 is a ripe fungus (mag. 1000 diam.) shedding its seed. These seem to us to be the same parasite as already mentioned, and that the difference is apparent only, and not real.

Uredo rubigo vera, De Candolle—Figs. 51 and 54, Plate IX.—Rust like the two preceding parasites; is a mushroom of the family of the *uredines.* It is developed upon both surfaces of the leaves, upon the stubble and upon the heads of the graminæ, with the appearance of little oval points, pulverulent, projecting, at first yellowish, and afterwards becoming black. The little streaks which it at first forms in parallel lines at the side of the fibres, finally spread, and, joining, form large patches. When the rust attacks the grain only feebly, it does not appear to be very injurious to it, but when it is considerable, it occasions serious losses. Among all the graminæ wheat appears to be the favorite of rust.

If the streaks formed by the rust be attentively examined upon the stalk, but particularly upon the leaf of the wheat, the epidermis will be found split in every instance, and it will not be difficult to perceive that the sap extravasated by this split gives birth to the mushroom, or at least that it serves as a receptacle to the spores of this mushroom, raised from the ground by the rains, carried through the air by the winds, or, what is perhaps more probable, absorbed in the earth with the nourishing juices of the plant. It has been remarked that the rust ordinarily shows itself when a very hot sun suddenly succeeds rains which have been somewhat prolonged. It is at the time when the evaporation of the water left upon the stocks and leaves, going on too rapidly, occasions cracks in the epidermis or vitreous varnish, which covers all parts, and thus permits the sap to deflect from its ordinary course, that circumstances favorable to the development of the mushroom are presented to its spores, whether they come from the interior or exterior. From the time, also, when a stalk of wheat is attacked by rust in a somewhat serious manner, it begins to languish; its leaves quickly begin to dry up; and when the rains are infrequent, the malady proceeds from the stalk to the head, which also soon turns red. The husk or nearest envelop of the grain then drying and adhering to this, soon occasions its decomposition, as much by the moisture retained by it as that which is maintained by the streaks of the mushroom fixed upon its glumes. It will not be rare in these cases to see fields of wheat produce less than half what they would have done without this accident.

The more then that heat and moisture permit the sporules or seminiform germs of the rust to attach themselves to the stalks of the grain, and develop themselves there, the greater will be the damage it may cause. There are certain places, as in South Carolina, for example, where the cultivation of wheat has had to be abandoned, because the natural humidity of the soil, conjoined with the mists, which prevail so frequently in that country, too greatly favor the development of rust. On the contrary, it has been remarked that, in the vicinity of the sea, or in grounds improved by means of lime or leached ashes, or manured with sea plants, the rust never exhibits itself in such abundance as to cause any considerable damage. The following seems to be the reason:

There is found upon the most of the gramineæ, and particularly upon wheat a certain shining varnish absolutely of the same material as glass. Most commonly this vitreous material terminates the edges of the leaves by little teeth, resembling a saw of extreme fineness, but always capable of scratching the fingers of those who carelessly amuse themselves by frequently rubbing these leaves in the direction of their length. The greater then, the thickness of this glassy layer, and the stronger the stalk, the greater will be its resistance to the moisture or other atmospheric influences, which might cause it to crack and present false issues to the sap upon which the rust attaches itself. And it is imagined (conceived) that, this layer of vitreous material will be stronger in proportion as the soil itself contains, or, as are furnished artificially, the elements of its composition. It is well known that to produce glass, sand is used, with lime and ashes, which are melted together by heat, although each one of these substances is scarcely fusible if heated alone. If, then by mixing with the soil, lime, ashes, &c., there be placed at the disposition of the plant a greater abundance of the materials which enter into the composition of the vitreous material with which it is covered, it will necessarily absorb a greater quantity, and thereby place itself in better condition to resist the rust. The sea-weeds, which, by their decomposition produce soda in quantity, which also enters into the composition of glass will produce the same effect. Thus too, it has been remarked that the rust has shown itself much more rarely in silicious or sandy grounds.

The rust is the less injurious to grain the nearer this has arrived at maturity at the time it is attacked by it. The damage which it receives only coming from the suppression of its nourishment which it (the root) intercepts to appropriate it to itself, or which it leads away from its ordinary channels, it (the grain) suffers the more it has great need of this nourishment.

As grain ripening early is rarely attacked by rust, and as this does not ordinarily show itself until toward the end of August or the beginning of September, perhaps a certain continuity of heat is necessary for the development of its seeds, a heat which it cannot meet in July or the commencement of August.

There has been no means used so far as I know, to combat the rust, in Ohio. There has been more reason to complain of it than ever in the district of Quebec during recent years, since particularly to escape the fly, the sowing of spring grain has been postponed until the commencement of June. The vicinity of the sea, in general, preserves the districts of Gaspe and Kamouraska. There ought, then, in the places where the rust is most to be complained of, after all necessary care of the ground by good drainage, be used as much lime and ashes as possible as a manure, and a field of stubble where rust has made an attack, ought not to be sown, and besides the seed ought to be limed as described above.

Smut.—(Du Carbon), *Uredo segetum*, *De Candolle.* Smut, like caries is a parasitic mushroom of the family of the *uredines.* It is pulverulent, like all mushrooms of this family, and it destroys or replaces the organs in which it is developed. Smut has often been confused with caries and rust, although its characters are sufficiently distinct to make it readily distinguishable from one and from the other. In several places the name mildew is also given to the smut.

Smut sometimes attacks the leaves and stems of the plants, but it is the grain itself which it most commonly invades. Smut attacks all the graminæ but seems to prefer oats, barley and maize. In a field one can scarcely distinguish the stalks affected, except by a little less height, and a somewhat tarnished or somewhat paler color. So long as the head has not emerged from its envelops, the diseased portions appear in almost their natural condition. But as soon as the head has separated the leaves which hid it from sight, it appears of a pale grey, and in a short time it assumes a black or coal-like tint. The floral envelops, the pedicles, the glumes, are all altered, changed or consumed; it is often difficult to recognize even a vestige of the grain. It blackens the fingers of those who touch it, and falls into powder if it is shaken; this powder is inodorous.

The seminiform sporules of the smut, which are infinitely small, and still lighter than those of rust and caries, are also produced in the interior of the plant. The proof of this is, that the heads are found entirely destroyed by the smut, even before they emerge from their envelops; the seeds of the mushroom absorbed in the soil with the alimentary liquids of the plant having found in the head the circumstances favorable to their development.

Smut is disastrous for the farmer when it attacks a great number of heads. Fields have been seen in which it had attacked one-fourth, one-half, or even two-thirds of the heads of grain. All the heads from the same foot are smutted, sometimes all the grains of the same head are not, but such grains are always small, lank and withered. The smut is developed as well in a dry as in a rainy year, and as well in a dry as a moist soil. But it has been remarked that where it made the greatest ravages was always in little fertile grounds or such as had the year preceding produced a graminæ affected by smut. In the first instance the vegetative life being enfeebled, the mushroom met less resistance to its development, and in the second, the ground having retained the spores of the mushroom, of the preceding year, it already contained the elements of the malady.

The remedy would be then, first a lime water soaking to rid the seed of the spores which may be attached to it, and in the second place not to sow grain upon any kind of cereal stubble which had been attacked by smut.

It is not probable that the smut can be injurious to man by the use which he may make of the grain which shall have been attacked by it, because at the time of harvest the spores of the mushroom have in a great measure, left the grain, and because threshing and winnowing will remove the remainder. According to several authors, even the straw of smutty heads although of an inferior quality would not be prejudicial to cattle fed upon it.

Smut, so far as known, has never been the cause of great damage to the Ohio farmer. It is believed that there have rarely been seen fields of wheat in which more than one-hundredth or one-sixtieth of the heads were attacked by smut. This is doubtless due to the vigorous vegetation which characterizes our climate, and perhaps also to the custom almost general in this country, to alternate fallowing and cultivation.

Before leaving this part of our subject, it is well to remark that very many fungi of different species infest the other members of the vegetable world almost without exception, and compose a large class of plants called *cryptogamia*, because the organs of reproduction are not distinguishable to the natural eye. The varieties of these fungi are very numerous, and it is impossible in the limits of this report to describe, or even name all of them, and our aim has been merely to point out those most important, on account of their extensive ravages.

CLADOSPORIUM HERBARIUM, Plate IX, Fig. 53, highly magnified, is a black fungus which sometimes gives a dingy appearance to whole fields of grain, it is often called mildew, but never attacks wheat except it has become already diseased. The appearance of the straw attacked by this fungus is shown Fig. 51, slightly magnified, the dark patches indicating the diseased points, or those upon which the Cladosporium has formed lodgment.

The *Uredo rubigo* already described, is figured in Plate IX, Fig. 54, highly magnified, and is one of the most important of the *uredines* as its ravages are so great under favoring circumstances as to destroy one-half or two-thirds of a crop of grain, and sometimes even more, and might, by extensive prevalence, be the cause of a serious scarcity of grain, and it well deserves the careful attention of the agriculturist.

The *Uredo fœtida* also described, is figured in Plate IX, Fig. 52, highly magnified, and is also an important member of this destructive family of parasites, which have received their names from the peculiar effects upon the plant attacked. *Uredo* and *Brand* are derived from words in Latin and German signifying *burning*, and correspond to our words *blast, blight*, and the burnt or rusty appearance of the plants attacked by some of these has given rise to the English term *rust*.

We have already adverted to the best means hitherto discovered of preventing wheat and other grains from being attacked by these destructive parasites. The following from an authentic source is not inappropriate:

PREBLE COUNTY, O., May 7, 1858.

JOHN H. KLIPPART: *Sir*—At the instance of our worthy Secretary of Preble County Agricultural Society, I give my personal observation as to the operations of the *rust*, one of the most ruinous diseases the crop is subject to.

In 1842 I had a large field seriously affected by rust, and having read in the Genessee Farmer the necessity of early cutting, I put a hand cradle to work and left—was absent a few days, and on my return found my hand had only cut a few dozen sheaves—avowed that it was so green he knew it would be worthless. I then procured hands and had the field cut, but too late for more than a *half crop*, whilst the portion cut at first was plump, and had well filled grains.

In 1849 I had three fields of wheat of equal size—about the 20th to 25th of June the rust made its appearance in its worst form. The cholera being in the country, hands were hard to procure. I however procured two cradlers and set them to work in field No. 1—soon left for the day, and on my return home was vexed to find my foreman had abandoned the field, with the declaration that if I was d—d fool enough to cut wheat so green, he was not. I explained and entreated, and finally got the field cut on *Monday* and *Tuesday* of the week—leaving the wheat in the swath unbound, until it partly cured in the sun before binding. Field No. 2 was left, partly to meet the views of my hands and partly to mark the difference as an experiment, until Thursday and Friday, when it was cut and shocked. Field No. 3 having been put in by a tenant and under his control, was left until the Monday following, though I urged him to have it harvested sooner. On Monday all hands were ready for the work, but on close inspection there *was nothing* but straw to cut, and hence the field was left unharvested.

THE RESULT.—Field No. 1, although it was the poorest set or stand by at least one-fourth, produced 12 measured bushels of wheat to the acre, weighing 56 lbs. to the bushel. No. 2 yielded 8 bushels to the acre, weighing only 46 or 48 lbs. to the bushel, while the third field, fully equal to the second field in every respect, and the same kind of wheat (white chaff beardy,) produced *nothing.*

The rust in '49 produced general havoc in this county, thousands of acres having been entirely destroyed. And *ignorance* as to the time of cutting when the plant was thus afflicted, must have bled our county of at least $50,000, if not double that amount. For all who cut any portion of their grain in the incipient stages of the rust, received a fair yield, varying in quantity and quality as to time of cutting. Again, in 1857, last year, the rust made its appearance, but not so fatal in its consequences, but enough to do great damage. So soon as discovered I "pitched into" field No. 1, cutting and shocking the same day. The crop was so green I had to re-open the shocks and many of the sheaves to cure them, to keep from moulding, as I also did in field No. 1 in '49. Field No. 2 was left a week, being a later sown field. And again had a field, No. 3, in charge of a tenant who obstinately refused to cut till ripe. Result No. 1—produce 25 bushels to the acre; weight 64 lbs. to the bushel, and as full, flinty wheat as I ever saw—No. 2 being only a half set by "fly" and "freezing out," produce 10 bushels to the acre and weighed 56; but in this field and on the poorest point in it, (clay land) I had well manured one acre in center of the field, and on which was at least 30 bushels of No. 1 wheat, neither the rust or fly had effected it. No. 3 yields (though a good set,) some 8 bushels to the acre, and the wheat so poor it could not be sold; I am using it for feed. I think it a fixed fact, that the *rust* detracts or draws the *substance* from the *grain.*

GEO. D. HENDRICKS.

ANIMAL PARASITES AFFECTING THE WHEAT.—The animal parasites affecting the different species of plants which compose the vegetable kingdom, are very numerous and very widely different in their character, habits, mode of attack, and importance to man as destroyers of the fruits of his labors, in the garden, orchard, field, and vineyard. We cannot advert to any except those most important, on account of their extensive depredations, and can only recommend to all persons whether directly or indirectly interested in the productiveness of our agricultural labors, to contribute, so far as possible, to the general fund of information concerning these enemies of man's comfort and prosperity, by studying practically the subject of entomology, and recording their investigations in regard to any or all classes of insects which may come within their scope of observation. In this manner we may hope to gain such an acquaintance with the nature and habits of noxious insects as will enable us to counteract their deleterious influences and restrain them within safe limits, if we should not succeed in entirely eradicating their species, and thus preventing the necessity of farther watchfulness in regard to them.

In the following descriptions we have not always been able to point out a remedy for the evil described, but it goes far towards discovering a remedy, when the disease has become fully known, and we may venture to hope that a knowledge of the means of preventing the destructive ravages of some, at least, of these terrible scourges, may soon be gained by some persons among the many whose interests they so greatly and injuriously affect.

CHLOROPS is a genus of insects which reduces the value of corn crops to a great amount by depositing eggs in the young wheat, barley and rye. These eggs produce maggots, which either eat through the base of the central stalk, destroying the ear, or by working up the straw, fig. 37, the ear is rendered more or less abortive. There are several species which are engaged in these operations.

C. Lineata (the striped wheat-fly) lays its first brood of eggs in June, when the ears are just appearing; they are placed at the lower part of the ear, at the bottom of the sheath; they hatch in about fifteen days, when the maggots pierce the tender straw, and make a narrow channel on the same, up the ear (fig. 37, (6, 11, 12,) it there changes to a brown pupa (fig. 37 12,) towards the middle of the furrow, and the flies hatch in September, laying their second batch of eggs upon the rye and other corn, recently sown. The fly is yellow; horns, and a triangle on the crown, black; thorax with five black stripes; abdomen with dusky bands, and a dot on each side at the base; apex yellow; legs yellow; anterior feet black, the others yellow; with the two terminal joints black; length one and a half line.

C. TÆNIOPUS (the ribbon footed corn-fly, (fig. 37 (2,) magnified at 3,) is the species which does the greatest mischief in England, causing the disease in wheat and barley, called the gout, from the swelling of the joints. The fly is pale yellow; horns black, and a black triangle on the crown; thorax with three broad black stripes, and a slender black stripe on each side, also a black dot on the side of the breast; abdomen pale greenish black, forming four black bands and two dots at the base; wings transparent; poisers white; legs ochreous, basal, and two terminal joints of fore-feet black; the others, with the two apical joints only black; length one and a half line.

These flies also deposit their eggs between the leaves in the autumn, and in spring, when the maggots live in the base of the stem; and, of course, destroy the shoot, or render the ears unproductive—the wheat sometimes altogether failing; in other instances, one side only of the ear, with the greater portion of the grain becomes shriveled. The maggots (fig. 37 (4,) are whitish, shining, tapering to the head, blunt and tubercled behind, the elliptical pupæ (5) are of a rusty color and fixed in the groove of the stalk (6) or inside of the closed leaves; from which the fly crawls forth with their crumpled wings in August, and are found in stacks through the winter.

Asa Fitch, who has devoted much attention to the study and description of noxious insects, has described, among others, the species of Chlorops peculiar to the country of North America, and particularly to the portion embraced by New York and the adjacent States, with Canada. These are sufficiently like their relatives already described to render an extended notice of them unnecessary. They are all more or less destructive to the wheat plant, and thus force themselves upon the attention of agriculturists, and will ultimately meet with such a careful examination by this class of citizens as to be far better known than they are at present. Figs. 41–2–3–4 are magnified views of the American varieties of the Chlorops, and do not require to be more carefully described, as the European species described and figured in this article are so like them that except for the purposes of nice entomological distinction, a description of the form and habits of one might serve as a basis of acquaintance with the other.

There is a parasite named *Cœlinus niger*, (fig. 37 (7,) magnified at (8,) which punctures the maggots, and these again fall victims to the beautiful little Pteromalus micans (9,) magnified at (10.)

Cœlinus niger, is a small ichneumon fly, parasitic upon Chlorops, fig. 37. The eggs are supposed to be laid in the maggots, in the stem and spathes of the green wheat, feeding upon the former as soon as they hatch, and undergoing their transformations in the indurated skin of the Chlorop's maggot, (11.) The Cœlinus hatches several days before the Chlorops, and eats a hole through the leaves to escape (12.) There are twelve British species, which are abundant from Midsummer to Michælmas, in meadows; the one bred from the wheat Chlorops is named *Cœlinus niger* (7) magnified at (8,) being of a pitchy-color; the two long jointed horns, head, and trunk, are glossy black; the abdomen is norrowed at the base; the ovipositor of the female is scarcely visible; the four wings are transparent; stigma brown; legs slender; fore pair ochreous, with dusky feet.

Pteromalus micans (*Oliv.*) is a brilliant parasitic fly, which hatches from the stems of wheat infested by the *Chlorops*, fig. 37. These little creatures have the power of discovering the hidden larvæ and pupa, in which the female, fig. 37 (9, 10 magnified,) lays her eggs, to live upon the fat and muscles of the *Chlorops.*

The sexes of *P. micans* are very dissimilar: the male is of a lovely green, with a blue or yellow tinge; the flail-shaped horns are brown and thirteen jointed; the body is strap-shaped, black, smooth and shining; the wings are transparent, with a short curved nervure on the costa; legs bright ochre, thighs pitchy, feet tipped with black. The female is dull green: base of horns ochreous; the body is lune-shaped, violet above, metallic green at the base; expanse three lines.

P. puparum (*Linn.*) is bred in multitudes from the pupæ of *Pontia Brassicæ*, and other white-cabbage butterflies. The sexes vary, and resemble *P. micans.* The male is brilliant green; horns slender, tawny; body very glossy and golden green; wings limpid; legs bright ochreous; tips of feet pitchy. Female greenish-black; horns black, ochreous at the base; body shining black, often violet above; base metallic green; legs bright ochre, thighs pitchy, excepting the base and tips; four hinder shanks brown in the middle; tips of feet black; expanse three lines.

Thrips cerealium (*Hal.*) is an active little insect, which resides in the spathes and husks of wheat and rye in June, causing the grain to shrivel; and at an earlier period effecting the abortion of the ear, by puncturing the stems above the joints, being the most injurious to late sown wheat. In the larvæ state they are deep yellow, with part of the head and two spots on the pro-thorax dusky; the horns and legs are marked with dusky rings; the pupa is active and pale yellow, with the horns, legs, and wing-cases, whitish, the eyes reddish. The perfect insect is larger, flat, smooth, shining, and pitch-color. The male is apterous, the head is semi-oval, with a short stout proboscis beneath, a granulated eye on each side, three simple ones on the crown, and two short nine-jointed horns in front; thorax somewhat quadrate, narrowed before, body very long, and acuminated in the female, which sex has four long narrow wings, lying parallel on the back in repose. Fig. 38 (1, natural size 2), fringed with very long hairs and adapted for flight (3, magnified at 4); they have six short stout legs, the first pair of shanks straw-color, feet very short, and terminated by a little gland.

They are not free from parasites, and a little white mite feeds upon them. T. MINUTISSIMA (*Linn.*) lives beneath potato leaves in the summer, and subsists upon the sap. The larvæ are ochreous and sole-shaped, eyes black, horns four jointed (5, magnified at 6). The pupæ are similar and ochreous. The perfect *thrips* is of a pale dirty ochre color, with two six-jointed horns; the lateral eyes are deep black; the trunk is elongated, the collar sub-quadrate, hinder portions broader, and to this are attached four narrow dirty white wings, which are fringed with long hairs, and folded parallel on the back in repose; the six legs are short, stout, and simple; the body is pitchy, elliptical, nine-jointed; the tail pointed and bristly (7, same magnified at 8).

THE CHINCH BUG, *Micropus leucopterous* (Say), (Fig. 45 natural size and greatly magnified) is undoubtedly one of the most pernicious insects, according to the writings of Asa Fitch, which we have in the United States. Although not confined to the southern portion of this country, its destructive habits have been most severely felt in that section. It is a small insect of coal-black color, with snow-white wing covers, which are laid flat upon its back.

They made their appearance in North Carolina, in 1783, and by 1785 had become so numerous and destructive as to cause the culture of wheat to be abandoned in some districts for four or five years and again became destructive in the same State in 1809, and probably at other times. In the Cultivator, vol. VI, p. 103, A. D., 1839, W. S. Gibbes, of Chester, S. C., describes their ravages in the wheat, oat, and corn fields, as exceedingly destructive, and was compelled to burn them, corn and all, to save the parts of fields which had not yet been attacked. The season he describes as hot and dry.

J. W. Jeffries, of N. Carolina, describes their attacks upon the wheat fields as beginning late in May and early in June, and as the wheat ripens or is destroyed by them they migrate to other fields, oats, corn, &c.,

and then to the woods, in incalculable numbers. The rapidity of their multiplication is great beyond estimation.

In 1840, the total destruction of the wheat crop was threatened, but the season became wet and the insects were destroyed and their ravages were arrested. About this time (1840—1844), they became known on the upper Mississippi by the name of "Mormon lice," as the Illinois people supposed that the Mormons were the causers of this pest as our ancestors supposed that the Hessian fly was bred by the German allies of the British troops. It was described by Dr. Le Baron, as a most formidable scourge, devastating the fields of wheat and other crops, and emitting a smell living or dead, which is most disgusting. In this section of country many fields were burnt over to prevent their spread and avoid their return another year. It was noticed to be most abundant in the south and east parts of fields, but in swampy places, the wheat or other grain was untouched. It was but little noticed in wet seasons, but three consecutive dry summers (1855), served to multiply it prodigiously. Early wheat escaped its ravages, as did the first crop upon newly broken up prairies. The grain from injured fields is light and shriveled when compared with other samples.

Various writers of the west mention or describe this insect from 1850 to 1856, and all concur, that when numerous, it is very destructive, that it first attacks the wheat fields, marching forward in the work of destruction with pretty well defined line like an army, once in a while sending out a small foraging party to destroy a small patch of wheat or other grain, besides the main line of devastation. When the wheat has been killed or cut, when it has become sapless, they march to other fields, oats and corn, which latter they are said to cover so closely sometimes, as to make the stalks look as though painted black. Wherever they go in numbers the grain dies.

These insects belong to the Hemipterous genus Rhyparochromus family hygaeidae. Length 1 2-3 lines, or 3-20 of an inch. Body black, covered by a fine grey down, not visible to the naked eye; basal joint of the antennæ honey yellow, second joint the same, tipt with black, third and fourth joints black, head brown; wings and wing cases white; the latter black at their insertion, and have near the middle two short irregular black lines, and a conspicuous black marginal spot; legs dark honey yellow, terminal joint of the feet and the claws black. The young individuals are vermillion red, thorax brown, with a white band across the middle of the body, comprising the two basal segments of the abdomen. As they increase in size they become darker, changing first to brown, and then to a dull black, the white band still remaining. The antennæ and legs are varied with reddish, and gradually change until they assume the characters of the perfect insect.

They are propagated by means of eggs, deposited in the ground, and are hatched out in the spring. They never appear like insects of other orders as maggots, but yet in the larvæ or developing state they differ much from the perfect insect.

Dry seasons favor their production—wet kills them, hence the practical deduction that drenching fields infested by them, copiously, by means of a garden or other watering engine, would afford a means of arresting their ravages, and this might be done in many situations with so little labor and expense, that the grain saved from their rapacity would amply repay for the outlay of means. There is no other feasible means of destroying them known at present, but, doubtless, Providence has placed within the reach of human ingenuity, all the means needed for the preservation of man and the works of his hands, and necessity will prompt their discovery sooner or later.

Complaints are occasionally made of the wire worm and cut worm, but a careful cultivation and a proper rotation of crops has lessened the evil produced by these insects.

A figure of the wire worm (Plate XI., Fig. 46) is given, the better to communicate a knowledge of its true character. The parent insects (2—3, Fig. 46) are familiarly known as the snapping bug, from the sound it produces when thrown upon its back in making the peculiar spring by which it regains its position. There are several varieties of the snapping bug, but the one most injurious is a brown smooth bug, which is about an inch long, and is well known to every farmer. The larvæ or worm, which is the incompletely developed offspring of the bug, is about one inch long, having six feet; it is tough, smooth and slender, and is said to continue five years before being transformed into the perfect insect, during which time it feeds upon the *roots* of wheat, barley, oats, corn, and grass. Its ravages are sometimes extensive and desolating. Newly cultivated grounds or meadows which have not been cultivated for a long time, are most infested by them, but they can be destroyed by cultivation, and if ground be fallowed and exposed to freezing during the winter, this insect, as well as the cut worm, which has often needlessly been mistaken for it, may be effectively destroyed. Plate XI., Fig. 46 (1) is the worm or larvæ wire worm; 2 the perfect male insect; 3 the perfect female insect—all of nearly natural size and general appearance. There are larger species which are not nearly so numerous and hence not so destructive as the one here described.

The Anguillula Tritici.—Among the enemies of the wheat plant the *Anguillula Tritici*, which has been described by British and Continental European writers, but which has not, so far as we know, been noticed by any American authority, deserves a passing notice in the present report. This it does because, although it has not been observed, as yet, to have produced sufficient injury to wheat crops in North America to have forced itself into notice, yet, from its peculiar nature and characteristics, it may soon become, unless agriculturists are fortified against its attacks by a knôwledge of these, a dangerous and destructive enemy.

This worm belongs to the family of *Helminthes Nematoides*, nearly all the members of which are parasites, either of plants or animals, and is the cause of the diseased condition of wheat known in England as *mildew*, and in France as *niel*, and possesses the very singular property of suffering no detriment to its vitality by complete desiccation, of any length of duration, and of being likewise unaffected by any of the narcotics or other vegetable poisons, of the alkaloid group, acting upon the nervous system, suffering immersion in these of very considerable extent of concentration of solution without injury to its vitality.

It is found, in the wheat affected, to have replaced the flour, and produces a shriveled, wrinkled grain, which, upon being broken, is found to contain a white powder, which, being moistened and examined by means of a microscope, is found to consist of numerous filiform particles, which are *anguillulæ*, or wheat eel-worms. These worms in the mature wheat, examined at any time, are always found without sexual organs, and are therefore to be looked upon as in a transitional state.

When wheat containing them is sown, they are dry, shriveled, and seemingly dead; but, absorbing moisture in the earth, they burst the covering of the grain, and, emerging, find lodgment between the leaves of the growing plant near the centre, where these are yet folded together in the form of an envelop for the forming stalk and head. Fig. 17 is a transverse, segmental section of a young stalk of wheat, magnified 100 times, showing three of the interior leaves, with two *anguillulæ* between these, as they are rolled or involuted upon each other, and by creeping among these leaves the worms find their way to the head of wheat, while undergoing that process of development which occurs previous to its "heading out." In Fig. 19, magnified 100 times, is seen a section of a young wheat stalk, upon which two *anguillulæ* (still in the larvæ state) are seen, but into the tissues of which they do not find entrance.

During the early stages of the development of the wheat-head, while the future chaff, the stamens, ovary, and pistil are yet rudimentary and composed of scales, as it were, of soft cellular matter, the *anguillulæ* find entrance into the forming grain; but, if they do not reach the head until these parts become distinct, and more consistent, they are then unable to effect their entrance at all.

Until these worms penetrate the forming grain, they undergo no change after being resuscitated by the moisture in the earth, which was supplied to them when the grain was sown, but so soon as they reach the grain their change from the larvæ or rudimentary to the adult state takes place, and they then exhibit the sexual organs,—the female is impregnated by copulation, and deposits a vast number of eggs, and, according to the law of insect existence, procreation being completed, the parents perish, while the ova are developed to the larvæ state in what would have been a wheat grain, and become desiccated when this dries at maturity, and there wait a resuscitation when the wheat is sown again in the fall. These larvæ may be desiccated and resuscitated a vast number of times without destroying their vitality, neither are they destroyed by heat which is not sufficiently great to destroy the germinating capacity of grain, nor does freezing kill them unless they are entirely surrounded by water, and they are therefore difficult to destroy, in a remarkable degree.

The injury they effect is seen in the leaves of the wheat, occasionally, which are shriveled and twisted and badly formed, as in Fig. 16, or they present the shriveled, worm-eaten appearance represented by Fig. 18, which is a magnified section of a leaf of mildewed wheat. But the principal or only real damage effected by them is in the grains attacked, which generally give lodgment to eight or ten larvæ, afterwards transformed into the perfect insect, and these deposit so many ova that the grain never contains any flour, its development being entirely metamorphosed, and its place supplied by an envelop consisting of the bran, containing the white flour mentioned, and which at the maturity of the wheat, is completely desiccated.

The appearance of a wheat-head attacked by the anguillulæ is very irregular, no one head ever having all its grains attacked; the healthy grains, with their husks or chaff, reach their ordinary development, while the diseased grains present a shriveled diminutive form, and the glumes are contorted and smaller in size than natural, as indicated in the wheat-head Fig. 16.

These parasites are peculiar to wheat alone, and their propagation may be prevented by choosing clean seed, proper screening, separating the shriveled grains, which should be destroyed by burning, or by being heated in an oven at so high a temperature as to destroy the vitality of the desiccated larvæ, or by soaking the seed wheat for twenty-four hours in a mixture of sulphuric acid one part and water 150 parts, which destroys the worm without affecting the germinating capacity of the wheat. Rotation of crops also prevents their multiplication. Care should be taken not to cast the refuse grains upon the manure piles, as the worms, by this means, find their way back to the fields again.

Experiments instituted in France, for the purpose of determining the matter, go to prove that the mildewed wheat, or the wheat damaged by the *anguillulæ*, is entirely innoxious when used as food by men or animals, but greatly lacking in its proper nutritive qualities.

Wheat may be attacked in the same head, even, by other diseases and parasites, at the same time as by the *anguillulae*, some of which may be prevented by like means as recommended to obviate the attacks of this enemy.

THE HESSIAN FLY.

When so much has been ably and carefully written in reference to the Hessian Fly, all that can be done is to collect and arrange the separate items of information upon this interesting topic, as nothing new has recently been discovered in regard to it, and we can only hope to present the present state of knowledge in a clear and comprehensive manner.

The Hessian Fly seems to have been an immigrant into this country from Europe, where it was known and described long before it commenced its ravages on this side of the Atlantic, where it first made its appearance the year 1776, and is supposed to have been brought over in the straw used by the Hessian allies of the British troops, hence its common name in this country. At all events it was first noticed in Long Island 82 years ago, and traveled inland at the rate of twenty miles annually, until it is now known as far west as Iowa and Minnesota, where wheat is cultivated.

From the most reliable information we are able to obtain, the Hessian Fly makes an attack upon particular districts, some of them very remote, and after continuing its ravages for two or three years it disappears in that district for a number of years, and then reappears; but it has rarely, if ever, attacked simultaneously the whole country in any one season, and there have been but comparatively few years in which it has not been injuriously abundant in some sections or other of the United States. Wherever it has been very destructive, late sowing has seemed to have a strong tendency to restrain and prevent its increase.

The insect, after having been called by various appellations, has at least received generally, the popular name of *Hessian Fly*, or *The Fly*, and its now well established scientific designation of Cecydomyia Destructor, and has been very frequently described by different authors with sufficient accuracy to make it recognizable by almost any of these descriptions, among which, that by the late Dr. Harris, is perhaps as accurate and reliable as any, while the following abstract of the description by Dr. Asa Fitch, of the male and female fly is so authentic that we cannot do better than give this as the standard of the descriptions of the *Cecidomyia Destructor.*

The head and thorax of the female, plate IX, fig. 39–1, 1 magnified and natural size, are black. The antennæ are about half as long as the body, and composed of sixteen joints, each of a cylindric oval form, the length being about double the diameter; each joint is clothed with a number of hairs, surrounding it in a whirl. The joints are separated from each other by very short translucent filaments, having a diameter about one third as great as the joints themselves. The thorax is oval and black; the poisers are dusky; the abdomen is of a dark color above, more or less widely marked at the sutures (joints) with twany, fulvous lines, and furnished with numerous fine blackish hairs. The ovipositor is rose-red. The wings are slightly dusky. The legs are pallid brown, the tarsi black. The several pairs of legs equal each other in length, being about one-fifth of an inch long when extended, of which length, the tarsus embrace one-half. Short basal joint indistinct.

The *male*, plate IX, fig. 39, 2–2, natural size and magnified. The antennæ are three-fourths the length of the body. The abdomen consists of seven joints besides the terminal one, which consists of a transversely oval joint, giving off two robust processes, armed with incurved hooks at the tips. In the living specimen the abdomen is of a brownish-black color, more or less widely marked at the sutures with pallid fulvous or smoky whitish lines. In all other points the male coincides with the female in its character.

The female deposits her eggs upon the young wheat leaves in September and May, between the minute ridges of the blade. They appear as minute reddish spots, and are cylindrical in shape, being about one-fiftieth of an inch in length, and one-two-hundred and fiftieth in width.

The eggs laid in the autumn hatch in a week, if the weather be warm, or two or three weeks if cold and unfavorable, and produce white maggots, which pass down the leaf, between the sheath and stem, until it reaches the first joint or crown, and remains fixed upon the stem, head downwards, fig. 39 3, until it assumes the pupa form.

The young fall wheat attacked by these maggots, wither next spring, while others proceeding from the same root will remain unaffected, and this death is caused by the nutritious juice being abstracted, from the shoot. The spring hatched maggots attach themselves to the second or third joint of the plant which is better able to resist their injurious influence. Fig. 39 *a* represents a plant withering from the effect produced by these maggots, while the stalk *b*, a tiller from the same root, is unaffected, and hence wheat which tillers well is less liable to suffer extensively than varieties less disposed to this process.

The maggots seem to live by suction alone, as they do not penetrate the stalk, and the injury they cause to summer wheat seems to be by their pressure between the leaf and enclosed stem, preventing the circulation of sap, and the deposition of silica upon which the strength of the wheat straw and its ability to resist winds, &c., greatly depends. Sometimes a swelling or gall (fig. 39–8,) is produced by their presence. Those varieties of wheat which have a naturally strong tendency to the deposition of silica and the formation of a hard flinty stalk have been found to resist the attacks of the fly best, and for the reason that they are better able to resist breaking by the winds. Moreover, tillering well, which is an indication of health and vigor in the plant, may compensate for the injurious effects of the presence of the maggot when not in overwhelming numbers, and good tillage and careful selection of seed will do much to prevent detrimental attacks of the insect.

The fall deposited egg hatches out a maggot which makes its way down the stem and is soon transformed into a dormant larvæ, surrounded by a case formed of the skin, which remains in the position marked at 3, fig. 39, a stem from which the leaves have been stripped, during the winter without undergoing any marked change. This pupa is seen magnified at 5, fig. 39. A magnified dorsal view of the active worm or larva is given at 4, and a lateral view of the same at 6, fig. 39. When spring arrives the dormant larvæ becomes transformed into pupæ or chrysalides, and after remaining in this position ten or twelve days the pupa-case bursts and the perfect insect emerges, about the time of flowering-time of the early spring flowers.

The larvæ of the Hessian fly have by their capacity to pass into the dormant larvæ condition a great power to resist extremes of temperature and atmospheric changes during the winter, how they resist like other pupa the tendency to freeze during the intense cold of our northern winters is a mystery, but that they do so may be determined by examining the partially developed pupa which will be found flexible, as is the case with the pupa of some other insects which have been found unfrozen although the temperature had sunk to many degrees below the freezing point.

The progeny of the fall fly which have passed the winter in repose upon the stalks of the wheat, in the spring become developed into the perfect insect state and then make a new deposit of eggs upon the same stalk which gave them lodgment during the winter, or neighboring ones, but upon leaves a little higher up, as the radial leaves are now more or less withered. The worm hatches, makes its way to the base of the leaf of the first or second joint, where it does not so greatly injure the plant but that it may become well developed, but a slight swelling usually points out its place of rest. Commonly, however, the stalk bends or breaks and gives a badly infected field an appearance as though a herd of cattle had run through it. The worm attains its growth about the first of June, becomes a pupa and undergoes its transformation to the perfect state and emerges a complete fly during the last of July or first of August, to recommence its depredations upon the fall wheat.

The *Cecidomyia Destructor* is subject to the attacks of numerous *parasites* which serve to moderate its multiplication very greatly. When the eggs are deposited upon the wheat leaves they are visited by a minute four-winged insect, of the *Platygaster family*, elsewhere described and punctured by it and receives a deposit of from four to six eggs of this insect within each egg of the fly attacked, and with these within and feeding upon it, passes on to the dormant larvæ state, when it dies, and these, its destroyers, at a proper season escape from its empty shell. Three other minute insects attack it in the larvæ state, of these the most common is the *ceraphon destructor* of Say, which alighting upon a wheat stalk instinctively sting through the stalk into the larvæ in their dormant state, deposit an egg which hatches to a maggot which lives in and feeds upon the worm of the fly. The attacks of these and other foes of the Hessian fly are so destructive that probably not more than one tenth of the eggs deposited by it ever arrive at maturity. The second generation of the fly, that is those hatched in the summer are seemingly most subject to the attacks of these parasites.

The means of preventing the ravages of the Hessian fly, which have been proposed and practiced are very various, but none can ever be found probably, which will entirely destroy the insect or wholly prevent its ravages, as the laws of equilibrium between vegetable and animal life are such that they cannot be set entirely aside, and we can only hope to restrain their attacks within comparatively harmless limits.

A *fertile soil*, rich in all the constituent elements necessary to a healthy growth of the wheat plant, is of the first importance. This lies within the power of the agriculturist to control by proper manuring, plowing to a proper depth, &c., and it is even supposed that the *Hessian fly* has been a benefit by compelling farmers to adopt a better mode of culture than was formerly in vogue in some places, and still is in many sections, and this improved culture has had the effect not only of lessening the ravages of the fly, but of increasing the productiveness of the better cultivated lands.

Late sowing is one of the best and easiest remedies for the fly, as it perishes before late sown wheat has made its appearance, and to avoid those accidents and diseases incident to late sown wheat proper means have been pointed out in the appropriate place, as draining, manuring, littering, &c. *Grazing*, *rolling*, and *mowing*, have been recommended as good remedies, either to remove or destroy the eggs and larvæ. *Fly-proof wheats*, that is, such varieties as tiller well and have a hard silicious stalk have been recommended, and found to offer a good means of lessening the injurious attacks of the *fly*. For a description of varieties of wheat possessing these properties, see the list of the varieties and characteristics of the plant in the preceding pages of our article upon that subject.

Soaking seed wheat has been noticed in connection with other subjects, and may be referred to here. Various materials have been used in solution, to hasten the germination of wheat particularly when sown late, and some of the materials acting as manures give the wheat greater vigor and strength to resist the effects of the *fly*. Hot *salt water*, (not hot enough to kill the germ in the grain), applied to wheat upon which a mixture of charcoal dust, guano, sulphate of ammonia, and other ingredients was used by a Mr. Pell, of N. Y., with a seemingly good effect upon the productiveness of the crop.

Oats as a decoy has been sown and then after the fly had deposited its eggs the oats were plowed in, but this is equivalent only to late sowing.

Decoy wheat patches have been sown in the middle of fields, and the flies being attracted to these, have deposited their eggs before the later sown portions of the field had grown up, and were then plowed under, but this is not a very efficient remedy in years bad on account of the great numbers of the flies.

Deep covering is not good, as will be seen by referring to where this subject is mentioned, *late shallow sowing* being equal as a remedy, and far superior for promoting the growth of the plant.

Procuring seed from uninfected districts is useless. *Sun drying* is equivalent to *late sowing.* *Sprinkling with salt lime* and other supposed remedial agents amounts to manuring only.

Burning and plowing up the stubble are good local remedies, if performed immediately after harvest, but to be of the greatest utility should be practiced in most, or all, of the infected district simultaneously. But if a wheat stubble field be twice plowed, the second plowing brings up the eggs, and many of them hatch out, and the fly is not destroyed.

Late sowed wheat is liable to the midge, rust, and smut, and to avoid all these contingencies at once, late sowed wheat should be properly stimulated to rapid germination and vigorous growth by proper soaking, shallow covering and good manuring, deep plowing, and a selection of an early ripening kind. These, with the other means pointed out, will in all ordinary years be sufficient to guard the wheat from the attacks of this one of its worst enemies.

Why this insect and many others should be more abundant some years than others, it is at present impossible to determine with certainty; but one thing is well established, that a constant and wide-spread cultivation of its favorite food, the wheat, insures it the means of subsistence, and favors its propagation so greatly that its eradication can hardly be conceived to be within the bounds of possibility, and the unknown conditions upon which depend its extraordinary multiplication in particular years, may always be so far looked for as likely to occur, as to stimulate the farmer to a constant care both as to the manner of cultivating wheat and to a rational and suitable rotation of crops, to avoid, as far as possible, any sudden increase of this pest from affecting his interests seriously. And the intelligent agriculturist will seldom suffer serious loss if he apply his knowledge to a practical use.

CECIDOMYIA TRITICI (*Red Weevil*).

The Midge, or Cecidomyia Tritici, is an insect belonging to the same genus as the Hessian Fly, and at the same time that the family resemblance is quite apparent, there are specific differences in the appearance and habits of the Hessian Fly and the Midge, which separate these two members of the same family into quite distinct species, and renders a separate description of these two exceedingly injurious insects necessary.

The Cecidomyia Tritici is ascertained to be the true cause of the failure, to such a great extent, of the wheat crop in France during the past four years, and it has, consequently, attracted unusual attention in that country, where the wheat has been found greatly deficient in well developed grains, on account of the ravages of this insect, which causes an abortion of many of the grains in a head attacked by it, leaving the grains which were not affected to mature healthily. This infertility of part of the glumes upon a head of wheat was formerly supposed to be due to atmospheric influences entirely, but this has not been a well ascertained cause, while the influences of the *midge* are well established as a definite cause of a partial abortion of the wheat heads, by destroying the fertility of all the glumes upon which it has made its attack. This assertion has been verified by very extensive observations in many departments of France.

To describe this insect, heretofore so little known, and to note its character and ravages, and means of prevention, if such there be, is an important entomological labor, and a careful examination of the whole question involved is of vast importance to every individual, as upon the existence or non-existence of the larvæ of this parasite in our wheat fields, where they may be found within the glumes about the time of flowering, depends much human comfort or misery, small as the insect is. And men whose modes of life present them with favorable opportunities for investigation of these matters of interest, should improve their opportunities for the advantage of themselves and fellow beings.

The *Cecidomyia tritici* (improperly named *wheat weevil*, by some persons: this last name is more appropriately applied to the *Calandra granaria*, hereafter to be described) is a small yellow fly, commonly called "*The midge*," which makes its appearance about the middle of June, and can be met with until the middle of July.

Towards sunset they leave the lower part of the wheat stalks upon which they had taken shelter during the day, and may be seen in myriads about the flowering time of wheat, when they sally forth during the early part of the evenings to deposit their eggs in the glumes of the wheat, just before it blooms. They remain on the wheat heads during the night, and sometimes two or three of them may be found depositing their eggs upon the same glume. They resemble common gnats somewhat in appearance, and are classified with them in entomological descriptions. The body is less than one-twelfth of an inch long, of a citron yellow, or sometimes inclined to orange. The eyes are proportionately very large, and jet black; the wings are long and transparent. The female has a long ovipositor, about the size of the thread of the silk worm, which she thrusts into the same place between the glumes of the spikelet as that from which the wheat grain is to spring, where the eggs are sheltered, hatched, and nourished. This deposit begins when the wheat head emerges from its sheath of leaves, and is terminated when the head is in bloom, after which they never deposit their eggs, as the grain will be too far advanced to furnish the larvæ their nutrition if deposited after flowering. Tardily flowering heads still continue to be attacked, and thus the process of deposit continues from the middle of June until in July.

The larvæ, when hatched, are white, but soon become yellow, and have been found in numbers from fifteen to twenty upon a single kernel of wheat, from which they derive their nourishment, and thus prevent the development of the grain upon which they feed. If the number of larvæ in a single glume be large, ten or more, the material for the formation of the grain will be entirely absorbed, but if only a small number be present, they merely divide the nutricious materials with the grain, which is then partly developed, as seen in the figure of a defective grain (figured between Nos. 14 and 24, a little to the right of the former Plate V). They begin their injurious work when the grain is in the formative stage, and continue it until the milk hardens, and they produce a livid, spotted, or faded appearance of the glumes infested by them, but this change of appearance becomes less marked as the head ripens, although the injured glumes turn yellow more rapidly than the healthy ones, as the natural humidity of a perfectly formed grain is wanting to delay the drying of the glume. The engraving between 10 and 12, Plate V., shows the larvæ surrounding the young grain.

The larvæ to attain their perfect development must reach and take shelter in the earth, and to do this they bend themselves into an arc, and like the so called skippers in a cheese, spring out and fall to the ground. Some of the larvæ remain in the heads, as exceptions to the rule, and attain a perfect development the following year after having wintered in the barn. Those which reach the earth, which they do just before or at the time of harvest, seek shelter near the roots of the wheat stalk, and burying themselves to a slight depth beneath the surface, lie dormant until the next spring, when they assume the pupa, then the imago, and lastly the perfect form, about the middle of June, as already stated, and may then be found resting on the ground during the day, whence they soar away like their progenitors of the preceeding year to propagate and destroy. When they greatly increase in any one locality, the parasites which feed upon them increase in a like or even greater ratio, and soon diminish the progeny to a safe limit again, and for the next few years they are not likely to do much harm, while some section not before, or at the time infested by them, becomes their field of destructive operation until their enemies there destroy them, and thus they alternately attack and leave unmolested different regions at different times, and those places not yet visited by it are more liable to destructive attacks in the few coming years than those where the scourge has already prevailed greatly, and where it must soon fall a victim to its natural and inveterate enemies.

If the blighted appearance of a wheat field caused by the cecidomyia were caused, as is supposed, by the weather, then there would be no remedy, and no means of predicting a failure of the crops, but such failure may be foretold by observing the numbers of the insects engaged in depositing their eggs, or a little later by examining the wheat heads to ascertain the prevalence of the larvæ. To do this, take a few heads of wheat at random, from a field, count the number of sound and affected grains, and the average of the crop may be easily calculated. The loss in some departments of France amounted in some years to one-eighth, then one-seventh, then one-half of the entire crop, particularly in early sown wheat, which the cecidomyia attacked and destroyed and were then powerless to do farther harm to late flowering wheat, as the eggs being once deposited they are done with their labor preliminary to the damage they cause.

Parasites of the Cecidomyia.—Simultaneously with the appearance of the yellow insect called *midge*, appears another quite different, being easily distinguished from it, although of nearly the same size, by being entirely black, having four colored legs, and being seen during the entire day. This insect is not as has been thought, an enemy, but is a protector of the wheat-field, being the natural enemy of the cecidomyia, upon the progeny of which its young are fed, and without which our fields would soon cease to yield us a crop of wheat at all. It accomplishes its work of destroying the eggs of the cecidomyia by thrusting its long lance-shaped ovipositor through the glumes of the grain and depositing its eggs within those of the midge, both insects being often found accomplishing their distinct missions at the same time upon the same ear of wheat, and although the destruction of the larvæ of the cecidomyia does not save the wheat crop of the current year, as these larvæ reach a development at the expense of the sap destined for the grain, yet they then perish while the larvæ of the parasite living upon them give origin to an insect in their stead not injurious to succeeding crops. If, then, the cecidomyia be abundant and the parasites few in number one year, the next crop will be very meagre, but if the parasites be very numerous then the cecidomyia will be nearly exterminated and seek a new section where it may prevail as it usually does in one place for two or three years and then fall again before the increasing numerical strength of its deadly enemy.*

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* Dr. Asa Fitch, State Entomologist of the State of N. Y., is of the opinion that this parasite (*Platygaster punctiger*, Plate IV, Fig. 11), has not yet reached America.

MEANS OF DESTROYING THE CECIDOMYIA OR PROVIDING AGAINST ITS RAVAGES.—The parasite mentioned we regard as the greatest destructor of the midge, besides which there are at least two others less common, and there is another auxilliary found in a small spider who spreads his net for the midge near the roots of the wheat stalk. But we should not depend upon these means alone to cure the evil where it exists, or prevent its invasion of new territory. The ravages of the insect are very unequally great in different years, and this is owing, doubtless, to some definite cause or set of causes, which we should endeavor to learn, and by which we might, perhaps, modify to our great advantage. And all the habits and transformations of the insect and attending circumstances being carefully noted may lead us to a knowledge of these causes.

When the eggs are deposited in the glume we can do nothing for the present harvest, but a preventive of future evil may be learned perhaps from entomologists. When the larvæ reach the ground they penetrate only to a short depth and changing into a chrysalis state lie there during the winter, unharmed by the frosts, but a deep plowing would turn them so far under that they would mostly perish and then the wheat crop might be drilled in so shallow as not to turn them up again. Again, entomologists know that a hot sun and dry atmosphere are fatal to chrysalides, and a repeated light harrowing of the ground which contains these larvæ would expose vast numbers of them to this cause of destruction. Mineral manures might also be found very efficacious as a means of their destruction. Mr. Paul Theward of France, has succeeded in destroying the Eumople or vine-hopper by an application of oil cake, of Colza and rapeseed powdered we believe, and prepared in a particular manner, but not heated in its preparation above 212° of Fahrenheit, would not this prove an efficacious remedy for the *midge?*

Burning the stubble fields destroys vast numbers of the larvæ. Would not lime, oil-cake as mentioned above, or other substances which would act in the double capacity of a manure and a poison to the insect be found beneficial, if applied at the time they emerge from the ground which, as

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I have failed to find them myself, but have reason to believe that they are in Ohio This belief is based upon the following ascertained facts: In a circular of queries, issued from this office, soliciting statistical and other agricultural information, addressed to County Agricultural Societies, was the following question:

"*Does the midge appear to increase in numbers for* 3 *or* 4 *years, and then suddenly disappear?*" To which forty counties answered in the affirmative. In the same circular was the question, "*What is color of, and how many wings has the insect which you call the midge?*" Several counties replied "*color,* black—*wings,* four—two large and two small." Several replied, 'steel blue wings."—[*Klippart.*]

is well known, takes place about the middle of June by destroying them before they deposited any of their eggs.

As the cecidomyia is ephemeral in its nature, being developed to the perfect state only to deposit its eggs and die, one means of preventing its ravages is to hasten the growth of wheat so as to pass the stage of growth at which the midge attacks it, and it then becomes a harmless insect. Another means recommended in France is to fish for them with fly nets, such as used by entomologists in making their collections and vast numbers might thus be caught and destroyed. Evening is the time for a successful application of this means. Being nocturnal in their habits they might be attracted like other nocturnal insects, and thousands of them be destroyed by torches carried through the fields. Lime sprinkled upon the wheat just as the heads were emerging from their sheaths,* and fumigations by means of fires around the fields, impregnated with materials to produce an offensive and dense smoke have been tried with some success. Frequent changes of the time of seeding may be found very advantageous as by this means the ravages of cecidomyia may be measurably prevented, by bringing the flowering time of the grain to a season too early, or too late for the midge. Each locality must regulate this change of seed time according to the season of the attack by the midge in such district which season should be carefully ascertained, and then late or early sowing, or sowing late or early ripening wheat, will anticipate or retard the cecidomyia and prevent its successful attack.

There are some important considerations as to the time when the cecidomyia should be destroyed, whether as a perfect insect, larvæ, or pupa, and it appears reasonable, that when the parasites of the midge are abundant, that the larvæ should not be destroyed, as the vast majority destroyed really contain the larvæ of its worst enemy and the agriculturist's best auxilliary. So that destroying the larvæ does more harm than good. But if the parasite has not yet increased to such a number as to make their preservation a matter of importance, then destroy the larvæ as thoroughly as possible. This remark applies also to caterpillars, and other noxious insects.

Omitting the culture of wheat throughout an infected district for one or two years, and cultivating instead some other crop, is a safe and certain remedy, and one which, in case of necessity, may and in all probability must be practiced. Variety of wheat has but little directly to do with prevention, as all varieties are subject to attacks by this insect; but a

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* This has been practiced in several instances which have come to my knowledge, but I believe in every instance the man that sprinkled the lime died from the effects of it.—[*Klippart.*]

change from late to early varieties may, as already mentioned, be found sometimes advantageous.

History of the Cecidomyia.—We have only room to glance at the history of this important insect, which has not been satisfactorily described and classified by naturalists until at a comparatively recent date. In France, until within a few years, it has been but rarely observed, although known in Germany, Switzerland, &c., somewhat earlier. But in these countries it has become only too well known since 1846. In England it was known and described as early as 1771, by Gallet, as one of the worst enemies of the wheat field. In that country its ravages were estimated at a loss equal to $100,000 in certain counties in 1827; $150,000 in 1828; and $180,000 in 1829; and Scotland and Ireland were not exempt from it. It was observed in the United States in 1820, and in 1828, 1829, and 1832, it attracted particular attention by its terrible ravages. In the State of Maine alone it has caused a loss of a million of dollars in a single year; and wherever it has prevailed its destructive powers are almost beyond calculation; there are but few sections in the Union where wheat is cultivated which have not been visited by it, in greater or less number.

Authors differ somewhat concerning the habits of this insect, the number of larvæ deposited in a single grain or upon a single head, &c., but this is because observations have not been equally carefully conducted, or perhaps so long continued by some as by others. Some suppose the larvæ to wait until a damp season to reach the ground by crawling down the stalk; others have observed its skipper-like action, and these rightly conclude that it is not the state of the weather but the stage of development which determines their descent. Some lay great stress upon the destruction of the sweepings of barn floors to destroy the larvæ, as they suppose that they continue in the wheat until threshed. This measure is certainly proper when many larvæ are thus found, but they do not thus remain in the wheat, other than as exceptions to the rule, because as a general thing they descend about the time the harvest is ripe, as already mentioned. Asa Fitch says they deposit from six to ten eggs upon a single grain, and sometimes attack other graminæ besides wheat, but the French authorities we have consulted do not record such an observation, although they agree with him as to the number of eggs.

The name of the insect is a matter of importance, as by establishing one name definitely in its entomological description, confusion will be avoided. *Cecidomyia Tritici* seems to be a fitting appellation.

The *female cecidomyia* is about two millimetres long. Eyes black, occupying more than two-thirds of the head, separated by a yellowish line.

Thorax and abdomen of a lemon yellow, sometimes orange. The abdomen is terminated by a retractile ovipositor as long as the body, not visible in the ordinary state of the insect (Fig. 9, Plate IV). Claws long, yellowish. Antennæ composed of elongated joints, strung together like beads, upon a very fine connecting filament. These joints are flattened and somewhat hour-glass-shaped, twelve in number, without counting the joint of attachment, these first being the longest, as though composed of two soldered together; they are armed with long hairs. The wings are transparent and ciliated, particularly at the borders. Figs. 9 and 10 give a good representation of their appearance. A question of importance in the description of this insect, yet undetermined, is whether there be a little transverse nervure besides the longitudinal ones, connecting the post costal nervure to the side? This question is important, because upon its answer may depend a distinction of varieties or species, and hence differences of habit and mode of prevention, &c., &c. Mons. Bazin, a French authority consulted by us, is of opinion that, in his country, such transverse nervure exists, and is best marked in the male (Fig. 10, Plate V).

The male cecidomyia is more rare than the female, and is distinguished by a shorter body, absence of the ovipositor, and less intense color. The thorax and abdomen are yellow-brown; wings slightly tinged with black, and have the nervures more distinctly visible. The antennæ differ. The joints are less elongated, spheroidal, thirteen in number, the first one in the female seeming to be made up of two joined into one. In the description of the male there are also differences among authorities, for the reason before stated, and further observations are required to make the characteristics of this insect well known. For figured representations of this insect and its parasites, which have been already described, the reader is referred to Figs. 9, 10, and 11, Plates IV. and V.

Parasites of the Cecidomyia Tritici.—We have said that several kinds of parasites attack the Cecidomyia Tritici. One of them, found as entirely in an exceptional state, is the *macroglenes penetrans*, (page 525.) As to the other two Hymenoptera, we are under obligation for their determination to the extreme politeness of M. Dr. Sichel, president of the Entomological Society of France, distinguished alike as an entomologist and as a physician.

Note of Dr. Sichel upon the hymenopterous parasites of the Cecidomyia Tritici arranged by M. C. Bazin.

The small hymenopterous parasites of the Cecidomyia Tritici, both belong to the family of *Oxyures* of Latreille, or the *Proctotrupides* of

Stephens and of M. Westwood, sub-family of the *Platygasterides* of M. Westwood, genus *Platygaster* of Latreille.

The first of these little insects, that which M. Bazin has found so numerous that he regards them as existing in myriads, is the *Platygaster punctiger*, fig. 11, plate IV. Nees d'Esenbeck (Hymenopt, Ichneumonibus, affin, II., p. 307, No. 15.) It belongs at present to the genus *Inostemma* of M. Walker, a genus which is distinguished by the submarginal nerve terminated at its extremity by a little disk, a character perfectly expressed, (fig. 11.) This figure is, in general, conformed to the insect which I have placed under the microscope, and to the description given of it by M. Nees.

M. Nees assigns very hesitatingly six articulations to the antennæ, but examination under the microscope, leaves no doubt upon this point. After the scape, very long and somewhat large at its extremity, comes a pedicle, short and somewhat large, then four very small joints, and then four other very large, which form the club, but in the individuals which are very old and dry, which I have under my eyes the limits of the joints, are most frequently indistinct and recognizable only by a very strong enlargement, which explains to me the hesitation of M. Nees. M. Fœrster, according to a letter communicated by M. Bazin, has made of this species the type of a new genus which he calls *Isostasius;* as he does not indicate the essential characters of this genus, and as I have not at present at my command any other species of the genus *Inostemma*, I cannot decide as to the correctness of this new generic distinction.

The second of these little hymenoptera is the *Platygaster scutellaris*, Nees. Although M. Bazin has only transmitted tc me three individuals, very dry, which I have not had time to soften and stretch out, they suffice perfectly to display the specific characters: reddish or russet feet, antennæ almost entirely russet, having a club somewhat perfoliated of four joints, like fig. 14, plate V—the shield or corica prolonged into a long spine, very broad at its base, and very pointed at its posterior extremity. The three individuals which I have under observation appear to be females, but I cannot pronounce with certainty in reference to this. I intend examining anew, with more exactness these two parasites, during the coming summer, when M. Bazin shall have furnished me more recent and numerous individuals.

As regards the insect which are represented in figures 11 and 14, and of which there has been transmitted me an abdomen dried and deprived of legs and wings, and partly covered by a viscid matter, I have postponed an examination of it until I shall have fresh and entire individuals. It is the abdomen of the *Platygaster inserans* of Mr. Curtis, according to the drawing of that author, that is of the female *Inostemma punctiger* of Nees; for M. M. Bazin and Miqueaux, found it before the mutilation of the individual, conformed to fig. 11. It has been impossible for me to resolve this qestion myself, hitherto, as I neither have fresh individuals of the female of this insect having the sting protruding, nor yet the work of Mr. Curtis.

SICHEL D. M.

PARIS, April 20, 1856.

WEEVIL.

After all the toil of the husbandman to produce a crop, and store it for future use, he may see his prospects blasted by a number of enemies robbing him of the products of his labors, and among these deserving especial notice is the

CALANDRA GRANARIA, (*granary Weevil,*) one of the most destructive insects which live among stored corn and malt. About April, or as soon as the weather is warm enough, the beetles pair, after which the female burrows into the corn heaps, and pierces a minute hole with her beak, in a grain, Fig. 27, 3 or 4, Plate VII, laying an egg in each, until they are all deposited, which often is not until the approach of autumn. The maggots soon hatch, and feed upon the flour until the husk alone is left, each grain supplying sufficient nourishment to bring its inhabitants to maturity, when it changes to a pupa, (Fig. 27, 1) and in about six or seven weeks from the time of pairing, the perfect weevil is hatched, and eats its way out of the grain.

Unless the weevils are seen walking over the corn, it is difficult to detect their presence until they have been at work some time, and the holes of their exit become visible in the empty grains, (Fig. 27, 4.) On throwing a handful, however, upon water, their operations are manifested by the floating kernels. The grain weevils cannot endure cold, being natives of more southern regions; and, consequently they desert the grain heaps on the approach of winter to seek a warmer abode in the chinks of walls and crevices in beams or floors, &c., so that if the old stock of grain be then removed, unless the weevils be ejected or destroyed, they are ready in the spring to commence upon fresh samples of any sort of grain, although they give preference to barley and malt. Corn, however, sometimes suffers greatly from their inroads, as well as wheat and oats.

Of course the eggs are extremely minute; the maggots have no feet, are white and fat, with horny ochreous heads, armed with little jaws; the pupa is of a transparent white, disclosing the members of the future weevil through its clear skin.

The beetle is one of the Curculionidæ, and is appropriately named *Calandra granaria.* It is nearly two lines long, (Fig. 27, 5) magnified at (2) smooth, shining, a little depressed, and varies from a dark chestnut to a pitchy color; the head is furnished with two small black eyes, and narrowed before into a proboscis, which is shortest and thickest in the male; at the apex are placed the jaws and mouth, and before the eyes it is a little dilated, where the slender elbowed horns are attached, these are nine-jointed, and terminated by a little ovate club; the thorax is large and narrowed before to receive the head; it is coarsely and thinly sprinkled with oval pits; the wing cases are short and oval, with eighteen deep and punctured furrows down the back; it has no wings; the six legs are short and stout; the shanks are hooked at their extremities; the feet are bent back in repose, being four jointed, the third joint heart shaped, fourth furnished with two claws.

C. Oryzæ, the rice weevil, is another species not less destructive abroad, especially to the rice of the East Indies, to wheat in the southern states of Europe, and to the corn of Guinea. Fortunately, our climate is too cold for them, so that it is doubtful if they breed in Ohio, although the beetles are no uncommon inhabitants of rice, &c. Its transformations are similar to those of *C. granaria*, but the weevils are rather shorter and not so smooth, they vary from an ochreous or golden color to chesnut or pitchy, according to the age; the eyes are black; the thorax is rough, with strong crowded punctures, the wing cases are broadest at the base, with rows of punctures down the back, forming ridges; in the dark specimens, four large paler spots are very visible on the back, two at the base, and two towards the tail. It has a pair of ample wings folded beneath; the legs vary but little from the foregoing species.

A minute greenish wingless insect, allied to *Meraporus graminicola*, infects the maggots or pupa of these weevils, and preys upon them.

MERAPORUS GRAMINICOLA (or an allied species of *Chalcididæ*) is parasitic on the larvæ of the rice weevil, *Calandra oryzæ.* It is only two-thirds of a line long, and like a minute ant, but of a glossy blue-black color; head hemispheric, with an eye on each side, and two short horns in front; thorax oval; abdomen elongate conic; wings none or rudimentary; six legs, stoutish and ochreous, with brown thighs.

No better remedy for the weevil is practicable than to omit storing grain in granaries infested by them, for one or two years, until these insects have perished or emigrated. Perhaps fumigation with burning sulphur might, where practicable, be found a good remedy.

GORTYNA ZOÆ, Fig. 40, Plate IX.—At the reaping and mowing trial held by the Board at Hamilton, Butler county, July 1, 1857, we found an insect affecting the Barley. In July, 1858, we found the same insect affecting the wheat in the vicinity of Columbus. In appearance it resembles the common spindle worm *Gortyna Zoæ*, (and for that reason have given it the above name, trusting that some competent entomologist will furnish the proper name) but if fully grown is considerably smaller. The cut is a correct representation of the living insect and of the normal size. It has sixteen legs, the first pair of pro-legs being rather smaller than the others. The color is a brownish black, the head and first segment yellowish white, with a blackish lateral stripe. The third segment has five white stripes; the lower part of the abdomen being of the same color. The antennæ are very short and hair like—the jaws brown—the pectoral legs are black, and the pro-legs white. In mode of progression this caterpillar resembles the Geometræ, bending itself in the form of an arch, but the presence of ten pro-legs separates it from that family. It is no doubt closely allied to the spindle worm, and may belong to the same genus. Not having seen the moth we have no means of knowing whether the transformation to a pupa is undergone in the stem of the plant or in the ground.

Besides the noxious insects described there are many others which future observations will bring more prominently into notice, but many of which are, at present, too little known to enable us to give reliable information concerning them, and we will close this description by merely reminding the Ohio agriculturist that all the labor which is bestowed upon a practical study of entomology will be amply repaid by the increased ability to cope with the annoying and dangerous enemies to human happiness, which the seemingly insignificant bug, beetle and fly, may prove to be.

NOTE 1.

Mr. Klippart: At your request, I will give you a short description of a few plants observed by me on my route to California, overland:

First. In the valley of Carson's river, just east of the Sierra Nevada, we passed through large fields of what seemed to be common beardless wheat, just ripe for the harvest, but upon examining this wheat carefully, I could not find anything but a very shriveled berry, smaller in diameter than a wheat berry, but in other respects very similar to the poorest berry screened from the wheat in our mills.

Second. In many places I saw specimens of oats, ripe and full, which I could not distinguish from the better varieties of our common cultivated oats.

Third. I found flax in blossom resembling, in all essential particulars, our cultivated flax, but not quite so high.

Fourth. In California I found frequently a plant like a diminutive bearded wheat stalk, but covered by a downy or woolly cuticle, while the wheat stalk is smooth, or nearly so. This plant presented several varieties, all diminutive when compared to wheat, not being more than ten or twelve inches high, but having a better developed berry than the wheat-like plant of the other or eastern side of the Sierra Nevada, and these diminutive plants I have since thought to be species of Ægilops. And my opinion always has been, that by cultivation, they might be brought to such perfection as to supply the place of, if they did not prove to be wheat.

Besides these mentioned, I observed many other plants, either just like our common cultivated plants, or like these would be if left to chance for propagation, and become degenerated; and the idea presented itself to my mind, that most probably the regions of country in which these were found, now almost without an inhabitant, had formerly been inhabited, and that these various plants had been left to themselves by the removal or extirpation of a former agricultural people, and had, in the lapse of ages, become degenerated for want of man's fostering care.

C. E. BOYLE.

BEE CULTURE.

Bee culture has received much less attention at the hands of agriculturists and others, than its importance really demands. This apparent neglect may be attributed to several causes, prominent among which is the difficulty of securing the colony of bees from the depredations of the moth. Another cause may be found in the belief entertained by many that bees can no more endure the progress of civilization than the deer, elk, or bear—that they flourish best on the frontiers of civilization, and that savageism on the one hand, and refinement on the other, are alike fatal to them.

But there has not been wanting in almost every community those who have made bee culture a prominent study: evidence of this fact may be found by referring to the Patent Office report for 1856, in which it is stated that the patent on thirteen different kinds of hives expired during that year, and that four new kinds were patented.

The public had almost despaired of ever learning of a hive which, whilst it would be acceptable to a colony of bees, at the same time could subject all its operations to the control of man. But such a hive has finally been invented, and is now received with the greatest enthusiasm by all apiarians who have tested it. Mr. Richard Colvin, of Delaware, O., has introduced this hive into central and southern Ohio; a cut of it is given on Plate XII. of this report; by it the apiarian has the entire control over all the combs—any or all of the combs can be taken out at pleasure, without injury to the combs or enraging the bees the least.

This advantage alone is of great importance. Every apiarian knows when this is accomplished all other difficulties at once vanish.

It permits all necessary operations to be performed without injuring or killing a single bee.

It gives the power of inspecting *all* the operations of the bee, and at all times ascertaining their precise situation.

It is adapted to swarms of all sizes, being made large or smaller at pleasure, in a moment. The combs can be moved without any jarring;

combs can be given to the bees to fill again. The whole or a part of a comb can be removed at any time.

It furnishes the greatest possible security against the ravages of the bee moth.

It offers facilities for feeding bees in either cold or warm weather.

It admits the safe transportation of bees any distance.

It allows the surplus honey to be taken any time, in the most convenient, beautiful and saleable forms.

All the good honey can be removed, and an inferior article supplied in its place.

It is either a swarming or a non-swarming hive, at the pleasure of the owner.

It enables the apiarian to *multiply his stock at pleasure.*

Queenless stocks can be supplied with queens without any difficulty.

The hive can be made by any person able to handle tools, being very simple in its construction.

There are many more advantages of at least equal importance with those enumerated. Every lover of the bee and its products will rejoice that the time has arrived when the management of the bee has become so entirely simplified, that all the former difficulties and perplexities are at once done away with.

We have had several of these hives in use over a year, and know from personal experience that all claimed for it as above stated, is no exaggeration.

The following, from an extensive apiarian, is worthy the attention of all interested in bee culture:

East Cleveland.

J. H. Klippart, Esq.—

Dear Sir: I wish to call your attention to the importance of bee culture, hoping you will call the attention of the Board to the subject, and that they will be induced to give more liberal premiums for its encouragement.

There is far more interest felt on the subject than for some years past. The severe winters and the ravages of the moth have been reducing the numbers raised, so fast, that till the introduction of L. L. Langstroth's movable frame hive, it was felt that nothing could be done to save them. This hive rendered the multiplication of swarms certain and rapid; enabled the keeper to clean his hives, and thus to prevent the ravages of the moth, so that we may now expect a rapid increase rather than a decline in their numbers, and that soon they will be so multiplied as to be able to gather those vast stores of honey which have hitherto been lost.

It may perhaps be thought, by those who have not examined or reflected upon the subject, that I am extravagant when I say that more than one hundred tons of honey are lost annually in each and every county in this State, simply for the want of bees to gather it. You may increase the number of swarms to more thousands than there are now fifties to the square mile, the State over, and you will find no difference in the amount each family will accumulate. There were one or two honey dews in this vicinity the last summer, which unquestionably deposited one ton of honey to the one hundred acres.

The White-wood or Tulip Tree affords a large amount of honey; the white clover also; and the Linn Tree affords the greatest quantity, and the best in quality. The Yellow Willow also is equally valuable, and were our highways, the banks of our streams, and our broken and waste lands appropriated to these trees, so rapid in growth and easy of production, the country would be beautified, and made comfortable to man and beast, in addition to the other objects gained.

E. T. STURTEVANT.

The following contains some good suggestions:

MOTHS.—To prevent the ravages of the moth, and also to get the greatest amount of honey, I keep strong colonies. I have never known a hive that has been kept well filled with bees, to be materially injured by the moth; but weak swarms frequently are.

Security against the moth is not the only advantage to be derived from full swarms. They do better through the winter, and with less honey; and in the spring, when many are necessarily employed in taking care of the young brood, others will be bringing in their stores, for this is the best time in the year for making honey. Here lies the secret of getting large quantities of honey from single hives.

A SUBSTITUTE FOR HONEY.—I take three parts of white sugar dissolved in water; heat it over a slow fire until the scum rises; skim clean; take it from the fire; then add one part of strained honey, and stir together.

Brown sugar can be used instead of white, if preferred, as above directed.

The flavor of the above preparation may be changed to suit the taste, by adding a few drops of essence of anise, or any other essence desired.

D. B. KINNEY.

OBERLIN, Lorain Co., O.

EXPLANATION OF THE MAPS OF MEAN DISTRIBUTION OF SPRING, SUMMER, AND AUTUMN RAINS, AND WINTER AND ANNUAL PRECIPITATIONS.

An elaborate essay on the climatology of Ohio has been prepared expressly for this report, by a competent person, but it was placed in my hands entirely too late for publication. It will be published in the Report for 1858, together with the tables from which these maps were compiled.

I have, under these circumstances, deemed it proper to state only, that the figures inserted on the five maps indicate the amount of rain and melted snow, in inches.

On the map of mean distribution of Spring Rains, the counties of Hamilton, Butler and Warren are more darkly shaded than any other counties on that map, and in Warren county is inserted "13," indicating that the aggregate amount of rains precipitated during the months of March, April and May, during a series of years, averages 13 inches in those counties. During the same period, 5 inches only was precipitated in Logan, while 8 fell in Clark, and 11 in Champaign. On the entire right bank of the Ohio River, from Wellsville, in Columbiana county, to Ironton, in Lawrence county, 10 inches were precipitated; while in Williams, Fulton, Lucas, all the northern portion of counties bordering on the lake, to Painesville, in Lake county—Geauga, Portage, Mahoning, Columbiana, Carroll, Tuscarawas, Harrison, Guernsey, Noble, Morgan, Athens, Vinton, Jackson, Lawrence, and portions of adjoining counties, 6 inches only were precipitated.

On each of the maps the *field* of rain is indicated by the shading. The precipitations during June, July and August, are called the Summer Rains; during September, October and November, the Autumn Rains; during December, January, and February, Winter Precipitations, and include the rains proper, and the snows melted; and the water thus obtained form the snow, considered as rain in the estimate of depth.

The map of mean annual precipitations is based upon the average amount of rain and snow precipitated throughout the several fields during a series of years. Thus, the annual average amount of precipitation in Logan county is 31 inches per annum, in Clark, 42, in Champaign, 45, Warren, 48, &c., &c.

The cause of the unequal distribution is the topic chiefly discussed in the essay above referred to.

With this explanation the intelligent reader can obtain an idea of the comparative value of the maps. (See page 61.)

STATEMENT of the number of acres sown, and bushels of Wheat raised, and of acres planted in Corn, and bushels raised, in the several counties of Ohio in 1857, as reported to the Auditor of State in 1858.

COUNTIES.	WHEAT.		CORN.	
	ACRES.	BUSHELS.	ACRES.	BUSHELS.
Adams	33,461	381,653	33,896	1,073,956
Allen	13,240	200,036	29,341	679,744
Ashland	20,623	306,562	18,856	696,467
Ashtabula	5,183	34,838	9,620	327,391
Athens	24,915	318,151	23,164	854,324
Auglaize	10,394	106,296	17,847	537,460
Belmont	37,686	403,566	32,384	1,330,403
Brown	34,749	479,882	39,138	1,350,769
Butler	42,396	789,569	56,383	2,696,597
Carroll	22,462	208,764	11,954	401,637
Champaign	34,979	406,164	37,880	1,475,670
Clark	31,315	420,780	30,914	1,222,009
Clermont	34,738	557,757	38,569	1,425,540
Clinton	27,908	444,528	38,980	1,402,003
Columbiana	23,646	305,824	16,453	503,856
Coshocton	25,816	182,552	38,906	1,442,972
Crawford	14,250	208,279	24,800	861,039
Cuyahoga	2,987	36,845	10,512	369,194
Darke	36,136	495,212	33,331	1,174,368
Defiance	6,549	76,883	9,458	304,312
Delaware	13,670	158,807	34,639	1,445,316
Erie	6,218	118,181	20,439	601,713
Fairfield	38,705	582,137	49,630	1,858,862
Fayette	15,542	258,920	48,611	2,257,752
Franklin	28,045	443,641	62,934	2,665,661
Fulton	5,449	73,335	9,308	276,798
Gallia	28,938	404,173	19,480	645,468
Geauga	3,823	43,322	6,687	217,144
Greene	34,189	537,041	37,471	1,592,590
Guernsey	25,939	176,483	22,651	746,361
Hamilton	19,958	380,224	31,928	1,172,831
Hancock	15,520	234,914	22,290	594,561
Hardin	8,125	107,418	16,254	512,158
Harrison	19,040	190,666	17,461	702,270
Henry	2,770	55,955	6,120	178,573
Highland	48,485	756,571	53 554	2,022,213
Hocking	22,639	284,120	16,865	560,828
Holmes	22,258	309,300	18,214	572,319
Huron	12,745	237,655	31,767	897,100
Jackson	18,212	220,973	19,000	533,841
Jefferson	21,795	205,987	15,562	583,940
Knox	18,300	232,633	33,640	1,216,205
Lake	4,304	41,571	6,437	238,348
Lawrence	12,081	168,724	17,393	553,244
Licking	28,323	289,942	48,156	1,944,390
Logan	23,194	209,459	29,223	1,081,369
Lorain	4,206	73,066	11,977	410,705
Lucas	2,490	43,527	6,131	198,444
Madison	9,711	117,739	36,410	1,541,601
Mahoning	12,593	171,961	12,265	422,876
Marion	8,704	128,872	34,074	1,365,109
Medina	11,575	175,355	14,929	743,624
Meigs	22,044	338,270	15,285	547,689
Mercer	13,968	159,245	17,251	543,845
Miami	33,269	457,936	42,117	1,631,301
Monroe	29,538	411,724	20,034	598,384
Montgomery	21,685	625,015	37,306	1,569,125

STATEMENT—*Continued.*

COUNTIES.	WHEAT.		CORN.	
	ACRES.	BUSHELS.	ACRES.	BUSHELS.
Morgan	32,155	355,510	21,645	842,857
Morrow	10,895	156,567	23,531	817,874
Muskingum	42,225	324,011	39,512	1,469,595
Noble	22,175	287,037	22,612	793,998
Ottawa	2,089	31,581	3,685	120,459
Paulding	1,395	12,897	3,883	116,674
Perry	27,656	309,377	21,054	674,266
Pickaway	34,119	531,442	72,188	3,409,177
Pike	13,400	164,321	27,715	1,050,976
Portage	16,245	232,952	11,371	620,038
Preble	42,634	670,484	39,210	1,420,901
Putnam	6,698	92 573	17,089	467,610
Richland	24,747	335,636	25,216	746,842
Ross	41,100	666,000	74,114	3,397,188
Sandusky	11,382	177,508	16,991	403,991
Scioto	14,972	253,623	24,767	949,069
Seneca	30,296	432,651	27,271	747,423
Shelby	16,230	180,425	21,680	695,603
Stark	51,419	997,790	21,791	751,120
Summit	20,496	374,641	11,142	307,979
Trumbull	8,499	97,356	12,294	439,247
Tuscarawas	36,332	390,435	25,649	948,521
Union	11,105	123,004	32,413	1,203,610
Van Wert	6,439	91,403	9,434	291.636
Vinton	13,463	148,148	14,587	450,898
Warren	34,735	603,095	43,206	1,834,777
Washington	35,152	513,833	22,646	719,561
Wayne	37,952	650,280	24,685	824,871
Williams	9,012	101,973	11,241	345,440
Wood	5,141	81,849	14,462	388,487
Wyandotte	11,490	154,203	21,389	733,530
Total	1,823,147	25,397,614	2,254,424	82,555,186

ERRATA.

Page 20, top line, read *three* million *eight* hundred thousand.

Page 76, third line from bottom, read *quantity* instead of *quality*.

Page 109, fourth line from top, read *practiced* instead of *practical*.

The author of the Prize Essay on Insects beneficial to the Agriculturist, requests that wherever the words *larvæ* or *larvæs* occur in his production, that they be read *larve* or *larves*.

Page 517, fourteenth line from bottom, read *food* instead of *ford*.

Page 520, tenth line from top, read *chalcis* instead of *chalris*.

Page 523, second line of third paragraph, read *Lecontii* instead of *Leconter*.

Page 576, thirteenth, twenty-first, and twenty-sixth lines from top, read *awns* instead of *arms*.

Page 577, eighth line from top, read *was* for *were*.

Page 578, sixth line from top, read *every* for *very*.

Page 579, thirteenth line from bottom, read *four* instead of *from*.

Page 592, twelfth line from top, read "investiga*tors*" for "investiga*tions*."

Same page, read *diastase* for *diastaste*, wherever it occurs.

Page 603, seventeenth line from top, read *mussel* instead of *muscle*.

The note on page 669, is from Liebig's Agricultural Chemistry.

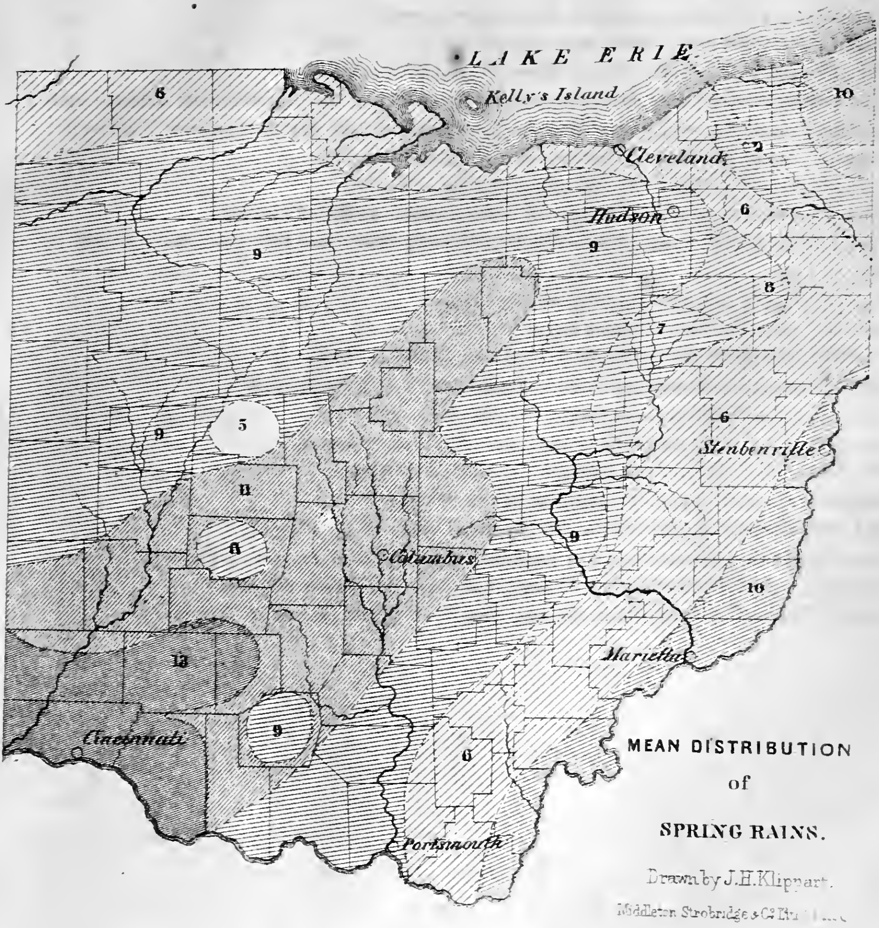
Page 683, ninth line from top, read *Ohio* instead of *Oho*.

Page 690, fifteenth line from bottom of page, read *Plate VI* for *Plate —*.

Page 691, ninth line from bottom of page, read *Page* 614 *et seq* instead of *Page —*.

Page 737, eighth line from bottom of page, read *Page* 700 instead of *Page —*.

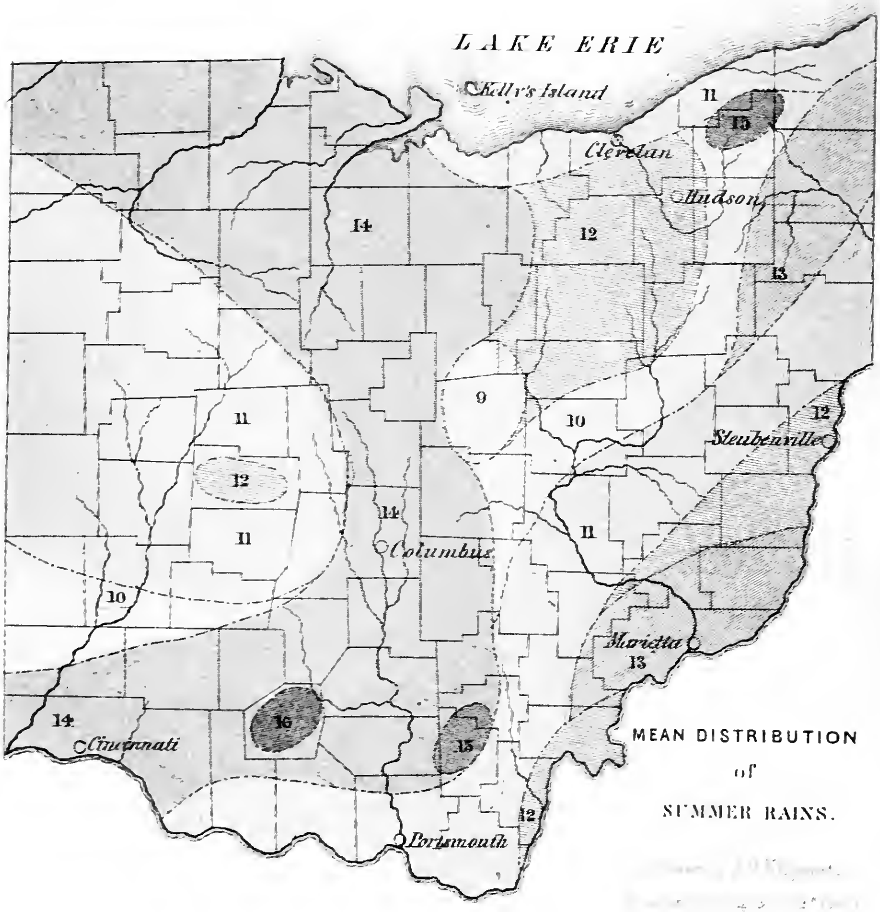
Page 752, ninth line from bottom of page, read D. P. *Egbert* instead of *Eghert*.



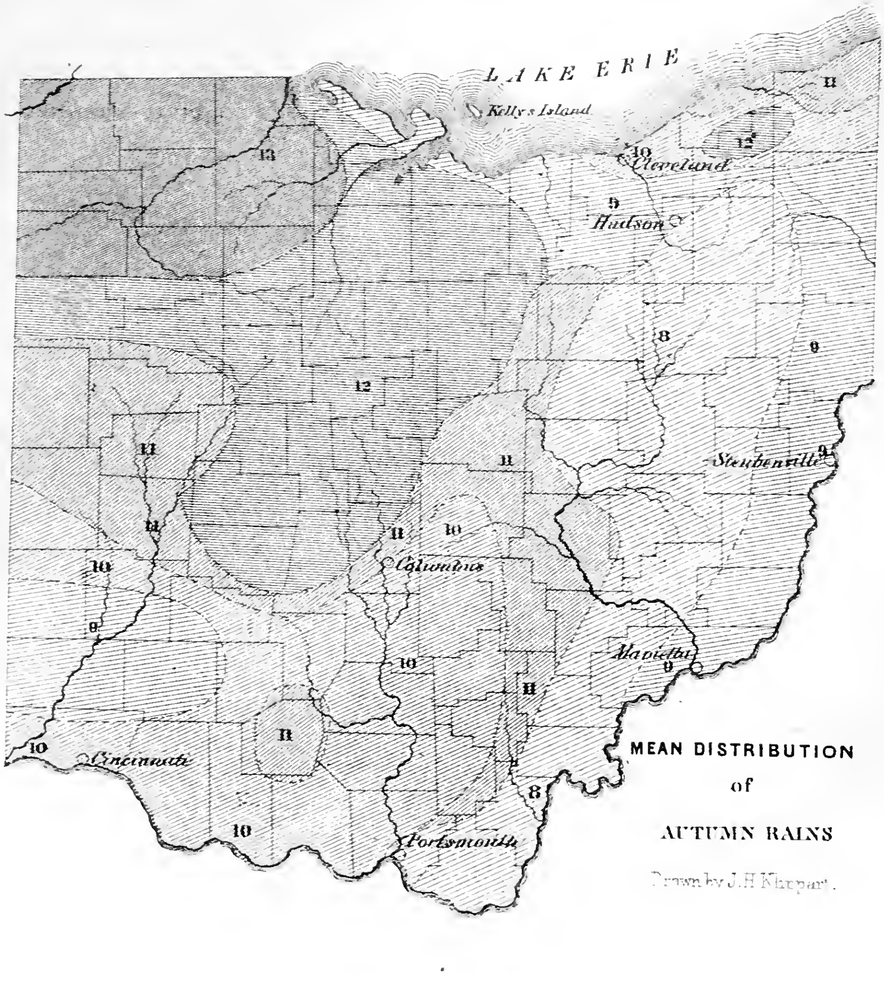
MEAN DISTRIBUTION
of
SPRING RAINS.

Drawn by J. H. Klippart.

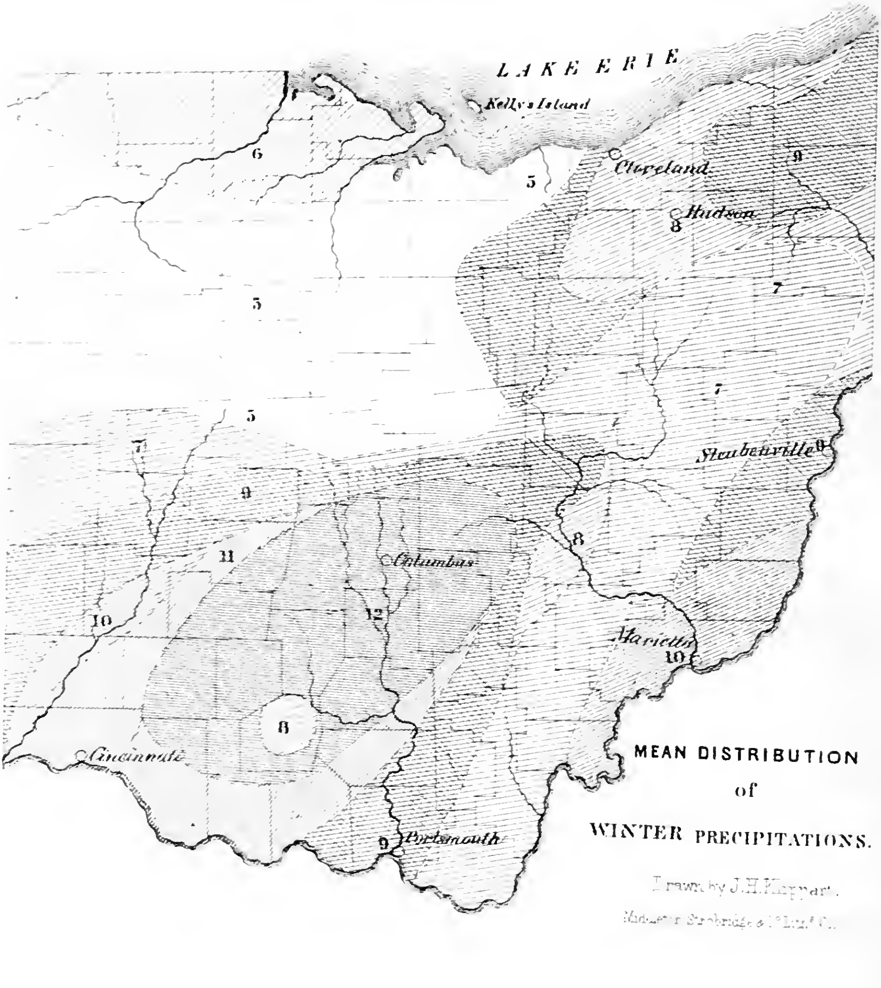
Middleton Strobridge & Co. Lith.



MEAN DISTRIBUTION
of
SUMMER RAINS.



LAKE ERIE
Kelly's Island
Cleveland
Hudson
Steubenville
Columbus
Marietta
Cincinnati
Portsmouth
13
12
11
10
9
8
MEAN DISTRIBUTION
of
AUTUMN RAINS



MEAN DISTRIBUTION
of
WINTER PRECIPITATIONS.

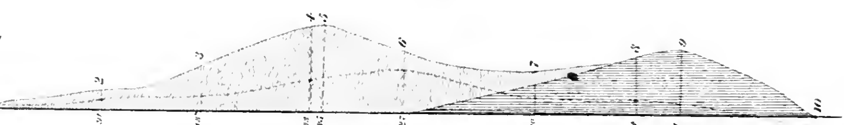
Drawn by J. H. Klippart.

Middleton Strobridge & Co. Lith. Co.

MEAN ANNUAL

PRECIPITATIONS.

I



Ideal Section from Michigan State line to Cincinnati.

II

Ideal Section from Indiana Stateline to the Ohio River at Wheeling.

III

Ideal Section from North Eastern Ohio to Ironton on the Ohio River in Lawrence C°

Plate I.

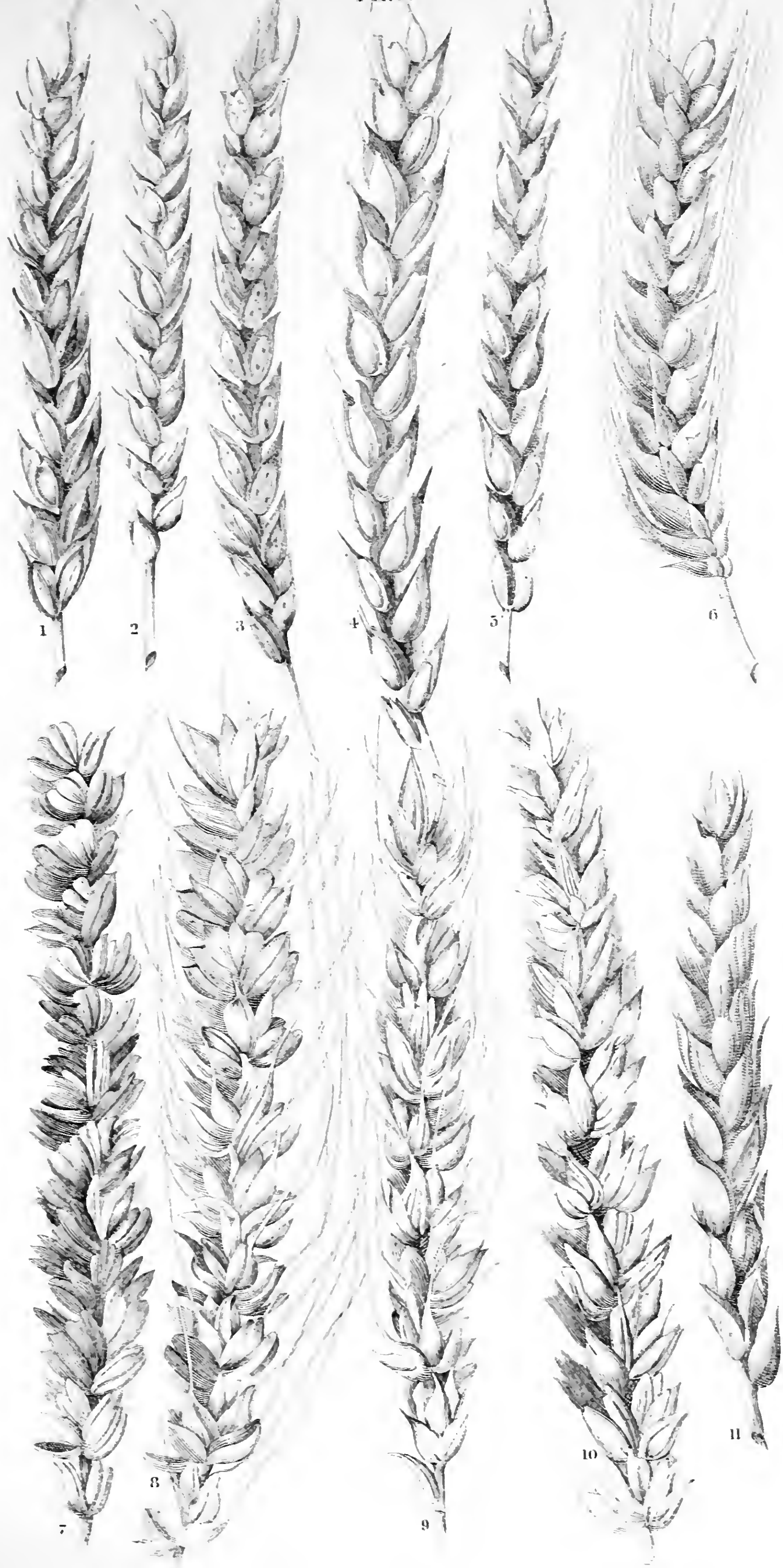


Plate II.

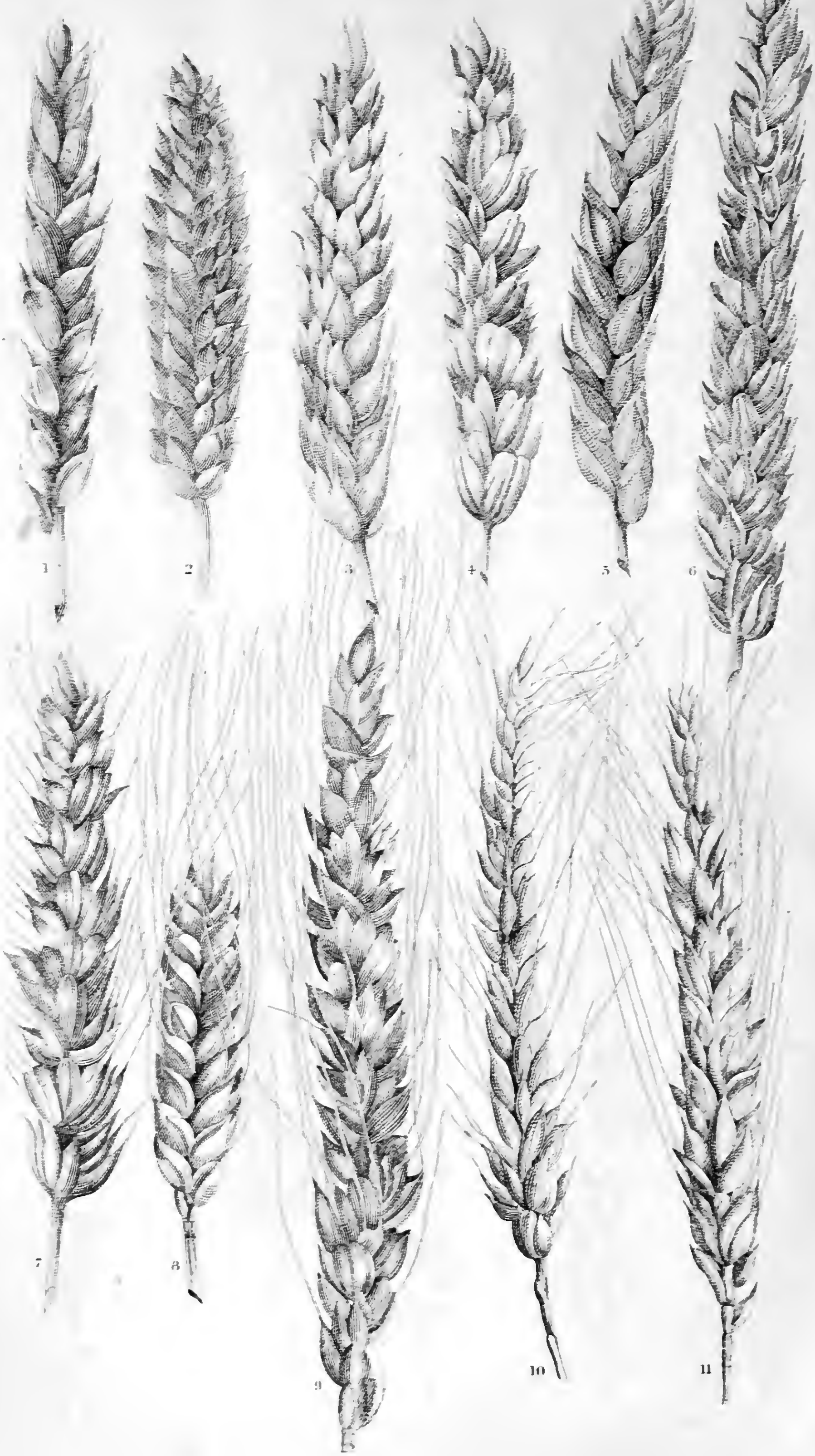


Plate III

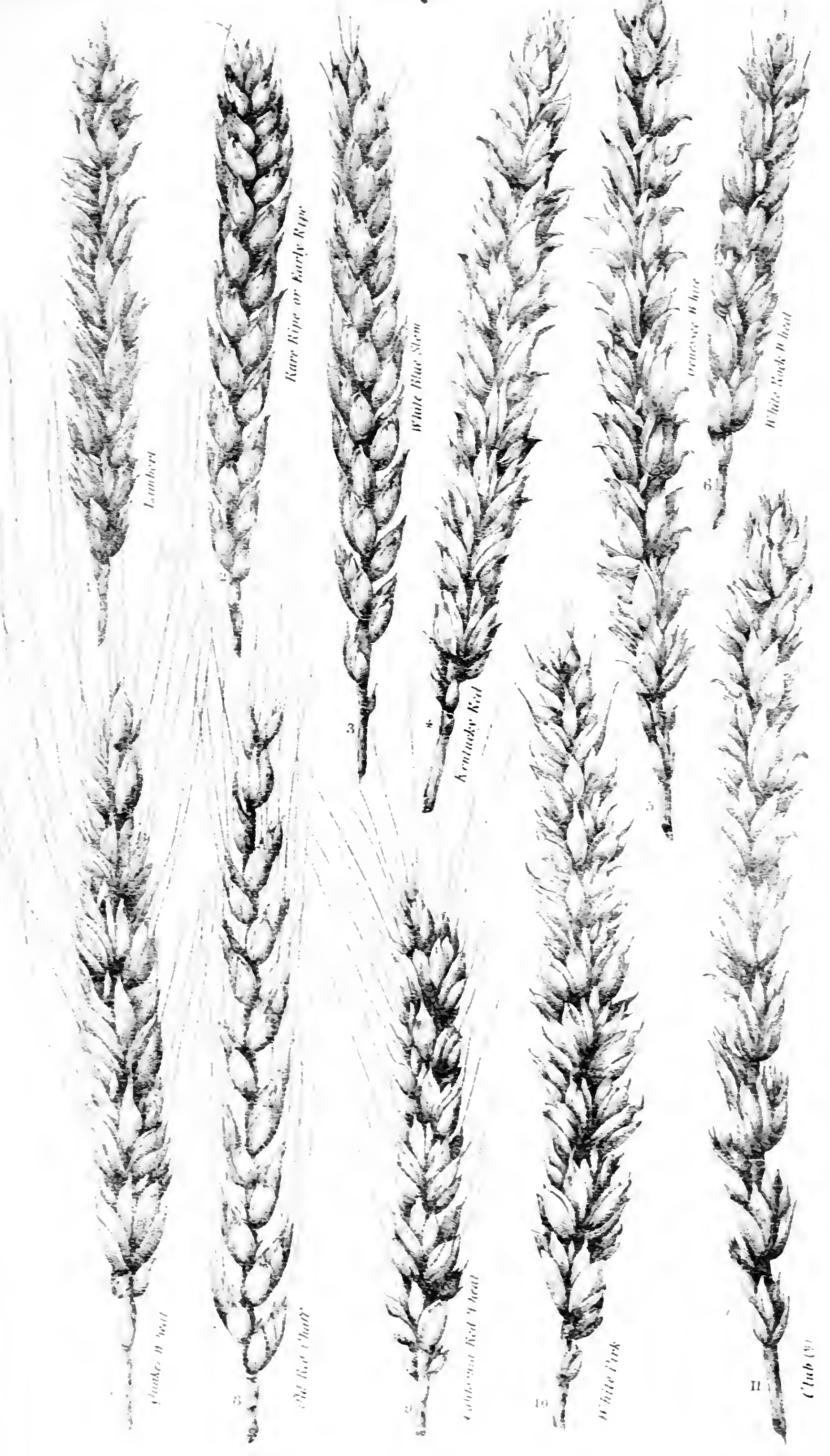

Lambert
Rare Ripe or Early Ripe
White Blue Stem
3
4
Kentucky Red
5
White Rock Wheat
6
8
9
10
11
Club

PLATE IV.

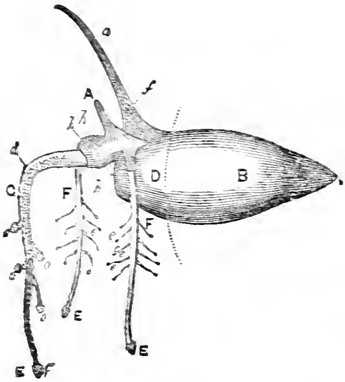


FIG. 3.

FIG. 16.

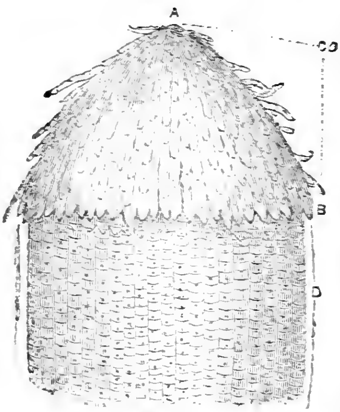


FIG. 5.

FIG. 25.

FIG. 21.

FIG. 22.

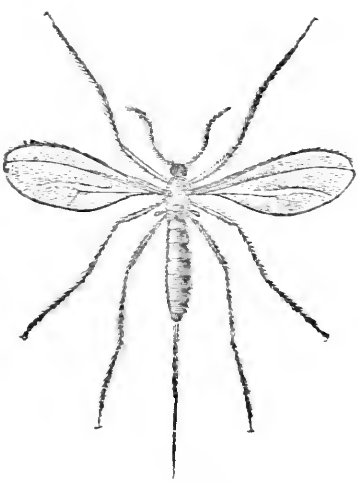


FIG. 9.

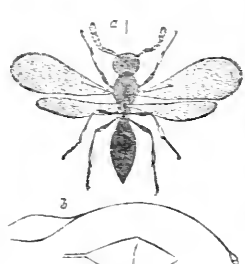


FIG. 11.

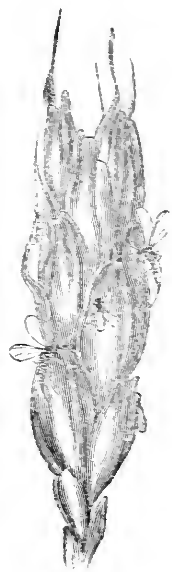


FIG. 13.

PLATE IV.

Fig. 3. A grain of germinating wheat magnified.

A. Cellular tissue, the original covering of embryo blade.

B. Seed, starch, gluten, &c., (amylaceous body.)

C. Main root.

D. Hard cellular matter, the base of growth of root and stem.

E. E. E. Free cones of cells at the points of roots.

F. F. Lateral roots.

a. Plumule—future green blade.

d. Course of bundle of dotted fibre.

e. e. e. Suckers.

f. Course of spiral fibre.

h. h. h. Cellular tissue, original covering of the embryo root.

Fig. 5. Young leaf of wheat (the extreme point of *a*, Fig. 3, magnified); it is seen to possess free capsule of cells and epidermic plasm, closely identical with those of the root.

Fig. 9. The *female Cecidomyia tritici* much enlarged,—the figure immediately to the right is a view of the ovipositor magnified.

Fig. 11. The Platygaster punctiger:

a. Natural size.

b. The ovipositor highly magnified.

c. The extreme end of the ovipositor magnified.

Fig. 13. Exhibits the *cecidomyia* depositing eggs through the glume, and the *platygaster* in pursuit of it.

Fig. 16. Appearance of the wheat when affected by the anguillule.

Fig. 21. Spores in *situ* of *Tilletia caries.*

Fig. 22. Spores of T. caries in various stages of growth.

Fig. 25. Part of the integument of a spore.

PLATE V.

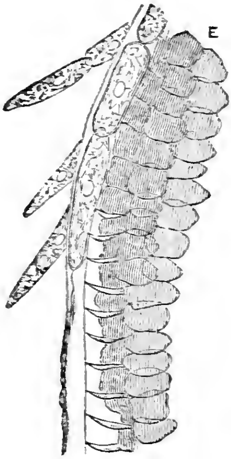


Fig. 6.

Fig. 18.

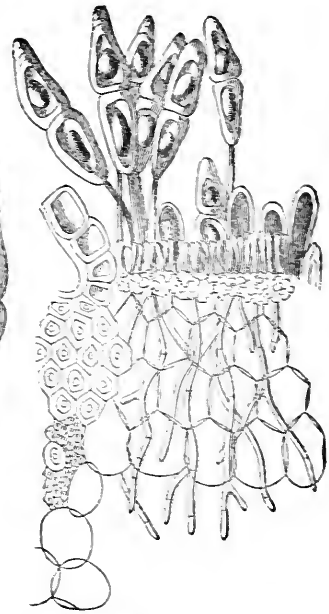


Fig. 20.

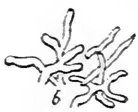
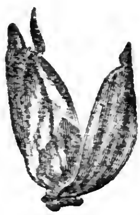


Fig. 23.



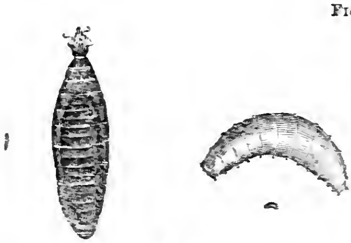


Fig. 15.

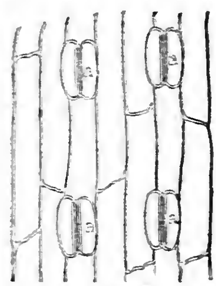


Fig. 8.

Fig. 14.

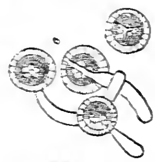


Fig. 24.

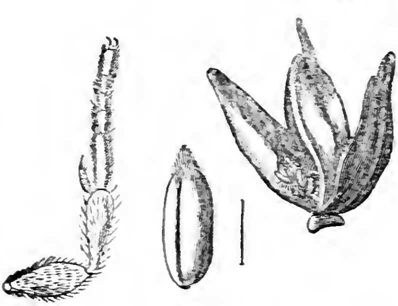


Fig. 12.

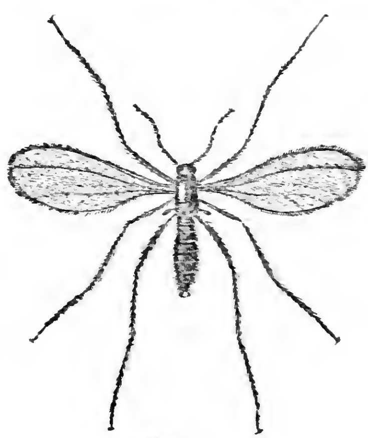


Fig. 10.

PLATE V.

Fig. 6. A portion of (Fig. 5, from A to B,) the edge of the young leaf of wheat, highly magnified.

Fig. 8. *a. a. a. a.* The stoma or breathing places on the under side of a leaf of wheat, highly magnified.

Fig. 10. Male Cecidomyia tritici.

Fig. 12. Central figure, grain of wheat magnified; right hand figure, glume of wheat with larvæ of *Cecidomyia tritici* within it; left hand figure, leg of C. tritici magnified.

Fig. 14. Antennæ of *Platygaster punctiger* (Fig. 11) highly magnified—right hand figure, but to the left of Fig. 24, is a grain of wheat attacked by the larvæ of the *C. tritici*, to the upper end of which they are attached.

Fig. 15. Right hand figure, side view larvæ of C. tritici—the under figure natural size; left hand figure, ventral view of same.

Fig. 18. Appearance of wheat leaf when attacked by *vibrio tritici.*

Fig. 20. Wheat mildew highly magnified.

Fig. 23. Mycelium of *T. caries.*

Fig. 24. Germinating spores of same.

PLATE VI.

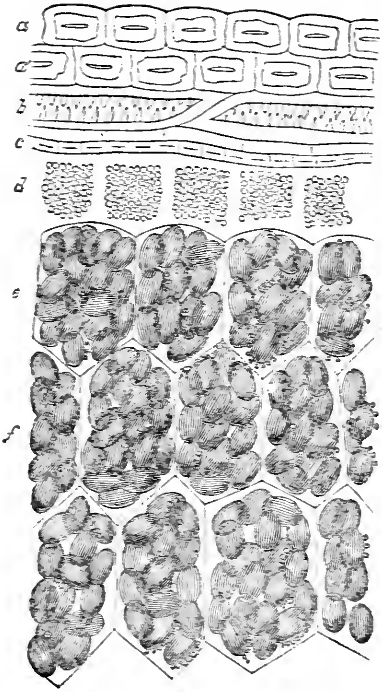


Fig. 1.

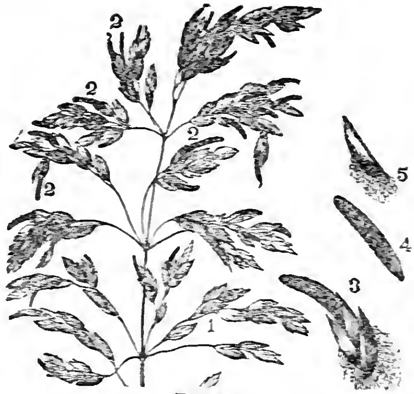


Fig. 36.

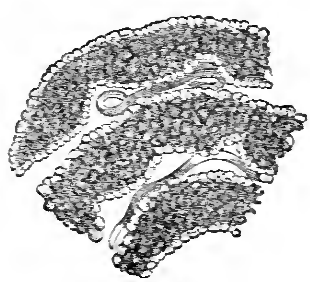


Fig. 17.

Fig. 33.

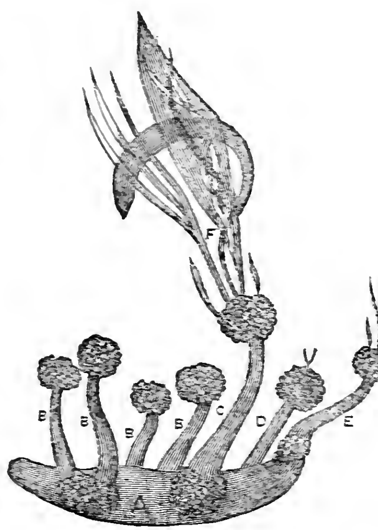


Fig. 25.

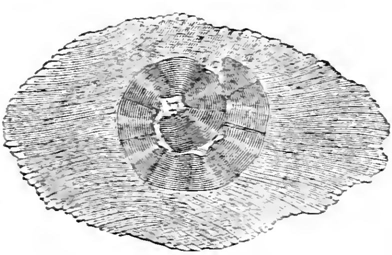


Fig. 7.

PLATE VI.

Fig. 1. Section of a wheat grain highly magnified.

a. a. cellular layers of the first seed skin.

b. same of the second.

c. the third or innermost skin.

d. cells of gluten.

e. the cellular tissue of the albumen with grains of starch meal.

f. grains of starch.

Fig. 7. Transverse section of embryo leaf folded (plate IV, fig. 5,) with its straw colored envelope.

Fig. 17. A section of the wheat plant and stem, showing the *vibrio tritici* in situ.

Fig. 33. Mantis.

Fig. 35. Ergot and its parasitic fungus.

A. Ergot of rye.

B. C. D. E., fungi in different stages of growth.

F. Sporidea.

Fig. 36. Panicle of Poa pratense affected by ergot.

1. Spikelet in normal condition.

2, 2, 2, 2. Ergot in spikelet.

3. Ergot (magnified) attached to the glume.

4. Ergot magnified.

5. White net like substance attached to ergot.

PALTE VII.

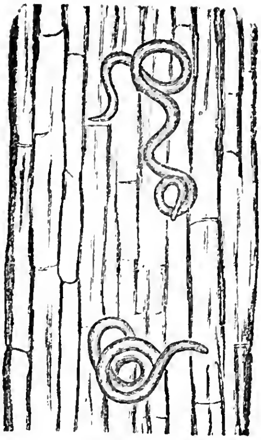


Fig. 19.

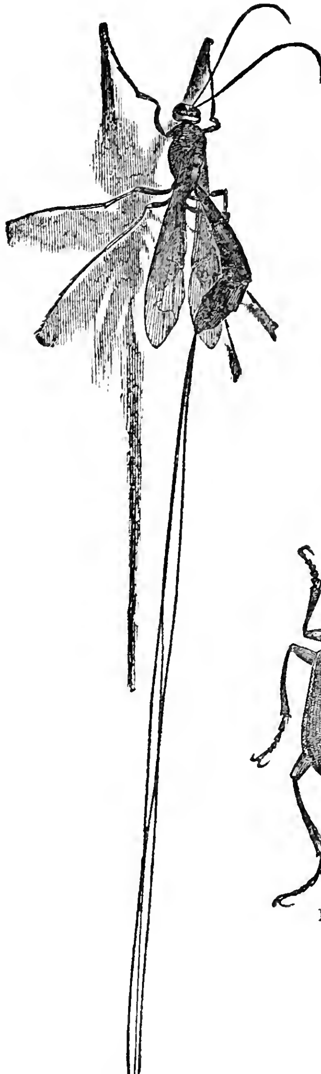


Fig. 32.

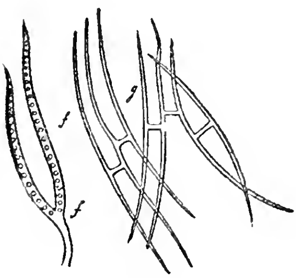


Fig. 26.

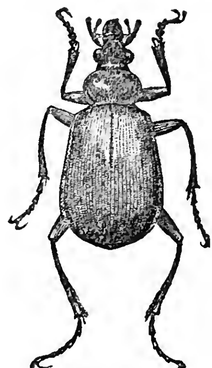


Fig. 34.

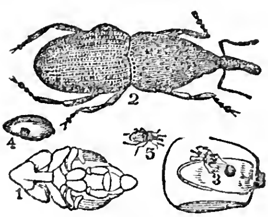


Fig. 27.

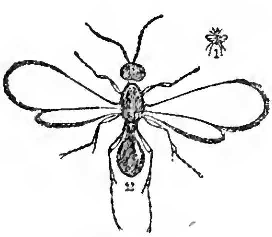


Fig. 29.

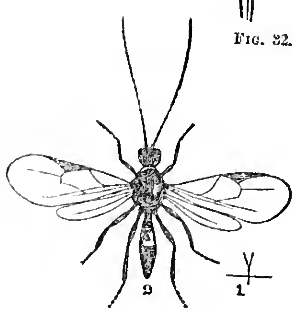


Fig. 28.

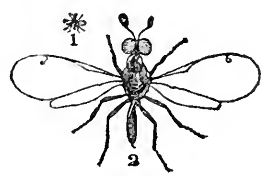


Fig. 30.

PLATE VII.

Fig. 19. Vibrio tritici or anguillule (enlarged) on a wheat leaf.
Fig. 26. Fusisporium inosculaus of T. caries (plate IV, fig. 21.)
Fig. 27. Calandra granaria or Granary weevil
1. Pupa.
2. Perfect insect magnified.
3. Insect emerging from grain of corn.
4. Grain of wheat from which the insect has escaped.
5. Natural size.

Fig. 28. Aphidius avena.
1. Natural size.
2. Same magnified.

Fig. 29. Platygaster tipulæ.
1. Natural size.
2. Magnified.

Fig. 30. Macroglenes penetrans, (male.)
1. Natural size.
2. Same magnified.

Fig. 32. Pimpla lunator, female, (natural size.)
Fig. 34- Calasoma scrutator, (natural size.)

PLATE VIII.

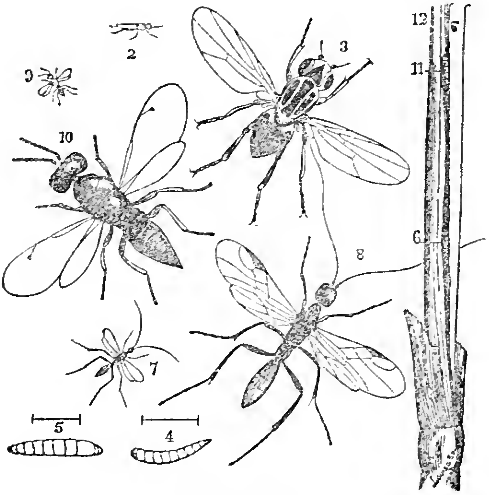


Fig. 37.

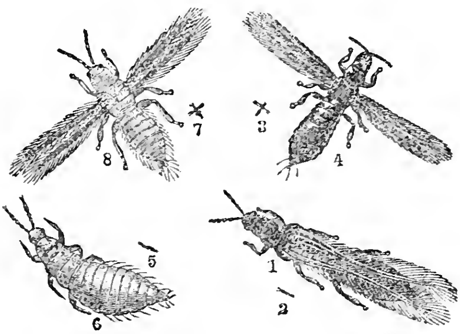


Fig. 38.

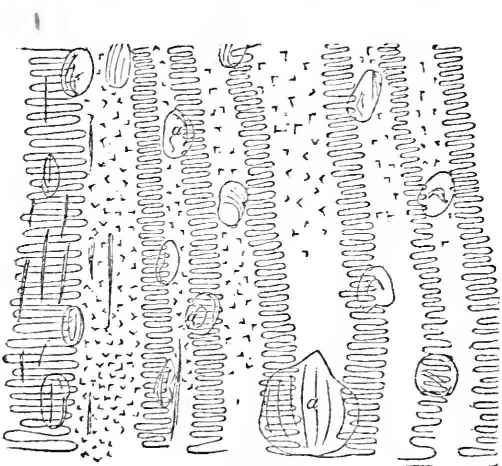


Fig. 48.

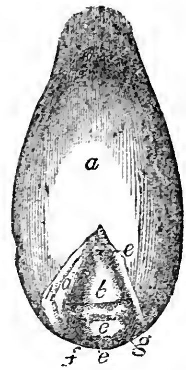


Fig. 2.

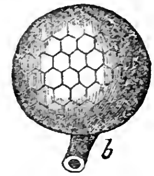


Fig. 55.

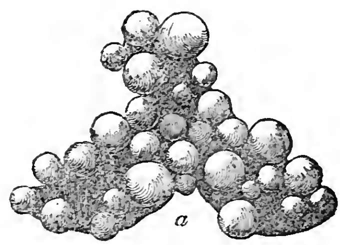


Fig. 49.

Fig. 50.

PLATE VIII.

Fig. 2. Grain of wheat (magnified) showing the embryo.

a. Amylaceous body.

b. plumule.

c. radicle.

h. and *d.* first and second seed-skins.

e. prominence from which the main root issues.

f. and *g.* prominences from which issue the true roots.

Fig. 37. Chlorops tæniopus, or ribbon footed wheat fly.

2. Natural size.
3. same magnified.
4. larvæ or maggot of same.
5. pupa of same.
6. one of the pupa fixed in the stalk.
7. Cœlinius niger (natural size.)
8. " " magnified.
9. Pteromalus micans (natural size.)
10. " " magnified.
11. larvæ of chlorops containing the larvæ of Cœlinius niger.
12. point of escape of C. niger from the indurated skin of No. 6.

Fig. 38. Thrips cerealum. 2. natural size.

1. same magnified.
3. natural size with wings expanded.
4. same magnified.
5. T. minutissima, natural size.
6. same magnified.
7. perfect thrips natural size.
8. same magnified.

Fig. 48. A portion of a glume (or chaff) of wheat highly magnified, showing delicate laminæ of silex at *a. a. a.*

Fig. 49. A small group of fungi of the uredo fœtida on their root or spawn, magnified 400 times linearly, or 160,000 superficially.

Fig. 50. A ripe fungus of uredo fœtida shedding its seed, magnified 1,000 times linearly.

Fig. 55. A young fungus of uredo fœtida not quite ripe, at which time it can be separated with its pedicle from the spawn.

***

PLATE IX.

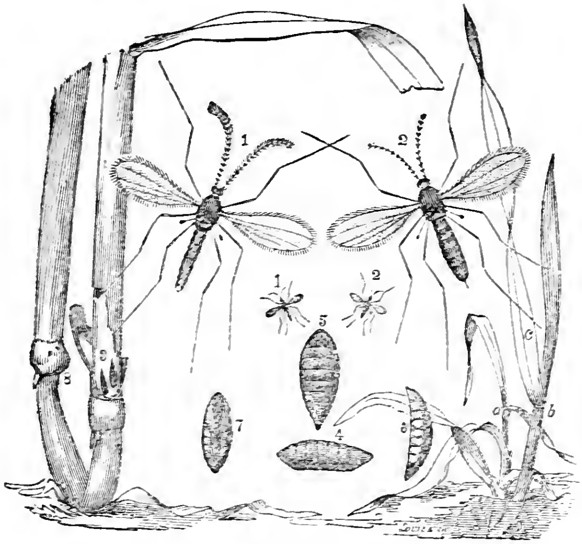


FIG. 39.

FIG. 51.

FIG. 40.

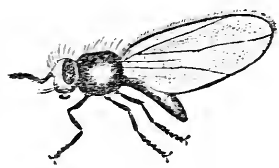


FIG. 41.

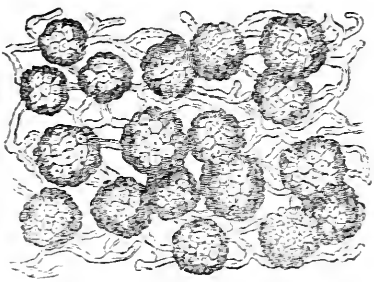


FIG. 52.

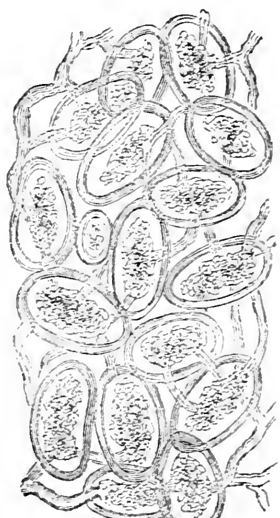


FIG. 54.

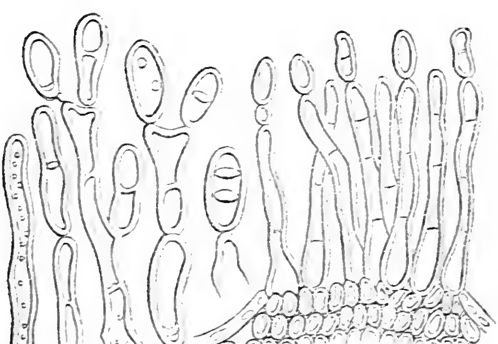


FIG. 53.

PLATE IX.

Fig. 39. Cecidomyia destructor (Hessian Fly.)

1. C. destructor (Male) natural size and magnified.
2. " (Female) " "
3. larvæ in flax "seed" state.
4. dorsal view of the larvæ magnified.
5. ventral " "
6. lateral " "
7. pupa.
8. Base of leaf sheath swollen from worms having lain under it and perforated by parasites coming from these worms.
9. Place where the larvæ are found in autumn.

a. stalk of wheat attacked by the fly.

b. c. healthy wheat plant.

Fig. 40. Gortyna Zeœ.

Fig. 41. Wheat Mow Fly, natural size 1-12 of an inch in length

Fig. 51. Section of wheat straw affected with rust.

Fig. 52. Uredo Fœtida.

Fig. 53. Cladosporium Herbarum, highly magnified.

Fig. 54. Uredo rubigo, (rust) "

PLATE X.

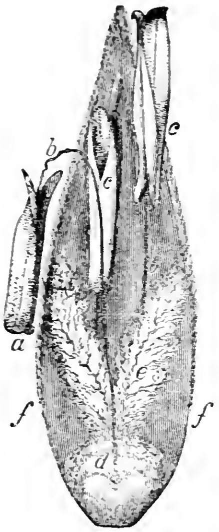


FIG. 63.

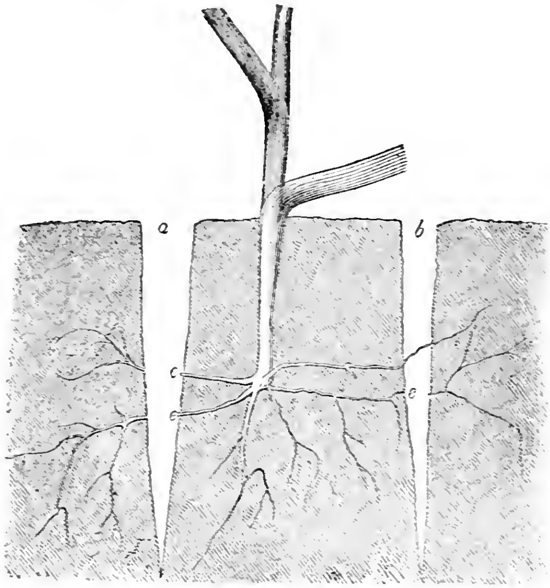


FIG. 47.

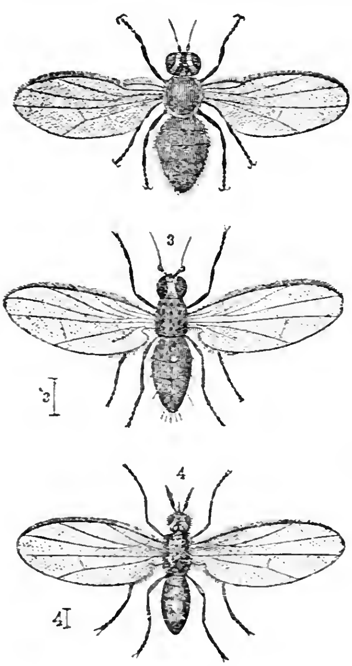


FIG. 42-3-4.

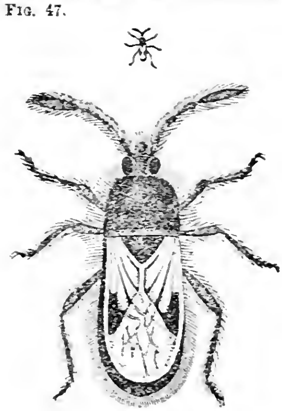


FIG. 45.

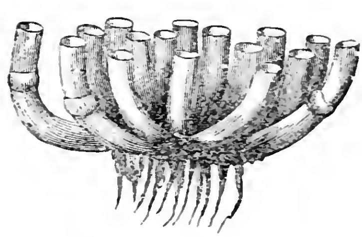


FIG. 64.

Electrotyped at Franklin Type Foundry, Cincinnati, O.

PLATE X.

Fig. 47. Wheat plant in clay soil.

a. b. Cracks in soil caused by drought.

e. e. e. Roots ruptured by the induration of the soil.

Fig. 45. Chinch Bug.

Fig. 42–3–4. Wheat flies.

3. Deceptive wheat fly, natural size and magnified.]
4. Common wheat fly, natural size and magnified.
5. Shank banded wheat fly, natural size and magnified.

Fig. 63. Glume of wheat in bloom magnified.

a. Ruptured anther.

b. b. Filaments.

c. c. Anthers not yet extruded.

d. Ovarium or young grain of wheat.

e. Pistil.

f. f. Glume.

Fig. 64. A *stool* of wheat.

PLATE XI.

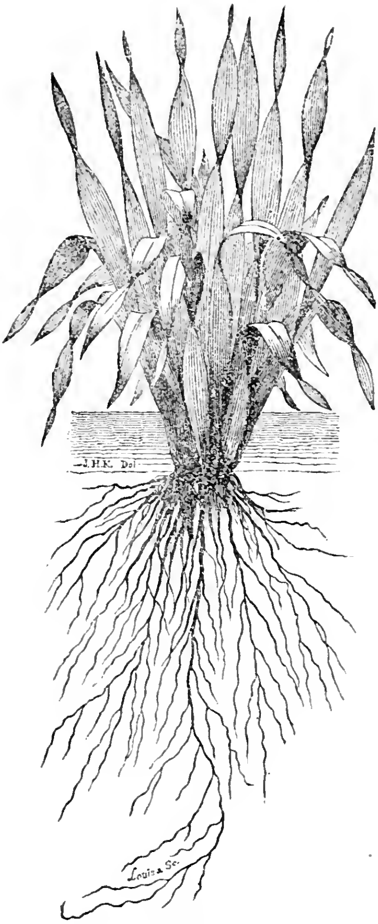


Fig. 56.

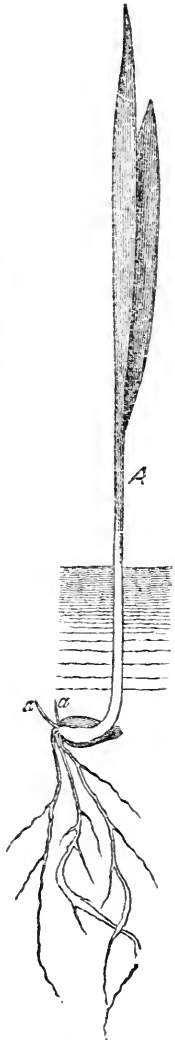


Fig 57.

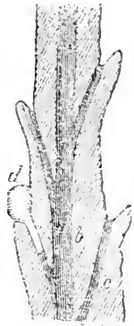


Fig 61.

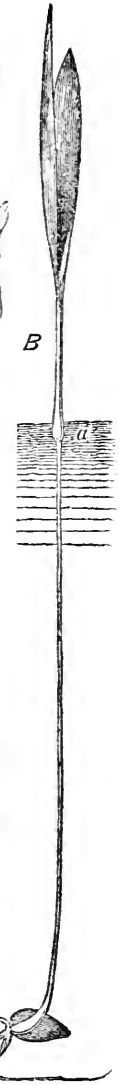


Fig. 58.

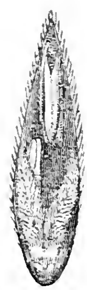


Fig. 62.

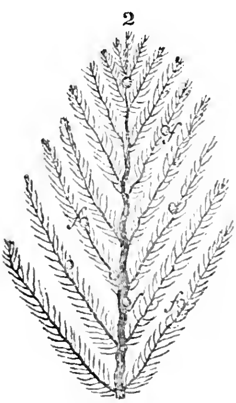


Fig. 60.

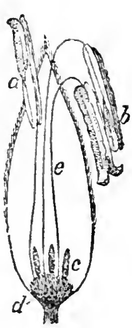


Fig. 59.

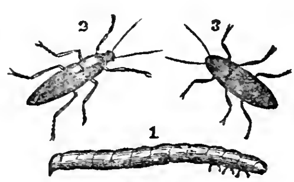


Fig. 46.

PLATE XI.

Fig. 56. Appearance of a normal wheat stalk in the spring after "*tillering*" has commenced.

Fig. 57. A stalk of wheat plant at 20 days from seeding, sown at the depth of one inch; *a. a.* young plants.

Fig. 58. B. Stalk of wheat plant at 30 days, sown at the depth of six inches; *a.* point of tillering.

Fig. 59. Glume of wheat exhibiting the sexual apparatus of the flower.

a. Anther partially ruptured and extruded.

b. Anthers entirely extruded and ruptured.

e. Filaments.

d. Ovarium.

c. Anthers as they appear before extrusion commences.

☞ The pistils are removed in this figure, to avoid confusion.

Fig. 60. A portion of the pistil highly magnified.

f. f. f. Pollen grains.

Fig. 61. A small portion of the pistil very highly magnified.

b. c. Portion of pistil.

a. Main cavity or duct leading from extremity of pistil to *ovarium.*

d. A pollen grain penetrating a branch of the main duct.

Fig. 62. Glume of wheat exhibiting pistils and anthers in situ.

PLATE XII.

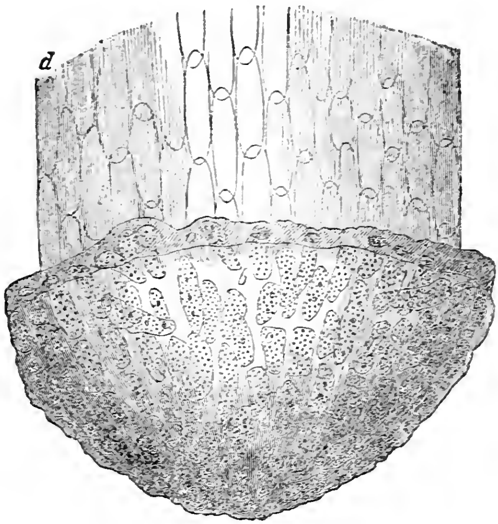
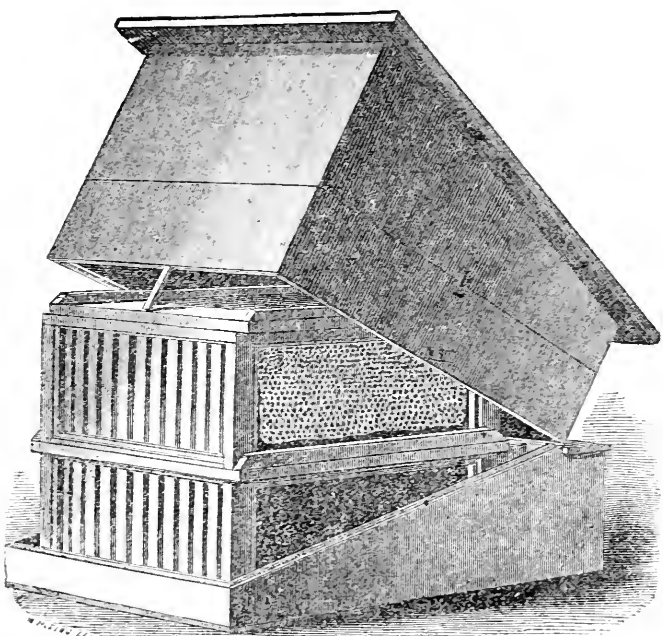


PLATE XII.

Fig. 65. Spongiole, or free cone of root E. Fig. 3, Plate IV.

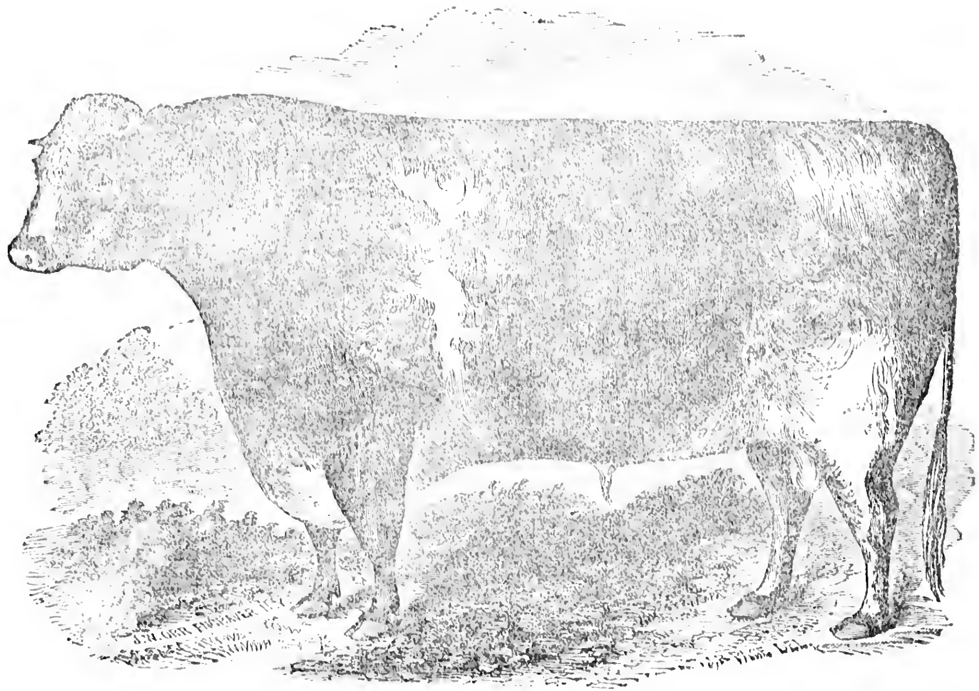


LANGSTROTH'S BEE-HIVE.

W. W. WILSON'S SUN DIAL.

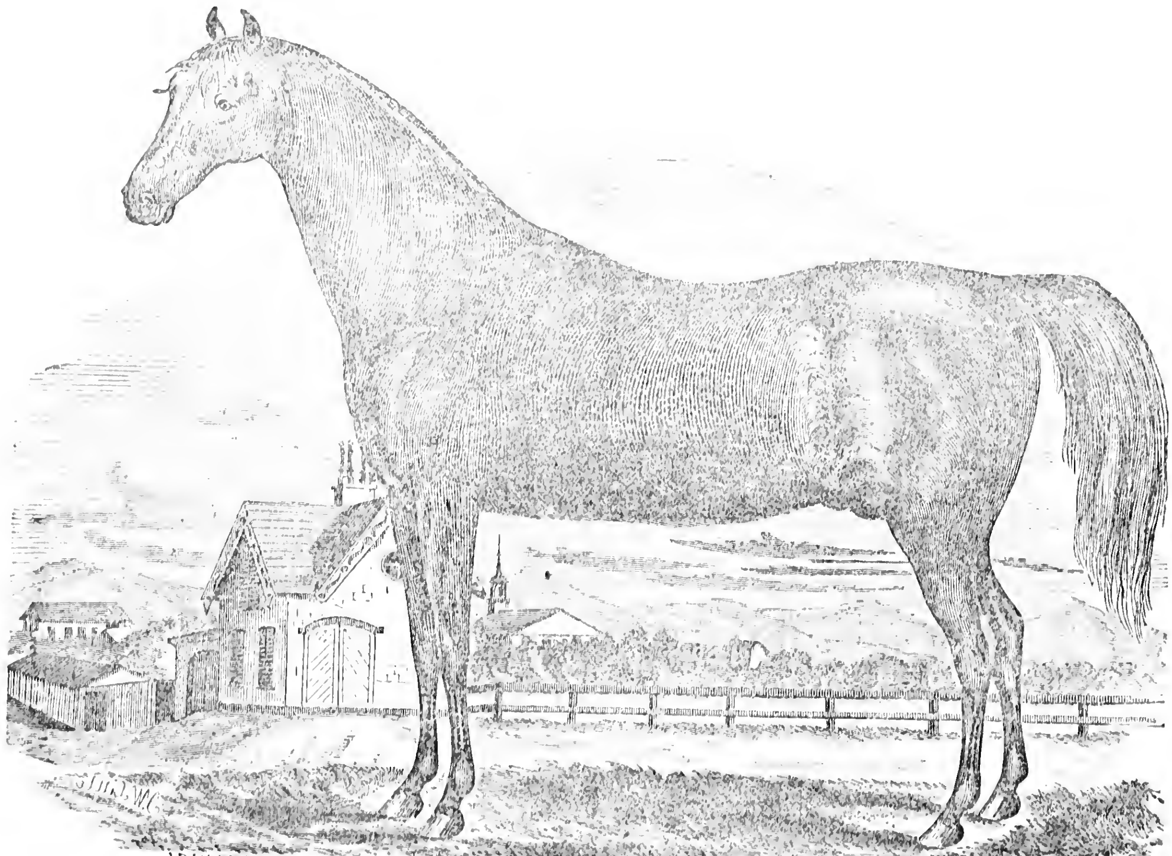
The most ancient registrar of time, has hitherto been prevented from general use by the large expense necessary to make it accurate, durable and ornamental. Mr. Wilson has succeeded in making, by a new process, at a very moderate cost, a sun dial of excellent workmanship and singular beauty. It is made of copper, and plated with pure silver. It has the equation of time engraved upon it, so that any one can observe the true time, and set their watch accurately any day in the year. It has, also, a mirror inserted, that reflects the clouds and marks their course! A doric column of cast iron, handsomely proportioned and painted to resemble stone supports the dial.

This sun dial and column, placed in the garden or on a lawn, is more attractive and ornamental than a piece of costly statuary, and at the same time permanently useful. No suburban residence is complete without one. It is valuable to the manufacturer, having many hands to call on from refreshment to labor. Every farmer of cultivated taste should have one. Colleges and other public institutions cannot well dispense with one of these beautiful dials.



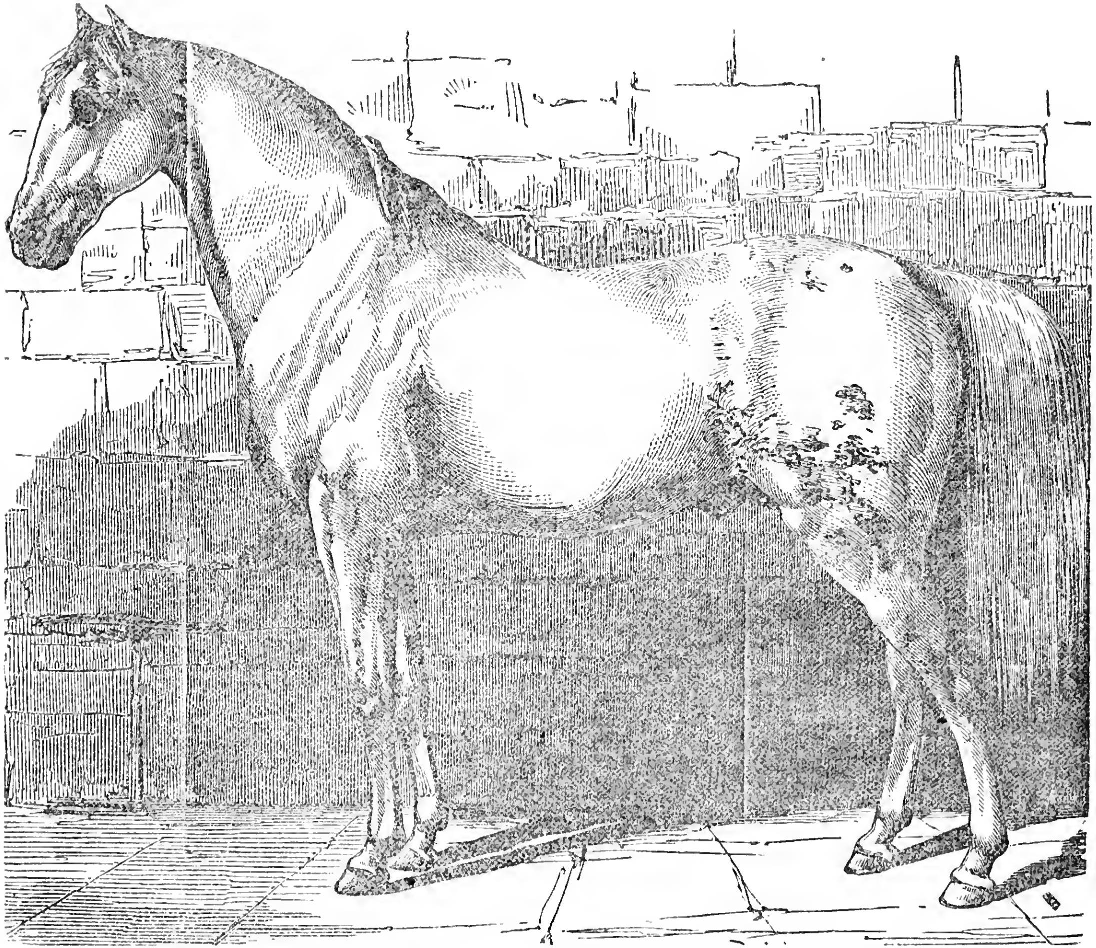
ROMEO—SHORT-HORN BULL.

STRAWBERRY—SHORT-HORN COW.

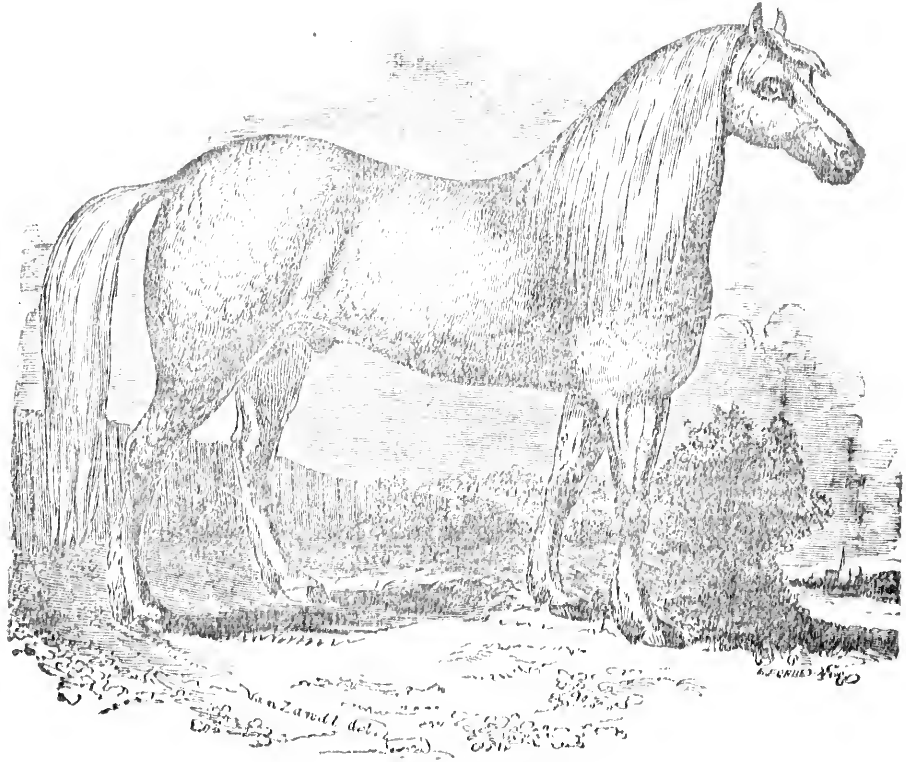


J.R. PAGE DEL. SENNET CAYUGA CO. N.Y. S.F. BAKER ENG.

TOM CRIB—TURF HORSE.



BUSH MESSENGER—HORSE FOR GENERAL PURPOSES.



NORMAN HORSE.