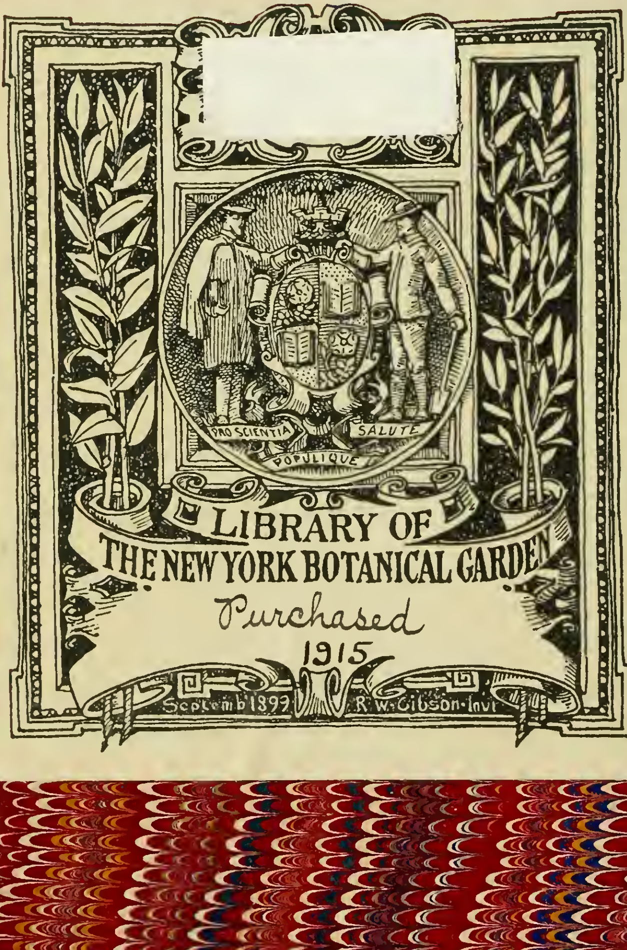
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THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

SECOND SERIES.

VOLUME THE TENTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1874.

These experiments, it is true, are not easy; still they are in the power of every thinking husbandman. He who accomplishes but one, of however limited application, and takes care to report it faithfully, advances the science, and, consequently, the practice of agriculture, and acquires thereby a right to the gratitude of his fellows, and of those who come after. To make many such is beyond the power of most individuals, and cannot be expected. The first care of all societies formed for the improvement of our science should be to prepare the forms of such experiments, and to distribute the execution of these among their members.

Van Thaer, *Principles of Agriculture.*

London: Printed by William Clowes and Sons, Stamford Street, and Charing Cross.

CONTENTS OF VOLUME X.

Second Series.

APPENDIX.

DIRECTIONS TO THE BINDER.

The Binder is desired to collect together all the Appendix matter, with Roman numeral folios, and place it at the *end* of each volume of the Journal, excepting Titles and Contents, and Statistics, &c., which are in all cases to be placed at the *beginning* of the Volume; the lettering at the back to include a statement of the *year* as well as the *volume*; the first volume belonging to 1839–40, the second to 1841, the third to 1842, the fourth to 1843, and so on.

In Reprints of the Journal all Appendix matter and, in one instance, an Article in the body of the Journal (which at the time had become obsolete), were omitted; the Roman numeral folios, however (for convenience of reference), were reprinted without alteration in the Appendix matter retained.

METEOROLOGY; IMPORTATIONS OF GRAIN; SALES OF BRITISH WHEAT; PRICES OF CORN AND OTHER PRODUCE; AGRICULTURAL STATISTICS; AND STATISTICS OF DAIRY PRODUCE.

[*The facts are derived chiefly from the Meteorological Reports of* Mr. Glaisher, *and the Returns of the* Board of Trade, *and of the* Inspector-General of Imports and Exports.]

METEOROLOGY.—1873.

First Quarter (January, February, March).—The warm period which set in on the 9th December, 1872, continued till 19th January; and for the period 1st to 19th January, the mean excess of daily temperature was 10°. After a few days of average temperature, a cold period began on 25th January and continued throughout February, the average daily deficiency being 4°. This was succeeded by a week of warm weather; a fortnight of cold weather followed, and the quarter closed with a week of warm weather. The mean temperature for the quarter was 39°·4, or 0°·8 above the average of 102 years. It was 42°·1 in January, or 5°·8 above the average; 34·°·3 in February, or 4°·3 lower than the average; and 41°·9 in March, or 0°·9 higher than the average. A decline of several degrees in temperature from January to February is rare; and, except in 1853, the decline this year was greater than any that had occurred during a period of more than 100 years. The rainfall in the quarter, at Greenwich, amounted to 5·7 inches, or 0·2 in. above the average of 58 years. There was an excess of 0·6 in. in January, and of 0·3 in. in February; while in March there was a deficiency of 0·4 in.

Hardy Pear was in blossom on the 8th of March at Helston.

Peach was in blossom on the 25th of February at Helston; on the 25th of March at Oxford; on the 26th at Wisbeach; and on the 28th at Lymington.

Plum was in blossom on the 27th of March at Strathfield Turgiss; on the 28th at Oxford and Lymington; and on the 30th at Silloth.

The Daffodil and Red Flowering Currant were in blossom on the 4th of March at Brighton.

The Swallow arrived at Guernsey on the 28th of March, and at Taunton on the 31st.

Second Quarter (*April, May, June*).—The first five days of April were warm, with a mean daily excess of temperature of $3\frac{1}{4}°$; then followed a cold week—the wind being mostly north-east—with an equal deficiency. From the 14th to the 21st of April the weather was again warm, the average daily excess of temperature being 6°·9. On the 22nd April a long cold period set in, and continued till the 18th June, the deficiency of temperature averaging $2\frac{3}{4}°$ daily. The remainder of the quarter was warmer, but not uninterruptedly so, the temperature on four of the twelve days being below the average for the season. The mean temperature for the quarter was 51·8 or 0·5 below the average in 102 years. The deficiency for April was 0·1, and for May 2·0; for June there was an excess of 0·7. The rainfall at Greenwich amounted to 4·7 inches, or one inch less than the average in 58 years. In April and May there was a deficiency, and an excess in June.

Wheat was in ear on the 12th of June at Strathfield Turgiss and Cardington; on the 17th at Brighton; on the 21st at Hawarden and Cockermouth; on the 24th at Silloth. *In flower* on the 20th of June at Weybridge; on the 26th at Oxford and Cardington.

Barley was in ear on the 15th of June at Cardington; on the 26th at Cockermouth. *In flower* on the 29th of June at Cardington.

Oats were in ear on the 25th of June at Cockermouth.

Flax was above ground on the 8th of May at Miltown, and *in flower* on the 25th of June.

It is generally remarked all over the country, in respect to the very small number of insects this season, and J. Jenner Weir, Esq., President of the Blackheath Natural History Society, in a letter, says :—" In accordance with your wish I give a short note on the condition of lepidopterous life this year. I have been into Southern Kent and Sussex and never before in my experience found so few day-flying lepidoptera.

" The South Downs, which in the month of June generally swarm with blue butterflies of the genus Lycæna, are this year almost without them; certainly, where hundreds usually occur, only units can be found.

" The day-flying moths and Sphingidæ are equally rare.

" Another curious fact is, that all that I found were late in their appearance; by this I mean that many insects were common as late as the last day in June.

" I consider the wet winter destroyed the ova, pupæ, and larvæ of the different species."

Third Quarter (*July, August, September*).—Till the 19th July the weather was mostly cold, the mean daily temperature being $\frac{3}{4}^{\circ}$ below the average. On July 20th a sudden change took place, and for a few days the weather was fine and hot, particularly on the 21st, 22nd, and 23rd: the mean temperatures of these days were 71°·7, 75°·2, and 72°·3, exceeding their averages by 10°·2, 13°·7, and 10°·7 respectively. From this time till September 2nd the weather was changeable, a few days of cold and a few days of warm weather alternating; the warm days, however, were the more numerous, and upon the whole of the 45 days ending September 2nd there was an excess of temperature averaging $2\frac{1}{2}^{\circ}$. Then followed a cold fortnight, after which the weather continued for the most part cold to the end of the quarter, the deficiency of mean temperature for the last 28 days averaging rather more than 2° daily. The mean temperature for the quarter was 60°·3, or 0°·6 above the average in 102 years. In July the excess was 1°·8, and in August 1°·9; in September there was a deficiency of 1°·8. The rainfall at Greenwich during the three months amounted to 7·6 inches, agreeing with the average of 58 years. In July there was a deficiency of 0·7 inches, in August an excess of 0·8 inches, and in September there was exactly the average amount.

Wheat was cut on the 22nd of July at Oxford; on the 24th at Helston; on the 28th at Brighton and Royston; on the 30th at Eastbourne and Strathfield Turgiss. On the 4th of August at Guernsey; on the 12th at Hull; and on the 20th at Silloth.

Barley was cut on the 27th of July at Helston.

Oats were cut on the 22nd July near Brighton; on the 27th at Helston; on the 28th at Strathfield Turgiss.

Local reports are as follow:—

July.—Bywell. The weather has been very favourable for haymaking; the crop is good and well got. Potatoes and turnips have made great progress and promise well. Barley is changing colour, but wheat and oats are very backward. Small fruits (berries) are plentiful; apples will be a fair crop.

Cockermouth.—Haymaking became general about the 8th. The crops of sown (or lea) grass were exceedingly poor, not more than half the average, owing to dry weather during the spring months.

August.—Hull. Harvest operations became pretty general about the 14th to the 18th. Turnips, &c., are looking well. There have been a few reports of the potato disease having made its appearance, but nothing of any importance.

Bywell.—The harvest is in full operation, but settled weather is required. The rains during the month have improved the pastures, which were getting very bare. Potatoes are plentiful and good in quality; fruit is also abundant. [Cockermouth.

METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1873.

1873. MONTHS.	Temperature of Air. Mean.	Air. Diff. from average of 102 years.	Air. Diff. from average of 32 years.	Evaporation. Mean.	Evaporation. Diff. from average of 32 years.	Dew Point. Mean.	Dew Point. Diff. from average of 32 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 32 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 32 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour. Diff. from average of 32 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
January ..	42·1	+5·8	+4·1	40·4	+3·7	38·2	+3·5	8·8	−1·6	42·5	0·231	+0·030	2·7	+0·4
February ..	34·3	−4·3	−5·0	32·8	−4·8	30·3	−4·7	8·4	−3·0	36·4	0·169	−0·037	2·0	−0·4
March ..	41·9	+0·9	+0·4	40·2	+1·0	38·2	+2·0	16·1	+1·5	42·1	0·231	+0·016	2·6	+0·1
Means ..	39·4	+0·8	−0·2	37·8	0·0	35·6	+0·3	11·1	−1·0	40·3	0·210	+0·003	2·4	0·0
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April	45·9	−0·1	−1·2	42·7	−1·4	38·9	−1·8	19·5	+0·9	49·3	0·237	−0·017	2·8	−0·1
May	50·6	−2·0	−2·4	47·3	−1·9	43·7	−1·8	19·8	−0·7	53·3	0·285	−0·018	3·3	−0·1
June	58·9	+0·7	−0·1	55·3	−0·7	52·1	−1·4	19·2	−1·9	60·7	0·389	−0·018	4·3	−0·2
Means ..	51·8	−0·5	−1·2	48·4	−1·3	44·9	−1·7	19·5	−0·6	54·4	0·304	−0·018	3·5	−0·1

NOTE.—In reading this Table it will be borne in mind that the sign (−) *minus* signifies *below* the average, and that the sign (+) *plus* signifies *above* the average.

Meteorological Observations recorded at the Royal Observatory, Greenwich, in the First Six Months of the Year 1873.

1873. Months.	Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Amount.	Diff. from average of 58 years.		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
January ..	87	− 1	29·576	−0·173	546	− 8	2·5	+0·6	413	10	17	4	18·5	43·9
February ..	85	0	29·901	+0·104	561	+ 8	1·9	+0·3	281	20	8	0	19·5	40·0
March ..	87	+ 5	29·623	−0·126	547	− 3	1·3	−0·4	295	23	8	0	18·2	39·5
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	86	+ 1	29·700	−0·065	551	− 1	5·7	+0·2	330	53	33	4	18·2	43·9
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
April ..	78	− 1	29·822	+0·053	546	+ 3	0·6	−1·1	291	19	10	1	17·4	43·6
May	78	+ 2	29·795	+0·014	540	− 1	1·5	−0·6	270	6	19	6	23·3	48·1
June ..	78	+ 4	29·794	−0·020	531	− 1	2·6	+0·7	251	0	7	23	33·0	56·2
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	78	+ 2	29·804	+0·016	539	0	4·7	−1·0	271	25	36	30	17·4	56·2

Note.—In reading this Table it will be borne in mind that the sign (−) *minus* signifies *below* the average, and that the sign (+) *plus* signifies *above* the average.

METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1873.

1873. MONTHS.	Temperature of										Elastic Force of Vapour.		Weight of a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames.				
	Mean.	Diff. from average of 102 years.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.		Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
July	63·4	+1·8	+1·4	58·8	+1·3	54·9	+1·1	22·7	+1·7	66·0	0·431	+0·016	4·8	+0·2
August ..	62·7	+1·9	+1·3	58·2	+0·9	54·4	+0·7	20·3	+0·5	65·8	0·424	+0·008	4·7	+0·1
September	54·7	−1·8	−2·6	51·8	−2·3	49·0	−2·1	19·1	+0·6	58·8	0·348	−0·032	4·0	−0·2
Means ..	60·3	+0·6	0·0	56·3	0·0	52·8	+0·2	20·7	+0·9	63·5	0·401	−0·003	4·5	0·0
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
October ..	47·8	−1·8	−2·4	46·1	−2·2	44·2	−1·9	16·4	+1·6	53·6	0·290	−0·024	3·3	−0·3
November	44·2	+1·9	+0·6	42·4	+1·0	40·3	+0·8	11·3	−0·4	44·3	0·250	+0·003	2·9	+0·1
December ..	40·6	+1·5	+0·3	39·3	+0·5	37·6	+0·6	10·5	+1·1	43·2	0·225	+0·003	2·6	−0·0
Means ..	44·2	+0·5	−0·5	42·6	−0·2	40·7	−0·2	12·7	+0·8	47·0	0·255	−0·006	2·9	−0·1

NOTE.—In reading this Table it will be borne in mind that the sign (−) *minus* signifies *below* the average, and that the sign (+) *plus* signifies *above* the average.

METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1873.

1873. MONTHS.	Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal movement of the Air.	Reading of Thermometer on Grass.				
										Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.
	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Mean.	Diff. from average of 32 years.	Amount.	Diff. from average of 58 years,		At or below 30°.	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
July	74	+ 1	29·793	−0·014	526	− 2	1·9	−0·7	264	0	0	31	41·1	59·6
August ..	75	− 1	29·765	−0·029	527	− 2	3·2	+0·8	284	0	2	29	37·3	60·5
September	81	+ 1	29·792	−0·015	536	+ 1	2·5	0·0	250	1	18	11	27·9	49·8
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	77	0	29·783	−0·019	530	− 1	7·6	0·0	266	1	20	71	27·9	60·5
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
October ..	88	+ 1	29·685	−0·014	542	+ 3	2·6	−0·2	237	10	11	10	20·0	48·1
November	86	− 2	29·708	−0·047	546	− 2	2·6	+0·3	296	6	21	3	19·0	44·9
December	90	+ 2	30·107	+0·310	558	+ 6	0·3	−1·7	247	17	12	2	13·9	43·8
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Means ..	88	0	29·833	+0·083	549	+ 2	5·5	−1·6	260	33	44	15	13·9	48·1

NOTE.—In reading this Table it will be borne in mind that the sign (−) *minus* signifies *below* the average, and that the sign (+) *plus* signifies *above* the average.

Cockermouth.—The harvest became general about the middle of the month, but was much retarded by the state of the weather. The hay crop not all secured at end of month, for similar reason. Potatoes began to be affected with disease during last week of month; the early kinds (in gardens) being much affected.

September.—Hull. The potato disease has become pretty general in this neighbourhood; about half the crop in some places is more or less affected. Crop good.

Bywell.—The harvest is quite finished in this neighbourhood, and all is secured in pretty good condition. Wheat is below the average; barley and oats are a good average. Field potatoes are pretty free from disease, but garden potatoes are much diseased. Turnips are a good crop; the pastures are improving.

Cockermouth.—The grain crop had not been all secured at the end of the month.

Fourth Quarter (October, November, December).—Till the 7th day of October there was an excess of mean temperature of the average amount of $3\frac{1}{4}°$ daily; the 8th and 9th days were cold, and the 10th and 11th were warm. A lengthened cold period followed of more than a month's duration, and the average daily deficiency of mean temperature was $3\frac{1}{2}°$; then from November 17th to December 7th the weather was mostly warm. A week of very severe cold weather ensued, the deficiency of temperature on the 9th, 10th, and 11th being $11\frac{1}{2}°$, $16\frac{1}{2}°$, and $12\frac{1}{2}°$ respectively; and these days in London were distinguished by a most remarkable continuance of very dense fog.

In the seven days ending with the 14th the average daily deficiency was $8\frac{3}{4}°$. A warm period then set in, and continued with slight exception to the end of the year; on the 16th, 17th, and 18th, the daily temperatures were 10°·8, 10°·0, and 10°·6 in excess of their respective averages. The mean temperature of these three days was 24° higher than that of the three days a week before, viz., the 9th, 10th, and 11th.

The mean temperature for the quarter was 44°·2, or 0°·5 above the average of 102 years. It was 47°·8, or 1°·8 lower than the average, in October; 44°·2, or 1°·9 higher than the average, in November; and 40°·6, or 1°·5 higher than the average, in December. The fall of rain at Greenwich was 0·2 in. and 1·7 in. in defect in October and December respectively, but 0·3 in. in excess in November.

CORN: Importations, Sales, and Prices.

Quantities of Wheat, Wheatmeal and Flour, Barley, Oats, Peas and Beans, Imported into the United Kingdom in the Year 1873.

1873.	Wheat.	Wheatmeal and Flour.	Barley.	Oats.	Peas.	Beans.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
January ..	3,952,570	684,371	1,260,075	506,771	72,612	230,429
February	3,184,340	674,191	1,023,944	658,526	60,607	210,152
March ..	2,820,809	645,971	1,192,149	794,951	85,674	263,175
April ..	2,338,370	448,475	866,506	836,446	126,080	186,679
May ..	2,903,904	468,373	832,209	1,283,460	161,675	283,530
June ..	3,451,275	472,613	269,950	1,424,937	187,495	204,642
In first Six Months	18,651,268	3,393,994	5,444,833	5,505,091	694,143	1,378,607
July	4,850,564	509,358	398,829	2,026,873	75,860	146,327
August ..	4,242,303	365,444	319,006	1,284,938	95,895	360,546
September	3,015,270	380,288	635,239	831,992	114,564	288,323
October ..	4,514,103	510,011	888,179	479,603	52,970	331,561
November	3,969,900	422,212	691,681	787,739	58,261	176,473
December	4,508,222	622,953	854,718	1,006,500	119,375	294,663
In last Six Months	25,100,362	2,810,266	3,787,652	6,417,645	516,925	1,597,893
Year ..	43,751,630	6,204,260	9,232,485	11,922,736	1,211,068	2,976,500

Note.—The average weights *per quarter* of corn, as adopted in the office of the Inspector-General of Imports and Exports, are as follows:—For wheat, 485⅓ lbs., or 4⅓ cwts.; for barley, 400 lbs., or 3$\frac{4}{7}$ cwts.; for oats, 308 lbs., or 2¾ cwts. Corn has been entered and charged with duty by *weight* instead of *measure* since September, 1864.

Computed Real Value of Corn Imported into the United Kingdom in each of the Five Years, 1869-73.

	1869.	1870.	1871.	1872.	1873.
	£.	£.	£.	£.	£.
Wheat	19,515,758	16,264,027	23,345,630	26,046,876	28,446,689
Barley	3,379,775	2,831,844	3,407,425	6,194,155	4,010,344
Oats	3,340,494	4,381,607	4,141,687	4,212,086	4,804,118
Maize	5,935,665	5,790,550	6,470,789	8,696,362	6,621,720
Other kinds	1,376,087	1,498,043	1,729,048	1,747,073	1,788,716
Wheat Flour	3,792,939	3,383,751	3,502,784	4,092,189	5,839,197
Other kinds of Flour	6,640	19,822	10,712	9,883	10,570
Total of Corn ..	37,347,358	34,169,644	42,403,575	50,998,624	51,521,354

QUANTITIES of BRITISH WHEAT SOLD in the Towns from which Returns are received under the Act of the 27th & 28th VICTORIA, cap. 87, and their AVERAGE PRICES, in each of the TWELVE MONTHS of the YEARS 1868-73.

	Quantities in Quarters.					
	1868.	1869.	1870.	1871.	1872.	1873.
	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.
First month ..	193,077	248,047	187,027	267,827	194,719	183,987
Second month	201,325	258,883	231,428	309,376	193,910	202,977
Third month (five weeks)	235,402	278,086	314,040	377,003	245,612	238,125
Fourth month	173,120	204,519	242,457	293,494	191,522	159,268
Fifth month ..	162,030	238,483	281,620	222,003	231,780	225,595
Sixth month (five weeks)	128,142	268,599	296,028	229,749	268,626	219,750
Seventh month	106,812	166,485	171,005	120,154	109,543	101,101
Eighth month	174,633	174,904	201,788	123,889	126,769	96,986
Ninth month (five weeks)	444,296	255,286	435,398	371,590	295,774	266,856
Tenth month	284,810	256,984	340,445	367,672	264,934	265,122
Eleventh month	268,848	220,876	298,407	269,351	195,743	214,026
Twelfth month (five weeks)	307,386	244,933	352,629	322,756	263,152	285,648

	Average Prices per Quarter.											
	1868.		1869.		1870.		1871.		1872.		1873.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
First Month ..	70	4	51	10	43	11	52	8	55	4	55	10
Second month	72	11	50	10	41	10	53	6	55	8	56	5
Third month (five weeks)	73	1	48	5	41	3	54	6	55	1	55	6
Fourth month	73	4	46	4	42	7	58	2	54	2	54	10
Fifth month ..	74	3	44	8	43	10	59	1	56	3	55	8
Sixth month (five weeks)	68	9	45	10	47	0	59	8	58	11	58	4
Seventh month	65	6	49	5	50	9	58	7	58	7	59	6
Eighth month	57	9	52	1	53	11	57	11	59	9	60	1
Ninth month (five weeks)	55	1	51	4	47	0	57	0	58	7	63	10
Tenth month ..	53	11	47	8	47	4	56	5	58	7	60	10
Eleventh month	52	2	46	8	50	1	56	2	56	11	60	9
Twelfth month (five weeks)	50	2	44	2	52	4	56	2	56	7	61	6

Average Prices of British Corn per Quarter (imperial measure) as received from the Inspectors and Officers of Excise according to the Act of 27th & 28th Victoria, cap. 87, in each of the Fifty-two Weeks of the Year 1873.

Week ending	Wheat.		Barley.		Oats.		Week ending	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
January 4..	55	11	39	9	21	11	July 5..	59	1	36	7	28	1
January 11..	55	10	39	11	22	0	July 12..	59	5	37	7	29	0
January 18..	55	9	40	5	22	8	July 19..	59	6	35	10	27	4
January 25..	55	9	40	3	22	1	July 26..	60	1	36	0	30	10
February 1..	56	8	40	3	22	0	August 2..	59	9	36	8	28	5
February 8..	56	2	40	2	21	7	August 9..	59	11	34	11	27	5
February 15..	56	8	40	6	22	8	August 16..	60	3	37	2	28	8
February 22..	56	1	40	8	21	7	August 23..	60	3	39	6	29	9
March 1..	56	2	40	5	22	8	August 30	62	5	39	11	28	9
March 8..	55	5	40	4	22	4	September 6	63	4	42	5	27	1
March 15..	55	4	39	9	23	8	September 13	64	7	43	8	29	0
March 22..	55	3	39	11	23	6	September 20	64	7	45	1	27	5
March 29..	55	4	39	0	24	0	September 27	64	2	44	8	27	0
Average of Winter Quarter	55	10	40	1	22	6	Average of Summer Quarter	61	4	39	2	28	4
April 5..	54	11	39	1	24	5	October 4..	62	3	45	0	25	9
April 12..	55	1	39	0	23	5	October 11..	61	0	44	3	25	3
April 19..	54	7	39	2	23	10	October 18..	60	2	43	1	24	2
April 26..	54	10	39	4	23	10	October 25..	60	1	42	10	25	10
May 3..	54	11	39	5	23	10	November 1	59	10	43	1	25	0
May 10..	55	3	38	3	26	3	November 8	60	9	43	9	24	10
May 17..	55	10	38	10	24	7	November 15	61	3	44	8	25	8
May 24..	56	10	38	4	25	5	November 22	61	1	44	5	25	9
May 31..	57	5	37	1	26	11	November 29	61	0	44	5	25	8
June 7..	58	8	38	2	26	2	December 6	61	6	45	0	26	1
June 14..	58	4	35	4	27	8	December 13	61	11	45	0	26	3
June 21..	58	10	38	9	26	8	December 20	61	7	44	7	26	3
June 28..	58	8	36	8	25	11	December 27	61	8	44	6	26	0
Average of Spring Quarter	56	5	38	3	25	3	Average of Autumn Quarter	61	1	44	2	25	7

Note.—The system of preparing the Monthly Trade Accounts of the United Kingdom has been altered since the commencement of the year 1871, with the view of providing earlier and more accurate information.

The quantities of articles imported are now taken from the "Importers' Entries," instead of from the "Landing Accounts," which are not completed until a much later date: the figures given for the Imports in January, 1871, will not, therefore, compare with those given for the months of January, 1869 and 1870—the former showing the complete Importations of the month, and the latter only the Returns of the Landing Accounts so far as received within the month, by which method the last seven to ten days' Importations of the month were excluded. So great a divergence will not occur in subsequent months.

The Import Account for the month of December, 1871, will in many cases exhibit a considerable deficiency when compared with the month of December in

QUANTITIES of WHEAT, BARLEY, OATS, PEAS, BEANS, INDIAN CORN or MAIZE, WHEATMEAL and FLOUR, IMPORTED in the FOUR YEARS 1870-73; also the COUNTRIES from which the WHEAT, WHEATMEAL, and FLOUR were obtained.

	1870.	1871.	1872.	1873.
Wheat from—	cwts.	cwts.	cwts.	cwts.
Russia	10,269,198	15,629,435	17,840,640	9,598,096
Denmark	327,919	130,370	431,176	301,758
Germany	3,348,214	3,049,031	3,887,746	2,153,857
France	253,644	134,841	2,843,016	1,170,522
Austrian Territories	60,472	239,147	54,732	29,730
Turkey and Wallachia and Moldavia	489,421	1,418,886	838,073	367,487
Egypt	104,950	884,396	2,337,208	1,260,401
United States	12,371,922	13,405,057	8,606,403	19,742,726
Chili	599,337	549,529	1,434,125	1,557,128
British North America ..	2,838,361	3,279,264	1,719,378	3,767,330
Other countries	237,791	687,690	1,997,731	3,802,595
Total Wheat ..	30,901,229	39,407,646	41,990,228	43,751,630
Barley	7,217,327	8,589,059	15,078,140	9,232,485
Oats	10,830,630	11,007,106	11,567,058	11,922,736
Peas	1,799,354	1,021,950	1,290,076	1,211,068
Beans	1,505,798	2,975,651	2,937,514	2,976,500
Indian Corn, or Maize	16,756,783	16,832,499	24,563,334	18,768,127
Wheatmeal and Flour from—				
Germany	911,108	967,892	1,054,574	687,243
France	645,181	37,150	1,341,465	1,669,356
United States..	2,148,251	1,794,805	743,412	1,580,697
British North America.. ..	451,463	403,989	339,300	444,729
Other countries	647,906	780,802	917,308	1,822,235
Total Wheatmeal and Flour	4,803,909	3,984,638	4,396,059	6,204,260
Indian Corn Meal	5,741	7,881	5,384	6,836

previous years. This circumstance should not be taken to indicate a decrease in the trade of the month, inasmuch as in former years the account for December was not published until the end of the following February, and embraced the record of large quantities of goods imported in previous months, but not registered until the "Landing Accounts" had been received.

The Average Prices of Consols, of Wheat, of Meat, and of Potatoes; also the Average Number of Paupers relieved on the *last day* of each Week; and the Mean Temperature, in each of the Twelve Quarters ending December 31st, 1873.

Quarters ending	Average Prices. Consols (for Money).	Minimum Rate per Cent. of Discount charged by the Bank of England.	Wheat per Quarter in England and Wales.		Meat per lb. at the Metropolitan Meat Market (by the Carcase). Beef.	Mutton.	Potatoes (York Regents) per Ton, at Waterside Market, Southwark.	Pauperism. Quarterly Average of the Number of Paupers relieved on the *last day* of each week. In-door.	Out-door.	Mean Temperature.
1871	£.		*s.*	*d.*						°
Mar. 31	$92\frac{1}{8}$	2·7	53	7	5*d.*—$7\frac{3}{4}$*d.* Mean $6\frac{3}{8}$*d.*	$5\frac{1}{4}$*d.*—$7\frac{3}{4}$*d.* Mean $6\frac{1}{2}$*d.*	75*s.*—100*s.* Mean 87*s.* 6*d.*	160,984	878,892	40·2
June 30	$93\frac{3}{8}$	2·5	59	9	$5\frac{1}{4}$*d.*—$7\frac{3}{4}$*d.* Mean $6\frac{1}{2}$*d.*	$5\frac{1}{2}$*d.*—$8\frac{1}{2}$*d.* Mean 7*d.*	51*s.*—76*s.* Mean 63*s.* 6*d.*	140,338	805,519	51·5
Sept. 30	$93\frac{3}{8}$	2·2	57	9	$5\frac{1}{2}$*d.*—8*d.* Mean $6\frac{3}{4}$*d.*	$5\frac{3}{4}$*d.*—9*d.* Mean $7\frac{1}{2}$*d.*	60*s.*—77*s.* Mean 68*s.* 6*d.*	132,065	769,482	61·3
Dec. 31	93	4·2	56	3	5*d.*—$7\frac{3}{4}$*d.* Mean $6\frac{1}{2}$*d.*	$5\frac{1}{2}$*d.*—$8\frac{1}{4}$*d.* Mean $6\frac{3}{4}$*d.*	75*s.*—104*s.* Mean 89*s.* 6*d.*	140,955	758,474	41·8
1872										
Mar. 31	$92\frac{4}{8}$	3·0	55	4	5*d.*—$7\frac{1}{4}$*d.* Mean $6\frac{1}{8}$*d.*	$5\frac{3}{4}$*d.*—$8\frac{1}{2}$*d.* Mean $7\frac{1}{8}$*d.*	80*s.*—120*s.* Mean 100*s.*	149,599	776,793	43·6
June 30	$92\frac{7}{8}$	4·0	56	8	$5\frac{1}{4}$*d.*—$7\frac{1}{2}$*d.* Mean $6\frac{3}{8}$*d.*	6*d.*—$8\frac{3}{4}$*d.* Mean $7\frac{3}{8}$*d.*	124*s.*—150*s.* Mean 137*s.*	134,412	724,463	52·8
Sept. 30	$92\frac{4}{8}$	3·5	58	11	$5\frac{1}{4}$*d.*—8*d.* Mean $6\frac{5}{8}$*d.*	$6\frac{1}{4}$*d.*—$9\frac{1}{4}$*d.* Mean $7\frac{3}{4}$*d.*	105*s.*—133*s.* Mean 119*s.*	126,377	681,987	61·1
Dec. 31	$92\frac{2}{8}$	5·9	57	3	$5\frac{1}{2}$*d.*—8*d.* Mean $6\frac{3}{4}$*d.*	6*d.*—$8\frac{1}{2}$*d.* Mean $7\frac{1}{4}$*d.*	154*s.*—187*s.* Mean 171*s.*	138,648	675,598	45·3
1873										
Mar. 31	$92\frac{3}{8}$	3·9	55	10	$5\frac{1}{2}$*d.*—8*d.* Mean $6\frac{3}{4}$*d.*	$6\frac{1}{4}$*d.*—9*d.* Mean $7\frac{5}{8}$*d.*	179*s.*—235*s.* Mean 207*s.*	150,392	703,357	39·4
June 30	$93\frac{3}{8}$	5·2	56	5	6*d.*—$8\frac{3}{4}$*d.* Mean $7\frac{3}{8}$*d.*	$6\frac{3}{4}$*d.*—$9\frac{1}{2}$*d.* Mean $8\frac{1}{8}$*d.*	183*s.*—242*s.* Mean 212*s.* 6*d.*	135,491	666,126	51·8
Sept. 30	$92\frac{4}{8}$	3·8	61	4	$5\frac{3}{4}$*d.*—$8\frac{3}{4}$*d.* Mean $7\frac{1}{4}$*d.*	$6\frac{1}{2}$*d.*—$9\frac{1}{4}$*d.* Mean $7\frac{7}{8}$*d.*	95*s.*—120*s.* Maen 107*s.* 6*d.*	127,674	632,412	60·3
Dec. 31	$92\frac{4}{8}$	6·3	61	1	5*d.*—$8\frac{1}{2}$*d.* Mean $6\frac{3}{4}$*d.*	$5\frac{3}{4}$*d.*—$8\frac{1}{2}$*d.* Mean $7\frac{1}{8}$*d.*	{ 96*s.* 6*d.*— 117*s.* 6*d.* } Mean 107*s.*	137,409	625,316	44·2

The annexed return shows the number of Beasts exhibited and the prices realised for them at the Christmas markets since 1841 :—

Year.	Beasts.		Year.	Beasts.	
		s. *d.* *s.* *d.*			*s.* *d.* *s.* *d.*
1841	4,500	3 8 — 5 0	1858	6,424	3 4 — 5 0
1842	4,541	3 4 — 4 8	1859	7,560	3 6 — 5 4
1843	4,510	4 8 — 4 4	1860	7,860	3 4 — 5 6
1844	5,713	4 0 — 4 6	1861	8,840	3 4 — 5 0
1845	5,326	3 6 — 4 8	1862	8,430	3 4 — 5 0
1846	4,570	4 0 — 5 8	1863	10,372	3 6 — 5 2
1847	4,282	3 4 — 4 8	1864	7,130	3 8 — 5 8
1848	5,942	3 4 — 4 8	1865	7,530	3 4 — 5 4
1849	5,765	3 4 — 4 0	1866	7,340	3 8 — 5 6
1850	6,341	3 0 — 3 10	1867	8,110	3 4 — 5 0
1851	6,103	2 8 — 4 2	1868	5,320	3 4 — 5 8
1852	6,271	2 8 — 4 0	1869	6,728	3 6 — 6 2
1853	7,037	3 2 — 4 10	1870	6,425	3 6 — 6 2
1854	6,181	3 6 — 5 4	1871	6,320	3 10 — 6 2
1855	7,000	3 8 — 4 2	1872	7,560	4 6 — 6 0
1856	6,748	3 4 — 5 0	1873	6,170	4 4 — 6 6
1857	6,856	3 4 — 4 8			

Average Prices of British Wheat, Barley, and Oats, per Imperial Quarter, in each of the Sixteen Years 1858–73.

Year.	Wheat.		Barley.		Oats.		Year.	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
1858	44	2	34	8	24	6	1866	49	11	37	5	24	7
1859	43	9	33	6	23	2	1867	64	6	40	0	26	1
1860	53	3	36	7	24	5	1868	63	9	43	0	28	1
1861	55	4	36	1	23	9	1869	48	2	39	5	26	0
1862	55	5	35	1	22	7	1870	46	10	34	7	22	10
1863	44	9	33	11	21	2	1871	56	10	36	2	25	2
1864	40	2	29	11	20	1	1872	57	0	37	4	23	2
1865	41	10	29	9	21	10	1873	58	8	40	5	25	5

Certain Articles of Foreign and Colonial Production Imported in the Years 1870–73; and their Quantities.

	1870.	1871.	1872.	1873.
Animals, Living:				
Oxen, Bulls, and Cows, number	170,647	208,472	139,468	157,549
Calves .. .. ,,	31,525	40,139	33,525	43,338
Sheep .. .. ,,	651,138	917,076	809,822	851,035
Lambs .. .. ,,	18,767			
Swine and Hogs .. .. ,,	95,624	85,622	16,101	80,976
Bones (burnt or not, or as animal charcoal) .. .. tons	96,088	100,857	111,692	69,945
Cotton, Raw .. .. .. cwts.	11,958,635	15,876,248	12,578,906	13,693,472
Flax .. .. ,,	2,373,528	2,587,066	2,022,507	2,194,473
Guano .. .. ,,	280,311	178,808	118,704	184,921
Hemp .. .. ,,	1,108,839	1,295,812	1,105,983	1,251,030
Hops .. .. ,,	127,853	218,664	135,965	123,228
Hides untanned: Dry .. ,,	527,809	599,922	815,542	615,548
,, ,, Wet .. ,,	670,941	678,432	626,064	712,040
Petroleum .. .. tuns	27,220	35,808	25,300	65,630
Oilseed Cakes .. .. .. tons	158,453	162,804	134,300	138,119
Potatoes .. .. cwts.	771,854	847,835	5,987,429	7,473,230
Butter .. .. ,,	1,159,210	1,334,783	1,138,081	1,277,729
Cheese .. .. ,,	1,041,281	1,216,400	1,057,883	1,355,267
Eggs .. .. per great hundred	3,590,352	3,337,275	4,429,990	5,500,277
Lard .. .. cwts.	217,696	477,147	578,676	644,044
Bacon and Hams .. .. ,,	567,164	1,093,838	2,001,855	2,973,414
Salt Beef .. .. ,,	203,713	279,179	193,215	218,563
Salt Pork .. .. ,,	220,533	266,967	212,382	266,084
Clover Seeds .. .. .. ,,	213,779	340,506	290,849	278,419
Flax-seed and Linseed .. qrs.	1,490,695	1,310,147	1,514,947	1,453,018
Rape .. .. ,,	551,107	665,452	246,549	275,823
Sheep and Lambs' Wool .. lbs.	259,361,963	319,385,049	302,500,925	313,061,244

Owing to the unfavourableness of the autumn and spring sowing seasons for the wheat crop of 1873, it was anticipated that there would be a large falling off in the acreage under wheat; but the Agricultural Returns, just published, show that the actual decrease of the acreage under wheat in Great Britain in 1873, as compared with 1872, was not more than 3 per cent. A further comparison of the results for 1873 with those for 1872 shows the relative effect of the wet weather of the last autumn and spring upon farming in the grazing and in the corn districts of England. Thus in 1873 there was a decrease of acreage under corn crops of 2·2 per cent. in the grazing counties, against 0·2 per cent. in the corn counties, and the acreage under green crops was smaller by 1·3 per cent. in the grazing counties, against 0·9 in the corn counties. As regards the acreage for hay, whilst that from clover and the rotation grasses decreased more in the grazing than in the corn counties, or 9 per cent. against 7·6 per cent., the falling off in the acreage of hay from permanent pasture was greater in the corn than in the grazing counties, or 8 per cent. as compared with 3·5 per cent. About 9 per cent. less land was planted with potatoes in the United Kingdom in 1873 than in 1872; the general failure of this crop in 1872 tended to diminish the cultivation in 1873. In 1873 there was a larger number of horses returned in Great Britain, and a larger number of cattle and sheep both in Great Britain and in Ireland. The stock of sheep in Great Britain, although considerably increased in 1873, is still a little lower than it was in 1869. The number of pigs was smaller by 271,000 in 1873 than in 1872.

Some interesting results relating to persons engaged in agricultural pursuits in England and Wales are shown in the recent census returns. The number of farmers and graziers enumerated in 1871 was 249,907 (including 24,338 females) against 249,745 in 1861 (including 22,788 females); these results show a slight decrease in proportion to the general population. Farm bailiffs have increased from 15,698 in 1861 to 16,476 in 1871. The landed proprietors returned themselves at 22,964 (including 8,773 females) in 1871, and 30,766 (including 15,635 females) in 1861, but these are exclusive of landed proprietors who returned themselves under other occupations.

The number of men returned as agricultural labourers was 908,678 in 1851, 914,301 in 1861, and 764,574 in 1871. Notwithstanding explicit directions as to the necessity of filling in the particulars relating to occupations, in the householders' schedules, according to the instructions, it is probable that some *agricultural labourers* were returned as *labourers*. It is, therefore, not unlikely that the number of agricultural labourers is understated in 1871, although it is pretty well known that there has been a decrease in this class of the population.

The table at page XVIII., extracted from the Census Report, shows the results at each of the last three censuses.

ACREAGE under each Description of CROP, FALLOW, and GREAT BRITAIN and

DESCRIPTION of CROPS and LIVE STOCK.	GREAT BRITAIN.		
	1871.	1872.	1873.
CORN CROPS:—	Acres.	Acres.	Acres.
Wheat	3,571,894	3,598,957	3,490,380
Barley or Bere	2,385,783	2,316,332	2,335,913
Oats	2,715,707	2,705,837	2,676,227
Rye	71,495	66,875	51,634
Beans	540,835	524,005	586,561
Peas	389,547	361,545	318,213
TOTAL CORN CROPS	9,675,261	9,573,551	9,458,928
GREEN CROPS:—			
Potatoes	627,691	564,088	514,682
Turnips and Swedes	2,163,744	2,083,507	2,121,908
Mangold	360,517	329,190	325,702
Carrots	20,154	16,499	15,503
Cabbage, Kohl-rabi, and Rape ..	178,919	177,800	174,762
Vetches, Lucerne, and any other crop (except clover or grass)	387,155	445,299	423,929
TOTAL GREEN CROPS	3,738,180	3,616,383	3,576,486
OTHER CROPS, GRASS, &c.:—			
Flax	17,366	15,357	14,683
Hops	60,030	61,927	63,278
Bare fallow or uncropped arable land	542,840	647,898	706,498
Clover and artificial and other grasses under rotation	4,369,448	4,513,451	4,366,818
Permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land)	12,435,442	12,575,606	12,915,929
LIVE STOCK:—	No.	No.	No.
Cattle	5,337,759	5,624,994	5,964,549
Sheep	27,119,569	27,921,507	29,427,635
Pigs	2,499,602	2,771,749	2,500,259
Total number of horses used for agriculture, unbroken horses, and mares kept solely for breeding	1,254,450	1,258,020	1,276,444
Acreage of orchard, or of arable or grass-land, used also for fruit-trees	206,583	169,808	148,221
Acreage of woods, coppices, and plantations	2,175,471	2,187,078	2,187,078

GRASS, and NUMBER of CATTLE, SHEEP, and PIGS, in IRELAND, in 1871–72–73.

Ireland.			United Kingdom, including the Islands.		
1871.	1872.	1873.	1871.	1872.	1873.
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
246,954	228,189	168,435	3,831,054	3,839,532	3,670,259
222,604	220,057	231,023	2,616,965	2,543,581	2,574,529
1,633,960	1,621,813	1,510,089	4,362,139	4,340,748	4,198,495
9,647	8,832	8,405	81,222	75,849	60,121
9,549	10,029	11,129	550,613	534,341	598,121
1,365	1,753	1,743	391,250	364,194	321,007
2,124,079	2,090,673	1,930,824	11,833,243	11,698,245	11,422,532
1,058,287	991,802	903,282	1,693,825	1,563,691	1,425,720
327,162	346,464	347,904	2,500,565	2,439,336	2,479,847
31,766	34,736	38,096	392,941	364,699	364,552
4,167	3,782	3,698	25,047	20,977	19,891
43,543	50,207	37,355	222,610	228,118	212,326
46,607	46,925	42,085	436,410	495,173	468,776
1,511,532	1,473,916	1,372,420	5,271,398	5,111,994	4,971,112
156,883	122,003	129,432	174,269	137,360	144,115
..	..	..	60,030	61,931	63,278
22,323	18,512	13,474	565,886	667,299	720,990
1,827,733	1,799,930	1,837,483	6,236,588	6,354,319	6,240,900
10,068,848	10,241,513	10,420,695	22,525,761	22,838,178	23,363,990
No.	No.	No.	No.	No.	No.
3,973,102	4,057,153	4,151,561	9,346,216	9,718,505	10,153,670
4,228,721	4,262,117	4,486,453	31,403,500	32,246,642	33,982,404
1,616,754	1,385,386	1,044,218	4,136,616	4,178,000	3,563,532
537,633	540,745	531,708	1,802,108	1,808,259	1,817,831
324,285	..	325,173	2,499,756	..	2,512,251

NUMBER of MEN returned as AGRICULTURAL LABOURERS, LABOURERS (branch undefined), SHEPHERD (out-door), and FARM SERVANT (in-door) at each of the THREE CENSUSES of ENGLAND and WALES, 1851, 1861, and 1871.

	1851.	1861.	1871.
(*a.*) Agricultural Labourers	908,678	914,301	764,574
(*b.*) Labourers (branch undefined) ..	324,594	306,544	509,456
	1,233,272	1,220,845	1,274,030
(*c.*) Shepherd (out-door)	12,517	25,559	23,323
(*d.*) Farm Servant (in-door)	189,116	158,401	134,157
	1,434,905	1,404,805	1,431,510
$a + c + d$	1,110,311	1,098,261	922,054

The following TABLE, showing the DENSITY of LIVE-STOCK in comparison with the DENSITY of POPULATION in ENGLAND and WALES, is extracted from the CENSUS REPORT of 1871.

GROUPS OF COUNTIES PROPER.	Proportion per cent. of		To a Square Mile—the Number of				
	Cultivated Land.	Un-cultivated Land.	Persons.	Horses used solely for Agri-culture, &c.	Cattle.	Sheep.	Pigs.
ENGLAND AND WALES ..	74·81	25·19	390	19	77	356	44
ENGLAND (including Monmouthshire)	77·17	22·83	422	19	77	352	46
WALES	58·50	41·50	165	16	82	389	32
METROPOLITAN COUNTIES ..	69·60	30·40	3498	17	60	116	52
SOUTH-EASTERN COUNTIES ..	80·07	19·93	375	17	47	425	46
SOUTH-MIDLAND COUNTIES ..	91·30	8·70	253	23	72	398	62
EASTERN COUNTIES	81·55	18·45	239	26	48	275	70
SOUTH-WESTERN COUNTIES ..	74·79	25·21	238	17	85	387	50
WEST-MIDLAND COUNTIES ..	85·94	14·06	444	20	92	334	54
NORTH-MIDLAND COUNTIES ..	85·37	14·63	257	21	95	451	43
NORTH-WESTERN COUNTIES ..	67·89	32·11	1131	17	128	145	38
YORKSHIRE	71·07	28·93	402	20	77	326	35
NORTHERN COUNTIES	56·83	43·17	255	11	64	371	14
MONMOUTHSHIRE AND WALES	59·26	40·74	178	16	81	384	32

The following remarks relating to Irish and Foreign Butter and to Cheese are extracted from 'The Grocer.'

IRISH BUTTER.—The transactions in January were very limited, with the exception of third and fourth Corks, the former at 99*s.* to 102*s.*, and the latter at 88*s.* to 90*s.* In February, stocks were light, particularly so those fine and fresh: there were stale parcels offering for resale, much below best. Quotations for finest Clonmels ruled at 136*s.* to 140*s.* throughout; thirds, 120*s.* to 135*s.* In March nearly all of fine quality was cleared off; the chief part of that left on hand consisted of stale parcels; for the little fine left, high rates were asked, and this caused a wide range in quotations. In April there was not enough Clonmels and butter of that class lying in the London market to establish quotations; there was a wide range in the asking rates. On the 21st April the Cork market opened with the new season's brands at very high prices—say 150*s.* for both firsts and seconds. At no period during the month of May did the stocks of Irish butter at the public wharves amount to 500 firkins, the chief part being stale parcels offered for resale. Throughout the month there was no quotable price for Clonmels, &c. The quantity lying in the London market was small in June, and nearly all old. In the first week of July there was a little more doing in sales. In August there was a fair average extent of business transacted; the variation in prices was small. In the early part of September there was a moderate extent of business doing. In October high prices checked sales; the nearly nominal quotations for Clonmels were 132*s.* to 140*s.* In November the demand was very limited, quotations for Clonmels, &c., began and finished at 134*s.* to 142*s.* With a few exceptions the transactions in December were small; quotations were chiefly 140*s.* to 150*s.* for first Corks.

CORK BUTTER MARKET.—1873 has again been a year of high prices in butter, as well as in most other articles, and three figures in the quotations are now as much a matter of course as two were formerly—the lowest quality now often touching close on the price of the highest in former days. The past season in the Cork butter market opened about May 1, and at the respectable rate of 145*s.*; but it was expected that a more genial summer than that of 1872 would bring in a largely increased supply and more moderate prices; and under the influence of this opinion and of the natural course of things, prices gradually and rapidly declined, 120*s.* being about the average for May, 114*s.* for June, and 113*s.* for the early part of July—the lowest point of the year having been reached in the middle of that month. Since then there has been a steady and constant advance, each month registering a higher range of prices, till they have finally attained the rates the market opened at in spring. The expectations of an increased supply to the market in 1873 have been disappointed, the receipts being in round numbers but 360,000 firkins, against 400,000 in the same period of 1872, showing the very large decrease of 40,000 firkins. This is attributable to the farmers having fattened the cattle for sale instead of keeping them for dairy purposes; so that, although the prices of butter may be called high, there were great attractions in other branches in farming.

Foreign Butter.—The month of January commenced with very heavy stocks lying at the London market, say over 25,000 packages, and a great portion of it of very inferior and doubtful quality. There was a good demand for finest Normandys at the beginning of the month at 134*s.* to 154*s.*, closing at 140*s.* to 156*s.* Dutch varied considerably. In February the greater part of the stocks lying in the London market was of inferior quality; prices for finest Normandys, the first week, 148*s.* to 156*s.*, then a reduction of 4*s.* the second and third weeks, and a further 4*s.* at the close; best Dutch, 135*s.* to 142*s.* With fair average supplies the month of March opened with a somewhat quieter feeling; the chief part of the arrivals were of middling quality: very little American in the market. The arrivals in April were of full average, and best Normandys were quoted at 124*s.* to 134*s.* the first week. The coldness of the weather at the end of this month had some effect upon prices; no American. In May supplies were large, over 120,000 packages. Best Normandys began at 122*s.* to 126*s.* In June, arrivals were large, but a good deal being wanted for Manchester, Liverpool, &c., a clearance was effected. Best Normandys were in request at about 112*s.* to 118*s.*: no American, and scarcely any arriving. In July arrivals were large. Best Normandys sold steadily at 112*s.* to 118*s.* until the last week, when, the weather being hot, buyers operated sparingly at a reduction of 2*s.* per cent. Supplies in August were a little beyond an average extent. The fear of the Adulteration Act operated against doubtful descriptions. In September supplies were large; a good demand for finest qualities. In October, supplies were beyond average ones; but the feeling was scarcely so firm as it had been. Asking rates were—Normandys, 136*s.* to 144*s.*; American, slow sale at from 90*s.* to 124*s.* In November the arrivals were very large, a considerable portion of it of second and third rate qualities. Best Normandys saleable at 136*s.* to 146*s.* American, sale slow at from 96*s.* to 104*s.* for inferior, to 126*s.* for finest. In December the foreign supplies were large, but holders of fine qualities firm.

Cheese.—In January holders of fine English showed no desire to press sales, but were anxious to move off lower qualities. The range in prices was great between best and common sorts, best and good Cheshire being offered at 70*s.* to 84*s.*, common qualities 56*s.* to 66*s.* American, early in the month—best 66*s.* to 72*s.*, middling descriptions 50*s.* to 62*s.* In February holders of fine English cheese were firm, but willing sellers of second-class and low qualities. Finest Cheshire at the beginning of the month 78*s.* to 84*s.*, at the close 80*s.* to 88*s.* Best American 66*s.* to 74*s.* In March the market was firm for fine English: Cheshire 70*s.*, 88*s.*, and Cheddar 90*s.*, 94*s.* The quantity of fine American lying at the London market was small. Although holders of fine English were firm in April, no change in prices was quoted during the month—Cheddar ranged from 70*s.* to 94*s.*, Cheshire from 70*s.* to 88*s.* The variation in American was only 2*s.*, prices being 66*s.* to 76*s.* the first part, and 66*s.* to 74*s.* the last part of the month. The market, with light stocks, and the growth of grass unusually late, ruled firm throughout May: the few parcels of American that arrived found buyers fast as to hand. Best Cheshire 80*s.* to 88*s.* Cheddar 80*s.* to 96*s.*; best American 66*s.* to 74*s.* In June the stocks of the best descriptions of fine English of last season's make being nearly cleared off, and the backwardness of this season preventing an early supply of new, holders of the little fine that was left were very firm. In July fine English of last season's make held firmly; the arrivals of American were large, but the conditions being far better than that of the new English, the demand rested chiefly upon the former. In August fine English was exhausted; quotations for old ceased early in the month. New Cheddar was afterwards quoted at 76*s.* to 86*s.*: supplies of American were large. With cooler weather in September supplies of English came forward more freely; quotations for new—Cheddar 78*s.* to 86*s.*, Cheshire 56*s.* to 86*s.* Some of the American arrivals in the early part of the month showed evidence of having been made in hot weather; the sale of these pressed at 62*s.* to 64*s.* In October the makers of fine English cheese were firm, and the dealers from large country towns were the most anxious buyers. The state of money matters in America caused a little uncertainty as to what would be the effect upon the market for American cheese in November; the general prices for fine qualities were 70*s.* to 72*s.* In December the market was firm; finest Cheshire 80*s.* to 86*s.*, best Cheddar 88*s.* to 92*s.*, best American 70*s.* to 72*s.*

STATISTICS OF DAIRY PRODUCE.

(*The following Quotations, &c., are extracted from* 'The Grocer.')

PRICES CURRENT on 1st SATURDAY in JANUARY of each YEAR, from the latest actual MARKET SALES.

	1869.	1870.	1871.	1872.	1873.	1874.
Butter:	Per cwt.	Per cwt.	Per cwt.	Per cwt.	Per cwt.	Per cwt.
Carlow, finest, F.O.B.	128s. to 136s.	124s. to 130s.	130s. to 144s.	120s. to 134s.	120s. to 132s.	134s. to 142s.
Landed	126 ,, 140	122 ,, 130	126 ,, 146	116 ,, 136	120 ,, 134	134 ,, 142
Cork, 1sts	136 ,, 145	134 ,, 137	142 ,, 150	133 ,, 137	136 ,, 142	143 ,, 150
,, 2nds	133 ,, 140	123 ,, 125	134 ,, 142	124 ,, 129	123 ,, 133	140 ,, 146
,, 3rds, new ..	125 ,, 128	107 ,, 109	122 ,, 125	106 ,, 118	100 ,, 106	122 ,, 123
,, 4ths	117 ,, 120	100 ,, 104	112 ,, 114	84 ,, 86	87 ,, 89	108 ,, ..
Limerick	.. ..	116 ,, 120	128 ,, 132	112 ,, 116	110 ,, 114	100 ,, ..
Foreign:						
Friesland	120 ,, 134	104 ,, 132	112 ,, 142	106 ,, 116	112 ,, 122	130 ,, 138
Jersey, &c.	100 ,, 130	74 ,, 130	76 ,, 130	75 ,, 124	74 ,, 120	95 ,, 140
Kiel	.. ..	104 ,, 136	110 ,, 156	100 ,, 140	112 ,, 146	130 ,, 148
Normandy	112 ,, 145	90 ,, 150	.. ..	90 ,, 150	90 ,, 150	100 ,, 148
American	112 ,, 120	100 ,, 112	94 ,, 116	60 ,, 115	60 ,, 105	95 ,, 126

Cheese:						
English Cheddar, fine, new	86 ,, 94	90 ,, 94	.. ..	66 ,, 84	70 ,, 90	76 ,, 92
,, good, new	74 ,, 82	74 ,, 86	74 ,, 100	.. ..	.. ..	.. ..
Red Somerset Loaf	.. ..	72 ,, 84	80 ,, 92	50 ,, 72	70 ,, 76	70 ,, 80
White or yellow Cheddar Loaf	.. ..	76 ,, 84	80 ,, 92	60 ,, 70	68 ,, 80	76 ,, 80
Scotch Cheddar	64 ,, 74	70 ,, 80	70 ,, 80	60 ,, 70	66 ,, 76	68 ,, 80
Cheshire, new	80 ,, 90	84 ,, 90	78 ,, 90	70 ,, 84	70 ,, 84	78 ,, 85
,, good ditto ..	64 ,, 76	66 ,, 78	60 ,, 74	50 ,, 64	56 ,, 66	60 ,, 66
Wiltshire, new	68 ,, 78	72 ,, 80	64 ,, 84	64 ,, 70	66 ,, 76	68 ,, 80
,, good ditto ..	62 ,, 64	62 ,, 68	.. ..	50 ,, 60	56 ,, 60	60 ,, 66
North Wilts Loaf, new ..	66 ,, 78	76 ,, 84	80 ,, 90	50 ,, 72	60 ,, 76	66 ,, 80
Derby ,, ,, ..	70 ,, 86	72 ,, 86	68 ,, 86	56 ,, 78	60 ,, 78	70 ,, 88
Foreign:						
American, fine	66 ,, 74	72 ,, 75	74 ,, 80	60 ,, 66	66 ,, 72	70 ,, 72
,, good	60 ,, 64	64 ,, 70	60 ,, 68	40 ,, 56	50 ,, 62	54 ,, 68
Gouda	50 ,, 62	50 ,, 62	50 ,, 64	40 ,, 64	50 ,, 64	56 ,, 66
Kanter	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
Edan, new	54 ,, 68	54 ,, 65	54 ,, 70	50 ,, 70	52 ,, 68	56 ,, 68

STATEMENT of the QUANTITY and VALUE of BUTTER imported from the UNITED STATES, BELGIUM, FRANCE and HOLLAND; and of CHEESE imported from the UNITED STATES and HOLLAND, 1864–72.

Years.	UNITED STATES.			
	BUTTER.		CHEESE.	
	Quantities.	Computed Real Value.	Quantities.	Computed Real Value.
	Cwts.	£.	Cwts.	£.
1864 ..	142,672	780,024	466,988	1,213,890
1865 ..	83,216	437,703	442,913	1,296,204
1866 ..	16,059	77,754	415,726	1,386,447
1867 ..	39,035	113,290	526,740	1,470,017
1868 ..	7,117	37,279	489,117	1,439,380
1869 ..	17,203	84,603	487,870	1,612,325
1870 ..	16,915	80,928	555,385	1,861,263
1871 ..	83,775	394,359	731,326	2,014,805
1872 ..	45,765	199,679	598,198	1,701,435

Years.	BELGIUM.		FRANCE.	
	BUTTER.		BUTTER.	
	Cwts.	£.	Cwts.	£.
1864 ..	81,575	470,167	163,020	858,793
1865 ..	70,619	433,179	353,115	1,867,085
1866 ..	76,667	426,712	452,196	2,276,493
1867 ..	80,754	470,464	450,693	2,265,147
1868 ..	70,456	405,987	393,578	2,156,824
1869 ..	85,789	481,609	407,432	2,231,450
1870 ..	84,408	516,643	289,692	1,672,899
1871 ..	94,539	523,460	304,683	1,636,006
1872 ..	74,191	409,555	355,089	1,916,795

Years.	HOLLAND.			
	BUTTER.		CHEESE.	
	Cwts.	£.	Cwts.	£.
1864 ..	336,224	1,774,462	336,831	881,972
1865 ..	345,026	1,886,486	386,962	1,100,037
1866 ..	383,225	1,979,070	426,559	1,317,231
1867 ..	326,217	1,733,459	332,628	961,245
1868 ..	343,322	1,992,414	329,565	959,547
1869 ..	415,176	2,253,420	426,913	1,262,101
1870 ..	406,795	2,388,459	422,553	1,204,830
1871 ..	390,616	1,986,708	348,148	954,236
1872 ..	269,091	1,358,579	329,535	942,537

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*Report upon the Agricultural Features of the Vienna Exhibition*, 1873. By JOHN WRIGHTSON, Professor of Agriculture in the Royal Agricultural College, Cirencester.

THE following report is intended to precede an account of the agriculture of the Austro-Hungarian Empire. A description of the domestic animals, implements, and products of that wonderful dominion seems a fitting introduction to the task still before me, and a study of the Agricultural features of the Vienna Exhibition supplies much of the necessary material. A report upon objects no longer before us is apt to become somewhat tedious. The subject has therefore been handled with the view of bringing the true nature of the Exhibition before the reader without wearying him with repetition or detail. The first pages are devoted to the Live Stock Show, opened to the public on May 31st, and closed on June 7th, 1873; next, some attention is given to the Agricultural Implements, so far as they are peculiar to the requirements of European agriculture as distinguished from British agriculture; and lastly, Agricultural Products are briefly considered.

LIVE STOCK SHOW.

The announcement that an International Cattle and Live Stock Show would be held in Vienna in connection with the great Exhibition of 1873, was received with no small interest in England. Distance, difficulties connected with exportation, and other reasons, however, operated to prevent a large collection of English stock appearing, and, consequently, the British section of the Cattle-show was scarcely a fair illustration of the preeminence of Britain as a stock-breeding country.

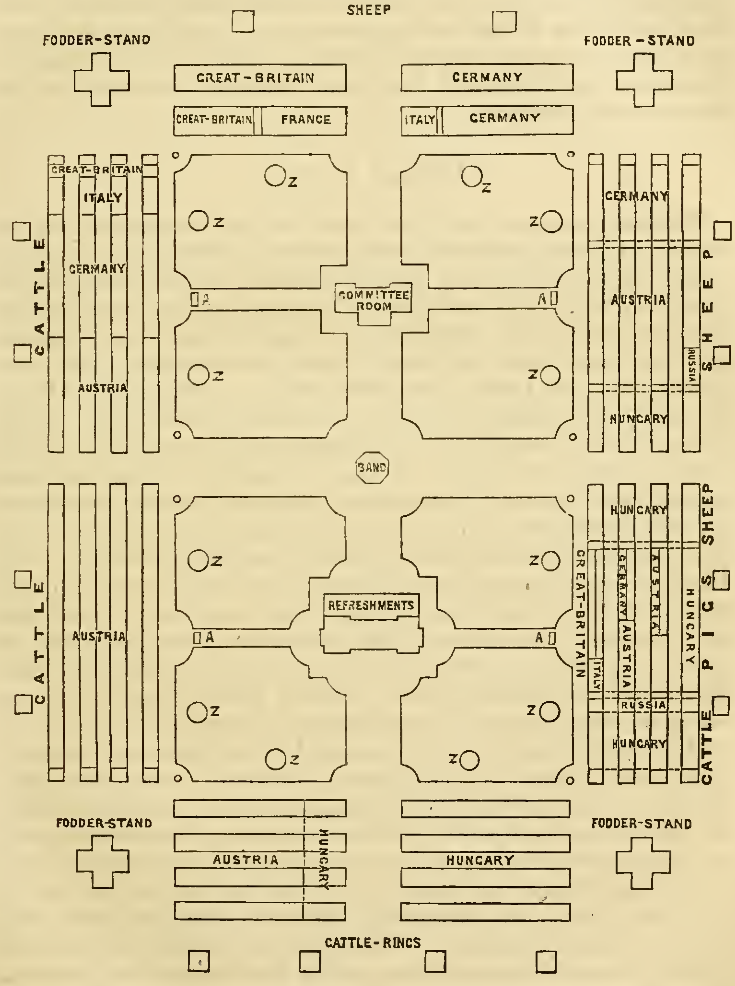
The stock exhibited by our countrymen will be reported upon in their proper position, and that they occupied the first place in the catalogue is a sign of appreciation which should not be passed unnoticed.

No person could doubt that, judging the Cattle-show as a collection of animals, he had before him at once the finest and most interesting assortment ever summoned together by the stimulus of competition. There were gathered in that arena, not only materials to instruct the breeder and rearer of stock, but also the naturalist, the "evolutionist," and the comparative anatomist. Neither was the picturesque element wanting, and the artistic eye might well be satisfied as it ranged over such a diversity of colour and form, heightened by the rich-coloured and picturesque clothing of the peasant attendants from the various parts of the Austrian dominions. The International Cattle-show was certainly to me the most interesting feature of the Vienna Exhibition. It possessed a charm of novelty, which could scarcely be said to belong to collections of silks, jewellery, gold, porcelain, and glass. To form an idea of the interest of the Vienna Cattle-show the reader must imagine the pleasure of contrasting his favourite native Shorthorns with their relatives bred for many years abroad, or with crosses effected between British and foreign races. He must endeavour to picture the majestic Hungarian ox as a larger type of the wild cattle of Chillingham Park. He must call to his memory the fawn-coloured cattle of Switzerland, black and white Dutch, red and white Bernese, silver-grey Allgauers, swarthy buffaloes, Merino sheep, and wool-bearing swine. It was allowed on all hands that such a magnificent collection of domestic animals had never been brought together, and the show of Merino sheep, especially, was declared to be unprecedented. With such materials, all that was necessary to make the exhibition successful was good arrangement. It was here, however, that the Vienna Cattle-show failed; and as a means of instruction this superb collection of animals seemed to have been called together for but little purpose. The general scheme, as shown in the accompanying plan (Fig. 1), was excellent; but unfortunately the names of the various nationalities, there so conspicuous, did not appear in the actual show-yard until the last day of the exhibition.

The scattered state of the various breeds made the work of the jurymen peculiarly arduous. Their first work was to find the cattle, then to go backwards and forwards across the show-yard to compare one with another, and lastly they met in a tent and voted. There was no show ring, and there were no classes. The unfortunate juryman was requested to give his opinion as to whether he preferred this yearling or that aged bull, this promising heifer or that blooming middle-aged cow.

Under these circumstances it was perhaps as well that no

Fig. 1.—*Plan of the Agricultural Show-Yard at the Vienna Universal Exhibition*, 1873.



A A. Latrines. Z Z. Tents.

more searching judgment was required than to give an opinion as to whether the exhibitor was entitled to a "medal for progress" or must be satisfied with a "medal for co-operation." Scarcely less happy was the arrangement of the stalls. The cattle stood in short rows across the sheds at right angles to their length, and not in a long single or double row, as in an English show-yard. The male visitor therefore crossed and recrossed the sheds in too close proximity to the heels of one row of cattle and the horns of another. Ladies could not make a series of such hazardous excursions, and therefore they were debarred from any but the most cursory glimpses.

English Cattle.

England occupied the first place in the catalogue, and, as might have been expected, so far at least as cattle are concerned, it was solely represented by Shorthorns. Mr. John Brown, of Grey Street, Hull, exhibited six young bulls; the Messrs. William and Henry Dudding, of Panton House, Lincolnshire, exhibited one bull; Mr. John Fowler, of Aylesbury, a bull and heifer, and Mr. Henry Frederick Smith, of Hamwath House, Sutton Mill, Yorkshire, showed one good yearling bull. These ten specimens completed the English cattle section, and some surprise was expressed on the part of foreign visitors that there was so small a show. Looking at the English section as a whole, it could not be said to give a first-class idea of our favourite race, but there were two or three animals of considerable merit. Mr. Fowler's bull exhibited ampleness of form, was thoroughly well haired, and possessed the characteristic grandeur of head and neck peculiar to the race; his colour also was gay, and his quality satisfactory. Some judges might have preferred Messrs. Dudding's red yearling bull "British Prince," but as he was many months younger it was difficult to compare the two animals. Both, however, were passed by the judges in favour of Mr. Smith's (No. 10) bull, which eventually was placed first. Evidently the judges were determined to look only at what may be called the flesh points of these animals. It probably would have been in vain to have pointed out to them a certain swarthiness, amounting almost to black, or brindled stripes, in the coat of their favourite, or to contrast his short hair with the flossy, silky coat of Mr. Fowler's bull. They appeared equally indifferent to that nobleness of head and neck which Mr. Fowler's bull certainly possessed in no small degree. They also considered that deficiency behind the shoulder, which English Shorthorn judges are too apt to condone as belonging to the race, an unpardonable fault. On the other hand, general levelness, length, and substance of carcass were evidently in their eyes all-important, and it was according to this standard that the awards were apparently made.

Mr. Robert Russell, of Horton Court, Kent, while himself an exhibitor in the sheep classes, showed his practical appreciation of excellence, whether found at home or abroad, by purchasing examples of foreign breeds of sheep and cattle. The present seems a fitting place to refer to this fact, because it is interesting to chronicle the introduction of foreign breeds of live stock into this country, conjointly with the introduction of our own improved races into other lands. Mr. Russell became a purchaser of Swiss and Italian cattle and Merino sheep, and, in answer to a letter of inquiry, he replies as follows:—

"In answer to yours respecting my foreign cattle, I think perhaps the first thing to mention concerning them would be give you some little idea as to the trouble and expense of importing foreign stock. These, you are aware, I purchased at the Vienna Exhibition, there being one cow and two heifers of the pure-bred Swiss breed, also a thoroughbred Italian bull calf, aged four months. In the first place, my man railed them to Antwerp, and on arriving there found that if they were shipped to England from that port they would have to be slaughtered; he then came over to England for instructions. I received information that if they were shipped from Rotterdam they could land at Harwich, and, by going through their quarantine of twelve hours, would be passed without any further trouble. I despatched my man over to Antwerp again, to rail them from there to Rotterdam; but on arriving on the boundary of Belgium and Holland, he was started off back with them, not being allowed to go into Holland; then I applied to the Privy Council for an order to land them; but the only one I could get was to ship them from Antwerp to London, then tranship them into a barge, then into the Dublin steamer for Southampton, at which place they were to undergo a month's quarantine; then I railed them home. However, now I do not regret the trouble I took, as I am very pleased with them. The Swiss cows are of a dark mouse colour; in appearance rather bull-headed, very level on the back, have wonderful large bone, and there is no doubt they are very hardy; they always appear in good condition, even when not having cake or cabbage, and they are very docile, and hardier than Shorthorns. They are very good milkers, but not so good as I should have expected perhaps, as they neither give so much milk, nor of such good quality, as the Alderney; but I have found out the way to obtain most beautiful butter, by mixing half Alderney and half Swiss milk. A great many of my friends have tasted the butter, and pronounce it to be the best they ever tasted. I intend trying three crosses, viz., one with the Italian bull and Swiss cows; one with an Alderney bull and Swiss cows; and one between the Italian bull and Alderney cows, to get a greater size. I have been extremely fortunate, as one of the heifers calved down (bull calf) at Antwerp, the other heifer at Southampton (bull calf), and the cow having a cow calf about six weeks ago; they all seem to thrive wonderfully.

"The Italian bull, since I have had him, has improved very much, and we have to keep him well, as he is inclined to outgrow his strength. His colour is sandy. I do not admire his points so much, but when he commences to fill out he will no doubt improve. He feeds well, and is healthy. The breed is a very large one, as the mother, I think, was the finest specimen of a cow I ever saw. They are wonderfully good milking cows as to quantity, but for quality I cannot say. The weight of bulls at three years old of this breed would be between 25 to 30 cwt. live weight.

"I also purchased four pure-bred Merino ewes, which I think of crossing with my Long-wool breed. One of the ewes has lambed down about three weeks since, having twins—one ram lamb and one ewe lamb. The other three have been tupped from my Long-wool class, which will improve the quality of my wool, losing but slightly the length of staple."

Shorthorns and Shorthorn crosses having especial interest for the English farmer, it seems advisable to deviate here from the plan of treating the cattle of each country in the order of the catalogue, and to make a few remarks on our dominant race as it appears, after it has been for a time in foreign hands and exposed to new climatic conditions.

Comparatively few Shorthorns and Shorthorn crosses were to be seen in Vienna, and in this respect the Exhibition faithfully represented the state of the country subsequently passed through.

Most prominent among the promoters of this breed is the Archduke Albrecht, the owner of vast estates both in Upper and Lower Hungary. I subsequently visited these estates, and learnt that the first Shorthorns imported suffered from lung disease, although later purchases had been more fortunate. Also that the race was not spreading into the surrounding country from the centres where the Archduke had established them. The Archduke exhibited four pure-bred Shorthorn bulls, all bred in Hungary; three cross-bred Shorthorn-Dutch bulls; two cows, two calves, and four fat calves similarly bred; two fat oxen, the result of a cross between Bernese cattle and Shorthorns, and a fine collection of fat cows, calves, and oxen described as Shorthorn crosses. The Shorthorn bulls were all smoother in the coat than English-bred cattle usually are, and since this is a characteristic of all the South European races, it may be regarded as a tendency to alteration from changed climatic conditions. It was, however, in the Shorthorn crosses that the Archduke's success, as a breeder and improver of stock, was rendered most evident. Take as an example his bull No. 726 in the catalogue, by a Shorthorn bull, and from a Dutch cow. This animal was in colour red and white, and in form, despite a little lowness in the chine, very excellent. After inspecting a large number of similarly bred animals on the estate Bellye, in Lower Hungary, I can speak to the very handsome appearance, good quality, and good milking properties of these animals. It is premature to speak of them as an established race, but as a cross they are worthy of the highest commendation. These animals are red and white, black and white, and almost black.

Neither must I neglect to mention a lot of five very splendid cows described as Shorthorn crosses, and numbered in the catalogue 756–760. Of these, No. 759 was undoubtedly the best. The Archduke's ten half-bred steers by Shorthorn sires were much and deservedly admired, many Englishmen declaring that they were well worthy of a place in our Islington show. Not far distant from the Archduke Albrecht's attractive collection, was the stand of the Sugar Factory Company, Keltschan, Moravia, with its excellent show of Shorthorn-Kuhländer and Shorthorn-Dutch cattle. Among the animals exhibited by this company the most admired were a brownish-red cross-bred cow between Shorthorn and Kuhländer, and another cow of mixed blood described as "Shorthorn-Holländer (Dutch) -Mürtzthaler," of dark grey colour, with a little white. These, with the addition of two "Shorthorn-Kuhländer" cattle, entered for exhibition by Josephine Bärnreither, Schloss Linz, Lubenz, Bohemia, were the only representatives of Shorthorn cattle contributed to the Vienna Exhibition from the entire Austro-Hungarian Empire, and it will be seen that the only exhibitor of pure-bred Shorthorns in the whole empire was the Archduke Albrecht. Germany contributed seven specimens, two of which were exhibited by Baron von Magnus, Drehsa, Post Tammritz, Saxony, a gentleman well known to English breeders, both of cattle and sheep, as a spirited buyer and enthusiastic improver of stock. Three of the remaining five were the property of F. Sagemüller, Abbehausen, Oldenburg; one English-bred bull of fair quality was exhibited by H. Sprengel, Schillerslage, Burgdorf, Hanover, and a single example appeared from Holstein. Judging the Shorthorns by the highest English standard of merit, and supposing that first-class animals had been sent from the mother-country, none of the foreign-bred cattle could be spoken of as first-rate, and it is more than probable that these cattle will deteriorate or at least alter in foreign hands. The climate speedily changes the coat, causing the cattle to assume that smooth description of hair before commented upon, and secondly, unavoidable want of knowledge on the part of the breeder as to points of "character," more than points of utility, must end in alteration of type if not in deterioration. It is too much to imagine that an Austrian or Hungarian breeder will be alive to the importance of those almost countless points of character which are so keenly discussed in animals brought under the notice of English judges. They rest their judgment reasonably enough upon milking properties, early maturity, and rapid fattening; but let any breeder of Shorthorns ask himself whether the uniformity, beauty, and character of a herd could be kept up solely by bearing those three important points in view. We must not accuse the foreign breeders of want of taste, because we find that they judge by a standard different from our own; but we may look in consequence to a rapid modification of the breed in their hands.

The following are the measurements of two fat steers described as red-and-black Shorthorn crosses, exhibited by the Archduke Albrecht:—

	Steer, No. 776. ft.	in.		Steer, No. 772. ft.	in.
Girth	8	2	..	7	6
Height at shoulder	5	2	..	4	10¾
Length from shoulder to tail head	5	8	..	5	3
Length from poll to tail head ..	7	4	..	7	1
Shoulder point to hook bone ..	4	5	..	4	2
Girth above knee	1	5	..	1	2½
Girth below knee	0	8	..	0	8

Italian Cattle.

There were 35 head of cattle entered from Italy, but only 10 appeared. They were generally described in the catalogue as bulls, cows, or calves, and were self-coloured,* varying in individuals from a very light grey approaching white, to fawn colour. The skin around the eyes and on the nose was black. The colour, as is often the case in these light-coloured races, was darker on the neck and inside the ears. The horns were turned up, short, and black tipped. Three cattle from Turin were of a richer colour, and especially one of the calves was of a fine fawn colour. One of the bull calves was purchased by Mr. Robert Russell of Farningham, Kent, and brought to England after much trouble and delay, in company with a cow and two heifers of the Swiss race, and some Merino ewes in lamb (see page 5). The animals of the Reggio race in this department were similar to those just described, but were of a much richer fawn colour.

German Cattle.

One hundred and twenty head of cattle were entered from Germany, including specimens of ten races, in the following proportions:—38 Dutch cattle (Holländers); 10 East Friesland; 5 West Friesland; 16 crossed Dutch and East Friesland; 11 Oldenburg; 1 Friburg; 3 Groningen; 16 Baden (Badnerlandschlag, and from Messkirch in Baden); 1 Montafuner; 7 Shorthorns; 1 Shorthorn crossed with Pinzgauer; 9 Simmenthaler; and 2 Scotch polled Angus. Of these, the Simmenthaler and Friburg are of Swiss origin, while the Dutch, Oldenburg, East and West Friesland, are essentially Dutch cattle,

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* By this term is meant that the colour was uniform over the whole body.

closely resembling each other. These cattle are familiar to English agriculturists under the name of Dutch cattle, and under the various designations above given they formed a very leading feature in the German section of the Cattle-show. About 90 per cent. of this race are black and white; 5 per cent. are grey and white, and 5 per cent. are red, or red and white. A mixed "pepper-and-salt," or black and white roan is also sometimes noticeable. These cattle give a large quantity of milk of watery quality. A large landed proprietor who supplies milk to Vienna, purchased Dutch cows for the purpose, but was compelled to relinquish them in favour of the Allgauer (Bavarian) race, in order to retain his customers. The following descriptions of these cattle were taken on the ground, and will give some idea of their form and character. No. 150 was a characteristic bull of the West Friesland sub-variety of the Dutch race, exhibited by K. C. Rüst, Bingum, Hanover. The colour was black and white, and the hair was short and not indicating what we in England call "quality." The horns were short and black, the muzzle black, the buttocks rather drooping, and the back a little narrow. The same gentleman exhibited three really handsome milking cows (Nos. 152–4), of the same race, black and white in colour, with long heads, black or speckled muzzles, short horns curved forward, and tipped with black; fine necks, good general forms, but a little narrow, and rather drooping in the hind-quarters. The quality, as indicated by touch, was fair, and the cows showed good, well-developed udders. The same exhibitor also owned the three Groningen cows above-mentioned. They were of silver grey, and black and white colours, and were, like all Mr. Rüst's exhibits, born in Holland. The specimens of East Friesland cattle noticed were exhibited by the East Friesland Agricultural Society, Bingum, Hanover, and were black and white, grey and white, and reddish-brown in colour.

The Oldenburg cattle are black and white, and occasionally grey and white. They are in appearance scarcely discernible from what are described as Dutch, but are said to yield a richer milk, to be handsomer in form, more easily fattened, and finer in the bone. All the cattle exhibited under this name were bred in the Province of Oldenburg, which is contiguous to, and is nearly surrounded by, what was recently the kingdom of Hanover. We must also notice the specimens of Dutch cattle exhibited by Messrs. Boekhoff, Brothers, of Bingum, East Friesland, all of which were bred in Holland. The herd consists of 400 head, and these are bred entirely for milk. The exhibitor supplies the whole demand for all the estates of the Archduke Albrecht, where these cattle are required. A bull and seven cows from this stock were sold for 4000 florins (400*l.*) during the Exhibition.

Among the representatives of English blood, Baron Magnus's Shorthorns may be noticed, comprising a cow bred in Saxony and a bull bred in England. A good white bull was also observed, bred in England, but exhibited by Herr H. Sprengel. It is worthy of remark that so few German-bred Shorthorns appeared on this great occasion, and the fact may be taken as indicating, that in spite of our export trade, the Shorthorn is yet unknown over vast tracts of the German Empire. We must defer for the present the consideration of the remaining breeds exhibited in the German section, as they formed more characteristic features of the pastoral life of other countries.

Austrian Cattle.

The Austrian Empire, excluding the Hungarian kingdom, contributed 559 head of cattle, including numerous examples of above thirty races, some of which have been already noticed. These were mixed or shuffled together in the greatest possible confusion, so that it was impossible to obtain a good idea of the various breeds. This was the more to be regretted, as the Austrian section presented by far the greatest diversity of races. The black-and-white Dutch cattle at once gave a character to the German section of the Show; the Hungarian oxen did the same service for Hungary, while the Austrian section alone was richly diversified.

An exhaustive description of these thirty races would carry us beyond the legitimate limits of a Report upon the Vienna Cattle-show. It will therefore be my aim to confine the following remarks to what might fairly be considered as matter of observation upon the show-ground; and the reader who wishes for more detailed information is referred to MM. Moll et Gayot's 'Connaissance du Bœuf' (1860), where he will find much valuable information, besides illustrations of all the leading European races.

The Austrian section was well filled, and the 559 entries might be analysed as follows:—

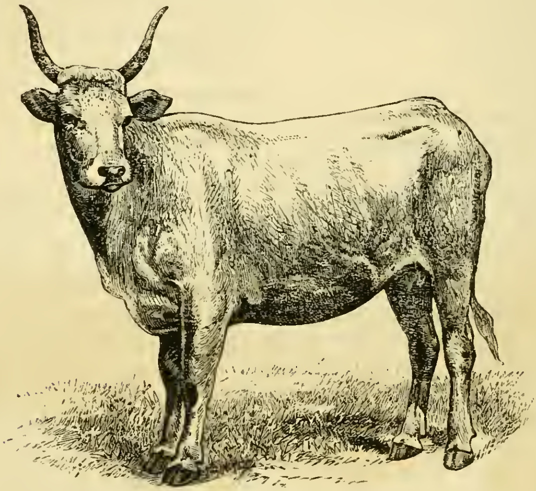
	Head.	
Podolian	9	Galician race.
Murzthaler	48	Styrian race.
Mariahofer	41	
Murbodenschlag	9	
Oberinnthaler	6	Tyrolese race.
Montafuner	26	
Patzuauer	8	
Zillerthaler	3	
Kemater	4	
Kitzbichler	5	
Tyrolese	3	

	Head.	
Mölthaler	12	Carinthian races.
Lavantthaler	6	
Pinzgauer	59	Salzburg race.
Vorarlberg	4	Vorarlberg race.
East Swiss	30	Swiss races.
Bernese	88	
Allgäuer	32	
Simmenthaler	4	
Kuhländer	18	Moravian races.
Deutscher	2	
Deutscher ord. cattle	8	
Moravian	3	
Schienfelder	6	Bohemian races.
Egerländer	7	
Dutch and crosses	63	Holland race.
Shorthorns and crosses	10	English race.
Hungarian and crosses	9	Hungarian race.
Other races and various crosses	36	

Of these, twenty races are native to the Austro-Hungarian Empire, but it will be noticed that Swiss and Dutch cattle occupy a very important position. Including the Kuhländer cattle (a constant, yet crossed Tyrolese and Swiss, race), these animals constituted about two-fifths of the Austrian section. Shorthorn crosses appeared to the number of about ten, and the pure breed was not represented. Of these ten, eight were exhibited by the Sugar Factory Company of Keltschan, Moravia, already mentioned, and the remaining two were the property of Josefine Bärnreither, of Bohemia, thus giving the most correct idea, that over vast tracts of the Empire the Shorthorn is unknown. This impression was confirmed by travel.

The Podolian Race.—Baron Jacob Romaszkan, of Horodenka, Galicia, heads the Austrian catalogue as an exhibitor of Podolian bulls and working oxen. This race is distributed over the greater part of Galicia, the exception being the mountainous district of the Carpathians, where a distinct race prevails. It is computed that Galicia sends about 20,000 fat cattle annually to the markets of Vienna and Olmutz. The cows give, after weaning their calves, 725 litres, or 160 English gallons of milk per annum. It often requires six or seven months to fatten them (Moll and Gayot). For milking and fattening purposes, therefore, the Podolian race is not of great value. It is as working oxen that they are most esteemed. MM. Moll and Gayot state that they will travel $2\frac{1}{6}$ miles per hour when yoked to an empty waggon, and $1\frac{1}{2}$ mile per hour when drawing a load. The four oxen exhibited at Vienna were trained to six different methods of yoking. They were fine-looking animals, of silver-grey colour, very uniformly tinted over the whole body, but slightly darker on the shoulders and haunches. The horns, which are characteristic, are black, well turned up, and not long. They resemble the Hungarian ox (page 31), and probably resulted from crossing this animal with an ancient race indigenous to Galicia. They are, however, shorter and thicker in the horn, shorter in the legs, and shorter and deeper in the body—altogether, nearer the ground and lower in stature than the true Hungarian ox.

Fig. 2.—*Podolian Cow* (*Galicia*), *exhibited by Baron Jacob von Romaszkan, of Horodenka.**



The Podolian is an aboriginal race of cattle, descended from the wild Urox † (*Bos primigenius*). This race, whose distribution may be regarded as already known, is distinguished by its capability of resisting the influence of the seasons, and its contentedness with poor diet. In Moldavia and Bessarabia the cattle are kept in the fields both in summer and winter, and are exposed to all the inclemencies of the weather. This breed is not subject to pleuropneumonia, and foot-and-mouth disease affects it very slightly, while the cattle-plague kills only from 12 to 20 per cent. of the beasts attacked.

Podolian oxen are very much sought after for fattening purposes. Nearly 75 per cent. of the oxen slaughtered at Vienna belong to this race. The meat is very much esteemed, and is distinguished for its tenderness and agreeable flavour.

The milk-producing powers of this breed are rather inferior, but they could, no doubt, be very considerably increased by better rearing and more nutritious

* The figures of Austrian cattle (Figs. 2-8) are copied from photographs kindly lent for the purpose by Lieut. T. H. Anstey, R.E., of the Royal British Commission for the Vienna Universal Exhibition. The descriptions printed in small type under each figure, are translations of those attached to the photographs.—Edit.

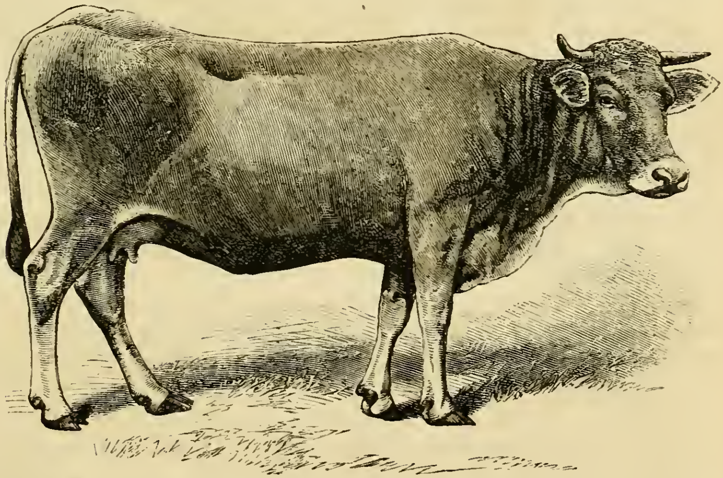
† In the original *Auerochs*. Some confusion exists in reference to the nomenclature of the ancient races of cattle; but, according to Professor Owen and Mr. Boyd Dawkins, the Urox is *Bos primigenius* of Bojanus (= *Bos Urus* of Julius Cæsar), while the Auerochs is the European Bison (*Bos Bison* of Pliny).—Edit.

food. The Podolian cattle are especially useful for grazing purposes, and stall-feeding is equally suitable to them.

Their colour is generally white or silver-grey, with variations passing into dark-grey, which shade is particularly seen in the bulls. These are darker in colour than the cows, and, indeed, are dark-grey on the neck, dewlap, and fore-feet, passing into white towards the ribs. The muzzle is white, the nostrils and upper lip black; the back is level, the set-on of the tail being in the same straight line.

Mürzthaler.—These beautiful cattle are native to Austria, and are found pure in the valleys of the Mürz and the Mur, in Styria. They are considered to be closely allied to the Hungarian cattle. The oxen work from three to eight years in the valleys and five or six years on the mountains, after which they are fatted. The cows are great milkers, and have been known to produce 775 gallons per annum, and 464 gallons is given as a usual average.

Fig. 3.—*Mürzthal Cow (Styria), exhibited by Geysa Ritter von Wachtler.*



The characteristic peculiarities of the pure Mürzthal race are the following:—The skin and mucous membrane are of a dark colour, as is shown in the mouth and on the tongue (blue tongue), muzzle dark; the horns are white, short, smooth, and thin, but black at the tips, directed forwards, and then turned somewhat upwards; the tail is long and thin, and is furnished with a black tuft; hoofs, black; the colour of the hair is bright or dark-grey (badger-grey), with brighter stripes round the muzzle; colour-rings round the eyes, and dark-coloured belly. The calves of the pure breed have a dark-blue tongue.

Three varieties of the Mürzthal breed may be distinguished, namely, the large, the medium, and the small. With regard to the distribution of the whole of the pure Mürzthal race, they may be met with in the districts of Mürzerschlag, Kindberg, Bruck, Aflenz, Mariazell, and Leoben, to the number of 47,584 head. The Murboden race, which is a branch of the Mürzthal breed, having a yellowish-white colour, especially on the head and neck, is distributed to the number of 41,815 head in the districts of Judenburg, Knittelfeld, Zeiring, and Obdach. The natural breeding districts of both these races are the districts Frohnleiten, Weiz, Gleisdorf, Birkfeld, Vorau, Friedberg, Hartberg, and Pöllau, with a total of 77,144 head.

The Mürzthal race is especially prized for its milk-giving properties, and its suitability for draught-purposes; but good sweet hay is necessary to their successful development.

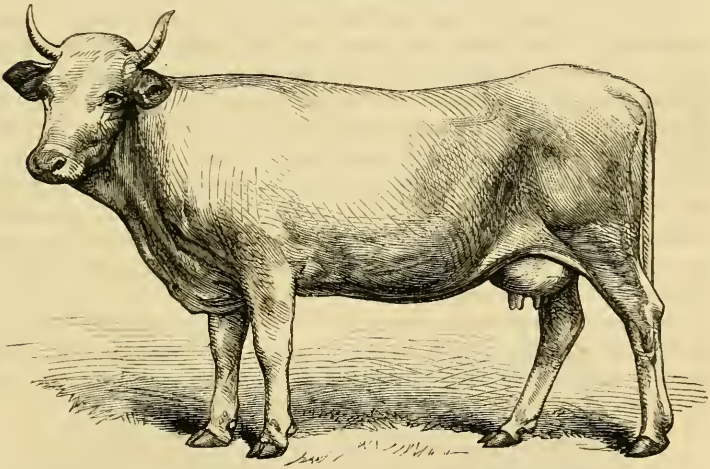
The following description is taken from the large collection of specimens exhibited by the Exhibition Committee of Leoben, in Styria, which comprised 90 head of the Mürzthal, Mariahof, Pinzgau, and Murboden Valley races. The colour varies in individuals from a light fawn to a dark grey, almost black. Each animal is pretty uniformly coloured over the body, invariably becoming darker on the cheeks, neck, lower parts of the sides (flanks) and thighs. The ears are light inside, and the muzzle is black, with a light-coloured ring of hair round it. There is a dark, or black, ring around the eyes; the horns are short, pointed, up-turned, and black-tipped; the stature is moderate, and the cows give the impression of being good milkers. As examples of the breed may also be mentioned a splendid pair of oxen exhibited by Herr St. Florian Stift, of St. Florian, Upper Austria. They were 6 and 6½ years old respectively, were born in Styria, and were almost white in colour, with black-tipped horns, mottled muzzles, and with black ends to their tails. I also noticed a calf, bred in Lower Austria (Cat. No. 488), mouse-grey on the back, sides, and head, and white below. Each hair was half white and half grey, which gave a mixed, or "pepper-and-salt," effect. The term "dachsgrau" (badger-grey) is usually employed as descriptive in the catalogue. That considerable pains is taken in maintaining this breed pure is indicated by numerous notices in the catalogue of the long period during which the herd represented has been established. Thus, Herr Adalbert Bernauer, of Bruck, Styria, informs us he "has been employed for the last thirty years in improving the Mürzthaler race, and breeding his 60 head with a view to the production of a great quantity of milk." Although forming a conspicuous feature in the Austrian section, this race was entirely absent from both the German and Hungarian departments.

Murboden Race.—This is another Styrian race, and occupied a place in the Styrian Committee's exhibition. It is described invariably as light yellowish grey. They are handsome cattle, and might be introduced into parks with good effect. They closely resemble the Mürzthaler cattle, but are lighter in colour, and lower in stature. They have the same uniform colour, shading from light to dark. The bulls are of darker colour than the cows, and the calves show a greater abundance of hair than is seen in the adult animals. The muzzle and skin around the eyes are black ; the horns are of moderate length, turned up, and black-tipped. All are long in the body, short in the hair, low in the chine, higher towards the tail and shoulders, low in the neck, light in the twist and buttocks, and fine in the limbs. The cows incline towards fawn, but may also be described as of a light grey, or light fawn, almost white on the top and sides, but shading to dark grey on the neck, shoulders, belly, and haunches.

They are said to give from 10 to 15 quarts of milk daily.

Mariahofer.—This was another well-represented race in the Austrian section, although absent from both the German and Hungarian departments.

Fig. 4.—*Mariahof Cow (Styria), exhibited by Baron Robert von Walterskirchen.*



The characteristic distinctions of the pure Mariahof breed of cattle are the following :—Bright flesh-red colour of the skin and mucous membrane, cream-coloured muzzle, yellow, smooth horns, to some extent directed forwards; bright-yellow hoofs; yellowish-white or sienna-coloured hair; light-coloured eyelids; straight thin hind-legs in the cows; the bulls are darker coloured on the head and neck, and have well-developed shoulders.

The Mariahof breed had its origin in the district of Neumarkt, and is only partially characteristic of the district of Oberwöltz, where it numbers 8500 head.

The natural breeding-districts of this race are the district of Vorlsberg, the neighbourhood of Graz, Feldbach, Fehring, Fürstenfeld, Kirchbach, Wildon, Leibnitz, Arnfels, Eibeswald, Deutschlandsberg, Slainz, Radkersburg (with Oberradkersburg), Luttenberg, Mureck, Pettau, Fridau, Rohitsch, Windischgraz, Schönstein, Franz, Oberburg, Cilli, St. Marein (Erlachstein), Tüffer, and Gronobitz, with a total of 258,291 head of cattle.

These cattle are native to Western Styria, and numerous examples appeared from Mariahof and Neumarkt. They are noted as milking cattle, and also fatten readily. Examples shown by Princes Adolf and Adolf Joseph Schwarzenberg, from their vast estates in Bohemia, representing specimens of their stud cattle, were white sweet-looking cows, with white muzzles, and of moderate size. The bull (No. 539) which accompanied them, although described also as "weiss," was inclined to cream colour, with a black muzzle. The principal group of these cattle formed part of the extensive exhibition by the Styrian Committee, already noticed in connection with Mürzthaler cattle. These formed a fine show of males and females. They are a uniformly-coloured race, often white, but sometimes inclining to lighter and darker degrees of fawn. The term "semmel-farbig" is generally used in the catalogue, and denotes the colour of a bun, or baked cake, called a "semmel." The horns and muzzle are generally white, but are occasionally dark. Some authorities state that the lighter-coloured cattle are the best, both as milkers and beef-producers. The heads are fine, and the bulls examined were almost Shorthorn-like in their docile and sweet mellowness of expression. The withers, or shoulder-tops, are rather high, the chine a little low, belly somewhat paunchy, or hanging, and the ridge or set-on of the tail is again rather high. Josef Daum, of Wettmanstetten, near Preding, in Styria, showed a good, straight bull, free from these faults. The cows are pretty and feminine-looking; show well for milk, and are quite uniform in colour, and may generally be said to be white, with a few instances of fawn colour, or "semmel-farbig."

I measured two noble oxen, exhibited by Ferdinand Kuchelbacher, of Oberdorf, near Bruck, Styria. The largest (No. 244) was an eight years old Mariahof ox, in fair condition, but not fat; born in Styria. He measured as follows:—

	ft.	in.
Girth behind shoulders	8	9
Length from shoulder to set-on of tail	6	0
Total length taken from poll to tail	8	3
Length from shoulder point to hook	4	11
Height at withers	5	8
Girth below knee	0	9½
Girth above knee	1	4

This was, I believe, the largest ox on the show-ground, and it girths more than any lean ox I ever heard of.

Oberinnthaler Race.—This is a Tyrolese race, specimens of which were exhibited by Jakob Rimmel Oberhofen Telfs and H. Jakob Seisser Flaurling, both of the Tyrol. It is a small mountain breed, of yellowish-grey colour, black on the nose, short in the horn, and the cows show well for milk. One bull, exhibited by the first-named gentleman, had a good deal of loose skin under the throat. This race is said to be peculiar for rapid growth, and for giving a good quantity of milk.

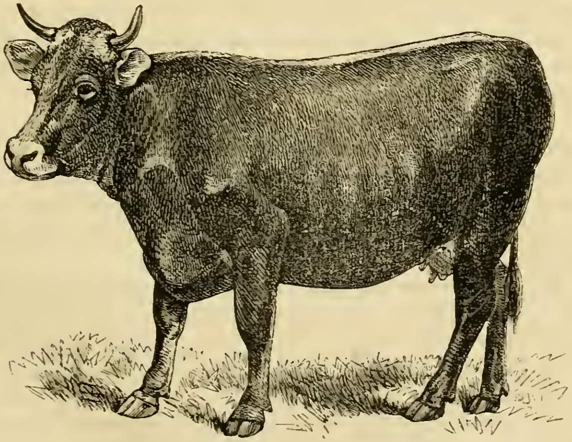
Montafuner.—In the Vorarlberg there exists a distinct race, intermediate in size between the Swiss cattle and the Small Allgauer. Thus the average carcass weights of the three races have been stated to be as follows:—

	kilos.		lbs.
Swiss cattle	308	....	650
Montafuner	263	....	555
Small Allgauer	140	....	295

This race was described from specimens exhibited by the Royal Agricultural Society of Mondsee, Upper Austria, and by Prince Schwarzenberg, of Postelberg, in Bohemia. The Society's cattle evidently belonged to a small race, and were of uniform dark brown colour, with a lighter streak along the spine; muzzles dark, with a light ring around them, nice horns, and sweet-looking heads and faces. The bull was inclined towards black.

Prince Schwarzenberg's cattle varied from black to a rich dark brown, a yellow brown, and a red brown. They were light coloured inside the ears, and around the muzzle, and each had a narrow lighter stripe along the spine. They were thickset, long, and low, with black noses. These cattle are principally esteemed for their milking properties.

Fig. 5.—*Montafun Cow (Vorarlberg), exhibited by J. A. Ritter von Tschavoll, of Feldkirch.*



This tribe, which is connected with the Swiss cattle, belongs to the heavy average group. The cows reach a live-weight of from 8 to 9 cwt., being lighter than the Swiss, and heavier than the Allgauer. Middle-sized animals measure $5\frac{1}{2}$ feet in length, about the same in girth, and 4 feet in height. The frame is moderately strong. The colour does not generally differ from that of the Swiss race; and the bright hairs round the muzzle and in the ears are equally characteristic, as also is the light-coloured stripe along the back. Brown and brownish-grey colours are predominant; bright-grey hues are little esteemed, and white patches should not exist. The head is short and wide, the delicate horns are turned upwards, white at the base, and black at the points. The neck is of medium size, and bordered with a considerable dewlap, which commences even at the throat; the crest of the tail is somewhat high, but strong, although the back is a little hollow; as a rule, the rump is broad, and towering upwards, and the set-on of the fine tail is frequently high. Breast and belly are deep and wide. The limbs are short and good, particularly well set on the hocks, and the sole of the foot is beautifully neat. The udder is large, and other indications also bespeak a considerable yield of milk. These animals are highly distinguished for their good temper; and their capabilities for draught and fattening purposes are satisfactory.

The Montafuner race is principally found in the Montafun Valley, but also in the Bregenzer Forest and in the Bavarian Allgau.

Zillerthaler.—These cattle take their name from the valley of the Ziller, in the Tyrol, where they are esteemed for the richness of their milk, their fattening properties, and their docility. They also are said to possess prepotency to a greater degree, when crossed with other races, than is the case with any other Austrian race except the Hungarian cattle; and this exception is only made in favour of the females of the Hungarian breed. I noticed two crosses between Zillerthaler and Duxer, which were black, with a little white on the ridge, brown or black around the muzzle; black on the muzzle; breast more or less white. A pure-bred Zillerthaler, exhibited by Josef Egger, Ziller, Tyrol, was described in the catalogue as light red, broken with white. MM. Moll and Gayot, in their work on cattle, speak of "*La rouge brune du Tyrol*" as being a well-known phrase in describing these cattle, and as being the characteristic colour.

Other Tyrol and Austrian Races.—The *Kemater* race is Swiss-like, being of the same uniform brown tint. It is described in the catalogue as dark, or light grey. The animals noticed were bred by Josef Ehrensperger, Tyrol, who states that in breeding his herd of twenty-five the production of milk is his principal object.

The *Kitzbichler*, a red and white race, exhibited by Josef Haas, Kitzbichl, Tyrol, is another milking race. Hans Heiss, of Brixen, Tyrol, showed a *Sterzinger* bull, not apparently a very good specimen, but on the whole resembling the Oberinnthaler race, and with the same loose skin about the throat.

The *Tyrolese Native Race* (larger breed), brown-red, with white head and white ridge, was illustrated by a three-year old, born in Ebbs, and exhibited by Peter Jäger, jun.

The *Patznauer Race*, exhibited by Alois Nikolaus Ischgl, Tyrol, is described as brown, grey, and black and white spotted.

The herd had been imported from the best type of the race in Switzerland.

The *Mölthaler Race* was represented by specimens exhibited by Georg Lakner, of Altenmarkt, Sachsenburg, Carinthia, among the Noric Alps; also by animals exhibited by Andreas Meixner and other breeders, all from the same locality. The cattle were reddish-brown and white, red and white; yellow-red and white; red-striped, and brown with white stripes.

The *Lavantthaler* is another Carinthian race, fawn or "semmel-farbig," with a white head. The colour of this race seems to be characteristic and uniform.

The *Moravian Landschlag*, or, as we should say, the country cattle of Moravia, are a red-and-white race, which have found an improver in Leopold Hauptische, estate director at Tiln in Moravia, who maintains a herd of 200 head.

Heinrich Heller, of Iglau, Moravia, exhibited a pair of oxen, one of which was remarkably good, the result of a cross between the Moravian and Bernese races. The ox was particularly good in his hind quarters, and was red, with a white forehead. Good working and fatting cattle are the results of this cross.

Another cross worthy of attention was that effected between the Lower Austrian race and Mürzthaler males. All were good grey cattle, very similar in appearance to the Podolian race.

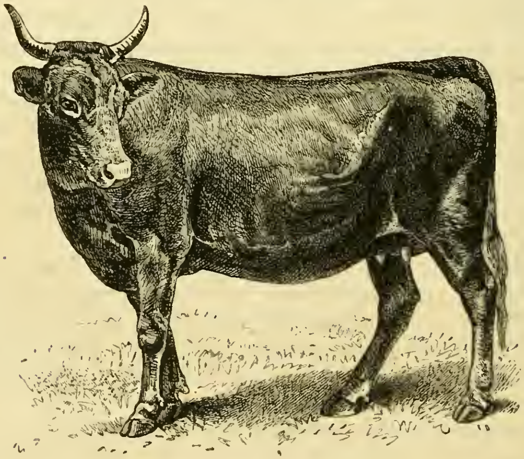
The average yield of milk from 48 cows, constituting a herd of these cattle, has been 470 imperial gallons per head per annum for several years past.

A breed, described as *German*, appeared from Moravia, which, however, bore no resemblance to those Dutch cattle which formed so large a proportion of the German section of the Exhibition. They are described in my notes as yellow, broken with white; one having a white face, and the other not. Both had white or cream-coloured muzzles.

The *German* cattle, from Kwassitz, Moravia, are again quite distinct, and vary from a light fawn to a good dark red, and all have black or spotted noses. As the colour darkens, it appears more apt to become broken with white. Another example was light brown, shading to light fawn and white, and one was finely dappled, self-coloured, and brown. The proprietor, Ritter von Proskowetz, rents under Count Thun, and is a spirited agriculturist, whose estate I subsequently visited. He maintains a herd of 500 head of these cattle, which supply him with working oxen, and 120 to 150 head of feeding cattle annually. The younger animals exhibited were bred in Kwassitz, but the elder, calved from 1865 to 1867, had been imported from Croatia. The principal object in breeding these cattle is to obtain large strong bullocks for work.

Egerland Race.—This race is named after Eger, a town and railway station on the frontier between Bohemia and Bavaria, and not far west from Carlsbad. The beautiful specimens exhibited by A. E. Ritter von Komers, of Mostau, near Prag, were of dark reddish-brown colour, and in form and hue not at all unlike Devons, with creamy noses, and yellow skin around the eyes. They are a small race, the average live weight being about 864 English pounds. The herd of which these were examples numbers 50 cows, 2 bulls, and 28 young cattle, and the object of the breeder is to increase the size of the carcass and the quantity of the milk. 287 gallons of milk per head per annum is the average result now obtained. They are well suited to stall feeding, and are favourites with the sugar manufacturers and distillers around Magdeburg, in Saxony.

Fig. 6.—*Egerland Cow (Bohemia), exhibited by A. E. Ritter von Komers, of Domain Mostau.*



The Egerland cattle resemble the reddish-brown Tyrolese race in their general characters, and are said to be the result of the crossing of the Bohemian native race with Zillerthal bulls. They have a nearly uniform dark reddish-brown colour; compact, deep, and powerful frame; short, broad head, bent sideways and forwards; generally weak white horns, black at the tips; strong and pendulous neck, a broad breast, and the tail somewhat highly placed.

What should be specially noticed are their general healthiness, and their contentedness with the quantity and the quality of their food.

In consequence of these characteristics the Egerland cattle are very much esteemed for breeding purposes; they are distinguished for unusual endurance, and they are very much sought after for feeding purposes on account of their great capability for fattening and the excellent flavour of their meat.

The cows experimented upon in Mostau yielded from 240 to 300 gallons of milk, for a consumption of 16 to 17 lbs. of hay per diem, and the best animals give as much as 420 gallons.

The average weight of a full-grown ox can be placed at as much as 9½ cwt., and will fetch a price of from 20*l.* to 22*l.* 10*s.* Cows scarcely reach an average weight of 6¾ cwt., but will now readily fetch as much as from 16*l.* to 20*l.*

Involuntarily one admires the beautiful and regularly formed horns of these animals, upon which the Egerlander prides himself. He also assists to develop them wherever their growth is not naturally uniform. This is done by weights, which are connected by cords to rollers attached to the roof of the stables; these weights thus follow all the movements of the heads of the cattle. Clamps are also used, by means of which the horns, after having been softened with grease, are pressed either forwards, backwards, or sideways, as may be required.

The *Mähr (Moravian) -Trüban Race*, examples of which were shown by the Land and Forest Society of Mähr-Trüban, were good-looking cattle, with somewhat Hereford-like markings, and the four cows looked like good milkers.

The fat ox, No. 621, entered as a *Steyrer*, or Styrian ox, was grey and self-coloured, resembling the Podolian type.

Schwarzenberg-Scheinfeld Race.—The Scheinfeld is an old Franken (Bavarian) race, which has long been bred on Prince Schwarzenberg's estates in Bohemia, and having had much pains bestowed upon it with considerable success, it has been named as above. The animals exhibited were of good form, of yellow-red colour without any white, creamy muzzles, and, on the whole, a sweet, milking race. Over 100 guineas each was asked for these cattle. Similar animals were exhibited under the name of Scheinfelder, from Lower Austria.

Vorarlberg Native Race.—The Agricultural Society of Vorarlberg sent four specimens of this race, which so clearly resembled the Mürzthal cattle that no stranger could detect any difference.

Pinzgau Race.—These cattle are found in Pinzgau and Salzburg. They give a smaller quantity of milk than either the Mürzthal or Mariahof cattle, but of a richer quality. The cattle are fine-boned and easily fattened, but are frequently disfigured by a hollow back and a high set-on tail.

The race was described from several examples. Herr Josef Kirchmayer, of Heitzing, near Vienna, showed a bull "just like a Hereford," with a red spot under one eye and a spot of white on the top of the shoulder—to all intents a Hereford, and with the same rounded buttocks and low, long form. A cow from the same herd was red, broken with white on the ridge of the back, set-on of tail, buttocks, breast, and belly, with horns tipped with black and pointed. Prince Schwarzberg's Pinzgau cattle were very similar to each other, and were red on the head and body, broken with white on the shoulders, chine, loins, ridge, tail, head, buttocks, and belly.

The exhibition of the Styrian Committee comprised some good examples answering to the above description, some with white and some with red faces, and all, as is usual in this race, had white or cream-coloured muzzles. I noticed some large Pinzgau oxen, and took the measurements of two of the most remarkable.

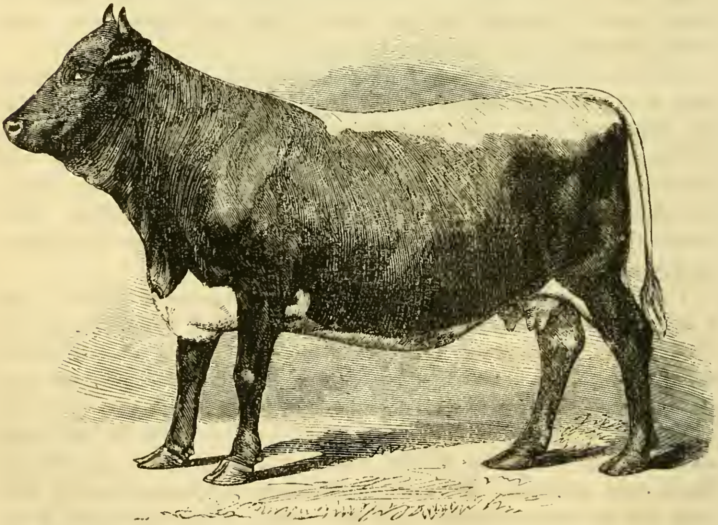
No. 183 was a four-year-old working ox, exhibited by Jakob Dentinger, of Markt, Salzburg :—

	ft.	in.
His girth behind shoulder was	7	9
Length from shoulder to set-on of tail	5	11
Total length from poll to set-on	8	2
Height at shoulder	5	5
Shoulder point to hook bone	4	4
Girth above knee	1	5
Girth below knee	0	10

Another example, exhibited by the Brothers Köch, Ischl, Upper Austria, a seven-year-old ox, gave the following dimensions :—

	ft.	in.
Girth	8	0
Length from shoulder to set-on of tail	6	0
Total length	8	0
Girth below knee	0	10½
Girth above knee	1	6
Shoulder point to hook bone	4	5
Height at shoulder	5	7

Fig. 7.—*Pinzgau Cow (Salzburg, Tyrol), exhibited by the Royal Imperial Agricultural Society of Salzburg.*



The Pinzgau race is the result of a cross of the Simmenthal breed with the ancient domestic cattle of the country; it is distributed throughout the whole of the Salzburg region, with the exception of a couple of small valleys of the Lungau, where the dappled mountain breed still exists. It is also found in certain parts of the Tyrol, adjacent to the Pinzgau district, also in Upper Austria as far as Wels. It is the preponderating breed in the district of Enns and St. Florian, in a great part of Upper Bavaria, and it is even, though more sparsely, met with in Lower Bavaria. For breeding purposes these cattle are exported in great numbers, particularly to Austria and Silesia; and, for milking purposes, to Lower Austria, and especially Vienna.

There are large and small varieties of the Pinzgau cattle, and their live weight is from 7 to 12 cwts.

The characteristics of the race, besides their complete symmetry and their very pleasing appearance, are a red colour varying from light red to brownish red with many white patches on the withers, back, rump, tail, thighs, and the under part of the belly as far as the dewlap; light rose-red or sienna-coloured muzzle, short head, brown forehead, the horns beautifully turned outwards and upwards, white with black tips; the neck somewhat slender, well-developed dewlap; the body somewhat lengthy, barrel-shaped, but with a good depth, generally somewhat higher at the withers than at the rump; finely developed udder with strong milk-veins; fine, elastic, easily removable hide, and a moderately strong bony structure. The endurance of these cattle is excellent, and their contentedness with poor fare is notorious. The capacity for milk-production is considerable, and the quality of the milk, if not very high, is excellent in comparison with the quality of their food. The Pinzgau cattle are easy to fatten, and their meat has a particularly fine grain and is very palatable, so that the Salzburg breed is a very desirable butcher's race.

Swiss Cattle.—Imported Swiss races are found upon many large estates in Austro-Hungary, and also occur in Germany. They were largely represented in all the three sections into which the cattle classes were divided, namely, those devoted to Germany, Austria, and Hungary. The Swiss cattle are well known to be great milkers, but it has been stated on authority that efforts to import them into other countries, where both air and soil are so different from those of their native mountains, have signally failed. In spite of this statement, we find Swiss cattle, in one form or another, occupying a very prominent position in Bohemia, Moravia, Silesia, and Austria Proper, where they are subjected to confinement and receive cut fodder. There are many varieties of Swiss cattle, but it is sufficient for our purpose to state that they have been divided into two great groups, the first of which prevails in the East, and is known under the name of Swiss cattle. The other occupies the West of the country, and is illustrated by the Bernese and Fribourg races. All are good milkers, and although they fall short of the Dutch in quantity, yet their milk is richer.

The Eastern Swiss cattle, the "Schwyzer" of the Germans, are self-coloured, varying from a light to a dark grey, shaded over the body with pleasing gradations of colour. A cow will give 4 gallons of milk per day, and exceptional cases have been reported in which $5\frac{1}{2}$ to $6\frac{1}{8}$ gallons have been given. The race is found pure in the Cantons of Zug and Glaris.

The Western cattle are quite distinct, owing to their being black and white, red and white, pied, and spotted. I shall take the Schwyzer and its sub-varieties first.

Swiss (*Schwyzer*) *Race.*—A bull of this breed exhibited by Prince Franz Salm, of Svietla, Bohemia, was a handsome mouse-brown, with black muzzle bordered with light-coloured hair, and black skin around the eyes. The horns were short and black; ears of lighter colour, inside and out; the colour also lighter on the poll, and the rest was mouse-brown; the stature was low; the carcass long and well-made. The herd, of which this was a specimen, numbers 114 head, bred carefully from cattle imported from Canton Schwyz in 1869 and 1872. The production of milking and fatting cattle, and the raising of useful work-oxen, are the objects aimed at by the owner and breeder. The late Prince Schwarzenberg exhibited three pure-bred Swiss cattle, a two-year-old bull, and two two-year-old heifers. They were of uniform dark-brown colour, with a much lighter stripe along the spine, and the bull was almost black. Others were described as grey-brown, with white round the muzzle, a white streak down the spine, and light-coloured on the belly. Others entered as Schwyzers were black-and-white and red-and-white, but these evidently belonged to the section which comprises Bernese and Fribourg cattle.

Prince Schaumberg-Lippe exhibited a cross-bred cow, by a Dutch bull from a Swiss cow. This nobleman has made a series of interesting and practical experiments by crossing various races, with a view to increasing the yield of milk and giving a strong, good constitution to his cattle (see Bernese cattle). The animal in question was good, but had distinctly taken after the sire.

Allgauer Race.—This is a very favourite milking race throughout the whole Empire, including Hungary, where it occurs on the large estates. It emanates from the East Swiss race, and greatly resembles it. The Allgauer is only an indifferent worker and moderate fattener, its speciality being milk. It is found native in the north-east of Switzerland, where Baden, Bavaria, and Switzerland meet, on the shores of Constance Lake. The Vorarlberg Agricultural Society showed examples of this race, bred at Bregenz, on the eastern borders of this lake; but specimens bred in the heart of the Empire and Hungary were not wanting.

Prince Schwarzenberg's Allgauer cattle greatly resembled the Swiss and the Montafun races. Again, Baron Ludwig, Redl, exhibited Allgauer cows and bulls, bred at Baumgarten, near Kirchstetten, in Lower Austria, which gave rise to the remark that they were very like Montafuner and Swiss cattle. All were fine silver-grey and badger-grey, self-coloured cattle. The Duke of Coburg-Gotha, in Lower Austria, also showed some beautiful perfectly uniform mouse-grey cows and bulls, with dun noses and scarcely a shade of difference in the colouring. These cattle form part of a herd established in Lower Austria in 1820, which since then has been mixed with no other blood. The Archduke Albrecht, in Hungary, keeps many of these cows, and while visiting his Imperial Highness's estates at Ungarisch-Altenburg, and Bellye, I had additional opportunity of observing them. At the former estate, I was informed that the head must be short, and broad between the eyes, and taper to a fine, narrow muzzle, which should be black. The eyes are black, the horns tipped with black, and there is a light ring of hair around the muzzle. The Altenburg Allgauers were giving 1½ gallons of milk daily.

Bernese (*Swiss*) *Race.*—The red-and-white or red-and-black Bernese formed one of the most conspicuous features of the Cattle-show. The Bernese cattle are great favourites in Austro-Hungary, and are esteemed both for milk and for fattening purposes. They may, in general terms, be said to resemble somewhat small and rather irregularly coloured Hereford cattle. Count Larish-Mönnich, of Freystadt, Austrian Silesia, exhibited a Bernese bull, with a white face and red body, broken with white on the sides and flanks. Prince Schwarzenberg's Bernese bull might have passed, both in colour and figure, for a fairly good Hereford, with a trifle too much white about him. Others were noticed similarly coloured, and it is needless to multiply examples. There is also a black-and-white Bernese, as was well illustrated by some fine specimens exhibited by Prince Schwarzenberg, and a brindled black-and-red Bernese is also occasionally seen. In form, the Bernese are not unlike coarse Shorthorns. There is also a certain similarity between this race and the Pinzgau cattle. It will generally, however, be observed that while the Bernese have white faces, the Pinzgau have red faces. Like many races which have not been highly bred, the Bernese are large in the bone; they are long and deep in the carcass, and have good broad hips. They are a little inclined to be low in the chine, high at the tail-head, and heavy-looking about the head. They attain to a large size, as may be shown from the following measurements, taken from No. 685, a seven-year-old ox bred and exhibited by Ritter von Theophil Ostaszevski, of Galicia:—

	ft.	in.
Girth behind shoulder	8	1
Length from shoulder to tail	6	0
Shoulder point to hook	4	2
Girth below knee	0	9
Girth above knee	1	4
Height at shoulders	5	4

Nos. 584-5 were a pair of very fine half-bred Bernese oxen. The former measured in

	ft.	in.
Girth	8	3
Length	5	10
Total length from poll to tail head	7	10
Height at shoulder	5	4
Girth below knee	0	10
Girth above knee	1	5

Many herds of Bernese cattle have been long established in the Empire. Thus the Duke of Coburg-Gotha's herd at Elenthal, Lower Austria, consisting of 80 head, was founded in 1820, and is maintained for the production of milk and meat. Count Larisch-Mönnich's herd also, previously noticed, was formed from cattle imported forty years ago; and, lastly, Prince Schaumburg-Lippe exhibited Bernese cattle from his herd at Post Skalitz, Nachod, in Bohemia, which had been bred there since 1820, and only refreshed by the importation of new blood in 1868 and 1871, when eight original cattle were introduced.

The Bernese crosses were also interesting. His Excellence Count Karl Altham, Iglau, Moravia, showed some good examples of a cross between Dutch bulls and Bernese cows, which were particularly noticed. The production of flesh and milk has been the main object in view in the management of the Count's large herd of 1000 head. A cross between Bernese bulls and the native race, as also between East Friesland bulls and the same, has resulted in the formation of a constant breed of the character aimed at.

Nos. 641-2 were black, pied, and mottled examples of a cross effected by Baron Simon Sina between Dutch bulls and Bernese cows. The dairy is at Rossitz, in Moravia, and comprises two original Dutch bulls and thirty-six Bernese cows. The object of the breeder is the attainment of a high quantity and quality of milk.

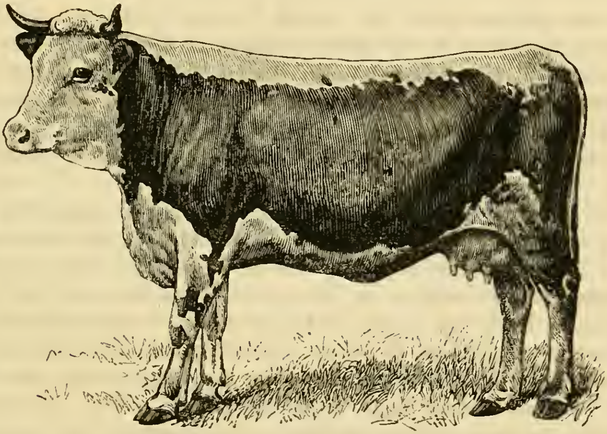
I also noticed and admired a first-rate fat ox, calved in 1868, and exhibited by the well-known Vienna butcher, Jacob Neumayer. It was from a Bernese cow, and by a Hungarian bull, and was of a rich fawn or almond colour. This remarkable ox measured in

	ft.	in.
Girth behind shoulder	8	6
Length from shoulder to tail head	5	10
Total length from poll to tail head	7	7
Height at shoulder	5	3
Shoulder point to hook	4	5
Girth above knee	1	3
Girth below knee	0	9

Prince Schaumburg-Lippe, of Post Skalitz, also exhibited crossed cattle, between Dutch bulls and Bernese cows, from his Moravian herd, which numbers 80 to 90 head, bred expressly for milk and constitution. The animals were certainly handsome, and took after the red-and-white Bernese side.

Kuhland Race.—The Kuhland race originated through a cross between Tyrolese cows and Bernese bulls, which was effected from 1780 to 1790. Up to 1830 the blood was renewed and invigorated by the use of Bernese sires bought at different times. The specimens from which this race is described were exhibited by Josef Maria and Emma Aresin, Partschendorf, in Moravia, and represented a herd of 200 head. Only about 20 head of cattle are annually fed, as there is a great demand for the young stock for breeding purposes. The animals are bred with a view to the production of milk and beef. The cattle are of moderate size; the horns are short; muzzle, cream coloured; face, white or mottled white and red; crest, shoulder-tops, and chine white; breast and belly, white; legs, red or white; sides, a fine red. The proportion of red and white varies in different animals, but the red sides with white above and below are characteristic.

Fig. 8.—*Kuhland Cow (Moravia), exhibited by the Agricultural Association of Neutitschein.*



The so-called "Kuhland" is situated in north-western Moravia, on the flanks of the Carpathians, and embraces about 4 square miles. The Oder meanders through this district, and forms meadow-valleys open to the north, the climate and soil of which seem to invite cattle-breeding. It comprises several villages and manufacturing towns, the most important of which are Neutitschein and Fulnek. There can be very little doubt that the district takes its name from its suitability for cattle-breeding.

Recently, the agricultural societies of the Kuhländchen * at Neutitschein and Fulnek, have substantially contributed to its pre-eminence, by encouraging the improvement of the cattle of the small proprietor-farmers (peasant-farmers); while they have rendered possible the improvement of the whole race by disseminating the rational principles of breeding, and by judicious selection and the suitable distribution of first-class bulls at reduced fees.

The predominant colour is dappled red, or cherry-red with large white patches on the head, along the back, and on the belly. The horns are yellowish white at the roots and black at the tips. The forehead bears a strong tuft of crisped or curled hair. The Kuhland cattle have also the finest, softest, silky hair; and the coat of the new-born calves is curly, while the bulls often retain this wavy hair on the head and neck throughout their life.

* Literally "the little cow-land."

Although only of the middle height, the Kuhland cattle must, nevertheless, be classed with the heavier races. The live weight of a cow may be taken at from 6 to 10 cwts. The average production of milk may be put at from $1\frac{1}{2}$ to 3 gallons per cow per diem, or even more. The average milking period may be taken at from 200 to 250 days, and cows are not rare which give in that time over 600 gallons of milk.

According to the last agricultural census, in the year 1872, the "circuits" of Neutitschein, Fulnek, and Freiburg, of the Kuhland district, possessed 26,000 head of cattle, mostly belonging to the Kuhland breed; this number being distributed over an area of not quite 4 square miles gives 1 head of cattle to about 3 acres of agricultural land. The easy feeding qualities, the quick development of the body in the calves, their symmetrical form with broad and strong hind-quarters, their cheerful temperament without vice, their specially good milking qualities, both as regards quantity and quality, and, finally, their constant capacity for transmission of their own qualities, are the best guarantees of the distinguished value of the animals of this race for breeding purposes.

In connection with this breed I must notice the collection of cattle exhibited by the Neutitschein and Fulnek peasants from Moravia. Eight peasants contributed each one animal of the Kuhland race to the exhibition. The animals were described as especially suitable for small holders of land, on account of their being useful in all three capacities of milk, flesh, and work.

The spirited sugar manufacturing company, under the presidency of Baron Klein, to which I shall have to refer several times in the course of this report, exhibited four cross-bred animals from Keltschan, in Moravia, the result of allying Shorthorns and Kuhland cattle. One of these, a four-year-old cow, had every appearance of being a good milker, and the rest were handsome-looking cows, resembling very much their Shorthorn sire. Cheap flesh, high milking powers, and the greatest economy in food are the excellent objects sought for in making this cross. Josefine Bärnreither, of Schloss Linz, Lubenz, in Bohemia, also entered two yearlings bred between Shorthorns and Kuhland.

Friburg Race.—These cattle are allied to the Bernese breed. The only example exhibited was in the German section, and was a black spotted animal resembling the black variety of the Bernese race. A place is awarded it here, since it seems best to consider all the imported Swiss races under the Austrian section.

Simmenthal Race.—This race was fairly represented in the German, Austrian, and Hungarian sections. We first meet with it in the German exhibits, and find it to be a characteristic, well-defined race. Mathias Bichl, of Miesbach, Bavaria, showed a fine bull and cow. Both had white faces and yellow bodies broken with white. Twelve more specimens from Baden, all resembled in colours those first noticed. Returning to the Austrian section we must pause at Count Rudolf Enzenberg's

Simmenthal cows and calf, from Schwaz in the Tyrol. They were representatives of a herd of some 36 head kept to cross with the Tyrolese cattle, and especially with the Unterinnthal, Zillerthal, and Pinzgau races, and this it is stated is done with good effect, The pure-bred Simmenthal cattle resembled those already described. The face is white, cheeks yellow, nose white, horns of moderate length, and the body light-red or yellow. Their attendant informed me that during the past spring

9	Cows gave	597½	gallons of milk in	March.
9	„	566¾	„	April.
9	„	595¾	„	May.

Dutch and Dutch Crosses.—The Dutch black-and-white cattle occurred in considerable numbers in the Austrian section. These animals have already received notice in the report on German cattle, and it only need now be mentioned that the Archduke Albrecht, who owns extensive estates in Silesia, as well as in Upper and Lower Hungary, contributed a large number of these cattle from Teschen and Saybusch. The former herd of 530 was imported from Holland in 1860, and is kept up by breeding and by continual importations of original bulls and heifers. The Saybusch herd of East Friesland cattle consists of 75 head, and in 1872 the average yield of milk per cow was 885 imperial gallons. These cattle were imported in 1837 from East Friesland, and have been kept up and refreshed by continued importation.

Count Larisch-Mörmich, whose extensive estates subsequently supplied an interesting study, is also an importer of Dutch bulls for crossing purposes. Baron Simon Sina has already been referred to as the promoter of crossed Bernese and Dutch cattle (see Bernese), and Kuhland crosses with Dutch were also not wanting. The Shorthorn-Dutch from Keltschan in Moravia have also been noticed, and since other examples might be given, it will be seen that Dutch cattle are greatly esteemed in the Austrian Empire both as a pure race and for crossing purposes.

Hungarian Cattle.

Many of the races exhibited in this section have already been noticed. It comprised 285 catalogue entries, of which by far the greater number were of the celebrated Hungarian race. Shorthorns were brought into special prominence by the Archduke Albrecht (see page 6), who showed a large number of pure and crossed cattle of this race. It is worthy of remark that the Archduke in this particular stands alone, and except upon his estates, the Shorthorn is scarcely to be found in Hungary. Ayrshire cattle have been imported into Galicia by John Paget, Esq., of Gyéres near Torda, and they have been successfully crossed (see below) with Tyrolese cattle for the purpose of producing a race giving a large quantity and good quality of milk. No other British race either in a pure or crossed form appeared. The Buffalo also formed an extraordinary and interesting feature of this section of the exhibition. The various races of oxen sent from Hungary comprised—

	Head.
Shorthorns and crosses	38
Allgauer	15
Swiss	15
Bernese	3
Simmenthaler	11
Dutch	9
German	4
Styrian	5
Tyrolese	1
Sennyeyer	6
Ayrshire-Tyrolese	5
Hungarian	144
Buffaloes	18
Other cattle	11
	285

Shorthorns and Shorthorn Crosses.—These were commented upon in the earlier pages of this report. They must not, however, be dismissed without offering a tribute of praise to the Archduke Albrecht, the most enterprising agriculturist in Hungary. Too much can scarcely be said with reference to the great successes this nobleman has achieved by crossing both cattle and sheep with the best English blood. The exhibits at Vienna were only a sample of very large numbers of animals similarly bred, which may be seen at Ungarisch-Altenburg and Bellye. Even better cattle than were exhibited are to be seen on those estates, and the stalls and court-yards in which they are accommodated rival and excel anything that can be witnessed in this conntry. It remains for us to consider at some little length the bovine races not yet noticed.

Ayrshire-Tyrol Cross.—Mr. J. Paget, of Gyéres, near Torda, Galicia, exhibited five examples of this cross. The object sought for in allying these two races was to produce a moderate-sized animal giving a good yield of first-rate milk. The cattle exhibited were the result of the second cross, and beyond this it is not considered advisable to go, as the skin would be apt to become too thin to resist the attacks of flies. It is proposed to breed them for the future *inter se.*

Hungarian Race.—The Hungarians are justly proud of their oxen. They are used as working cattle over the whole Empire, and at present there is little indication of their being superseded either by horses or steam power. It is no uncommon sight to see a team of oxen yoked to a plough, and driven by the ploughman entirely by the voice and without any assistance either from reins or driver. Judges did not consider the Hungarian ox to be well represented at Vienna, and I certainly saw much finer examples while travelling through the country.

Naturalists agree in considering the Hungarian ox as the best living representative of one at least of the original progenitors of our domestic cattle. These it is believed owe their origin to three distinct types, viz., *Bos primigenius*, *B. longifrons*, and *B. frontosus*. The two last are extinct as wild races, and are solely represented by certain types of domesticated cattle. *Bos primigenius* still exists in a semi-wild state in Chillingham Park, and is closely allied to both the Pembroke cattle of South Wales, and the beautiful little Devons. The Hungarian and Podolian oxen also are considered to be more or less pure representatives of the Primigenius type. I had the opportunity of seeing large numbers of these handsome cattle. They are white with a shading of grey on the neck, flanks, and buttocks. The ear is dark-shaded inside, the horns are very long and wide-spreading and tipped with black; the muzzle, skin around the eye, the eye itself, and the feet, are all black. An eight years old ox, exhibited by Neumann, of Arad (Cat. No. 941), measured 6 ft. 11 in. between the tips of his horns, and one horn measured 3 ft. 7 in. in length! The stature of these cattle will be best illustrated by two or three measurements actually taken on the ground. Messrs. Kuffner and Gutman, large and enterprising sugar manufacturers, at Dioszegh, Pressburg, showed some fine examples of fat Hungarian oxen. These were scarcely "thick fat," according to English ideas of fatness, but were "good," albeit a little hard to the touch. No. 885, an eight years old bullock, measured in girth behind the shoulder 7 ft. 10 in. No. 886, which with the last made up the customary "pair of oxen," measured in

	ft.	in.
Girth	7	9
From shoulder point to hook bone	4	6
Height at shoulder	4	5½
Girth above knee	1	3
Girth below knee	0	8½

Another example, six years old, exhibited by the same firm, gave the following measurements:—

	ft.	in.
Girth	7	2
Length from shoulder to rump	5	4
Total length from poll to rump	6	4
Shoulder point to hook	4	3½
Height at shoulder	4	9
Girth above knee	1	3
Girth below knee	0	8½

The finest race of Hungarian cattle is that to be seen at the Imperial Estate of Mezöhegyes, in Lower Hungary, where a fine breeding herd of the Csáky breed is maintained. Splendid cattle are also to be seen on the shores of the Platten See, upon the estates of Count Festetics. The Transylvanian closely resembles the Hungarian ox, but has more spreading horns. Mr. Paget, who has resided many years in Transylvania, drew my attention to this point in the case of No. 788, a fine ox described as Hungarian-Transylvanian. This ox possessed wide-spreading horns characteristic of his Transylvanian parent, whereas the true Hungarian ox carries his horns more uprightly. The Hungarian ox is also higher at the withers, lower behind, and not so straight in the back as the Transylvanian ox, and has a less quiet eye. Mr. Paget informs me that the Transylvanian ox is allowed on all hands to be a first-rate animal for draught, and that his pace is equal to that of a horse. It is also acknowledged to be better for fattening and milking than the true Hungarian race. Mr. Paget at the same time acknowledged that the fault of these cattle is, that they give too little milk and hold it for only a short time. Four oxen bred between these two rival but very similar races, exhibited by Count Stubenberg, of Szekelyhid, Hungary (No. 864), were pointed out as examples of fast Hungarian cattle. The back was very straight, the legs strong, and the whole animal apparently well fitted for draught. They were not quite so large as the ordinary Hungarian ox, but are said to bear changes of temperature well. A large number of the Transylvanian young cattle are purchased by Hungarians for draught.

Oxen grow scarcer in Hungary every year, owing to the practice of breaking up the meadows and pastures, and no estates were visited where they breed a surplus quantity—all and more are required for work. The Gulya or herd roams on the wooded pastures by the banks of the Danube, or on the extensive plains where the land is still in the condition of pasture. The cows calve from January to July, and hide their offspring for five or six weeks in the woods among bushes or in some secluded place. The young calf is of dark tawny or fawn colour at first, but gradually changes to a grey creamy colour, and finally to the shaded white peculiar to the race. They suck for four or five months, after which the cow dries naturally. They are slow of growth, and under general management do not attain their full size until six years old, at which time they go first to work. They continue at work from seven to nine years; and, in fact, like the Merino wether sheep, are finally only culled on account of age. The cow calves and young bulls are herded separately on different parts of the pasture, and the breeding stock (Gulya) also roams alone. Each herd is constantly attended (for here are no fences) by their Gulyas (pronounced Goolyash) or herdsmen. The cows drop their first calf at about four years old. The herds are in the woods and pastures summer and winter, and may be almost spoken of as wild. It is not safe for a stranger to approach them, and such a proceeding would be very rash without the protection of the Gulyas. The ox is undoubtedly unrivalled for hardihood, speed, strength, and durability. He is capable of subsisting and working upon a worse quality of fodder than any other race. Poor pasturage in summer, and Indian corn straw with a little barley straw and hay in winter, are all that he requires; and no corn or artificial food is added, except for a short time in spring during the sowing season. They work generally in Hungary with a double yoke, four in a plough, and obey the word of command, turning in at the end of the furrow often without rein or driver. Large numbers of Hungarian and Transylvanian oxen are bought by the neighbouring countries of Prussia, Bohemia, Moravia, and Silesia on account of their fine working qualities, and they are in especial demand by the large proprietors and sugar manufacturers. The custom is to work the land in spring and autumn, and to fatten the surplus oxen during the winter.

The cows are seldom abundant milkers, but the milk is of rich quality. They milk for eight months, and are dry for four months. An ox under seven years old is called a Tino ox.

I cannot dismiss the Hungarian ox without referring to the interesting exhibition of bulls, cows, and oxen of this race from Prince Esterhazy's estate of Kapuvar, now on lease.* These were enclosed in a space at some little distance from the sheds, and were exhibited in true national style. The cattle represented a herd of 1200 head which originated from the Földsziget herd. These cattle are, as is always the case with a Gulya or breeding stock, continually in the open air during summer and winter. The herdsman appeared in the show-yard in his best costume, and when mounted on his horse, with Hungarian saddle and accoutrements, his fine scarlet embroidered cloak thrown over

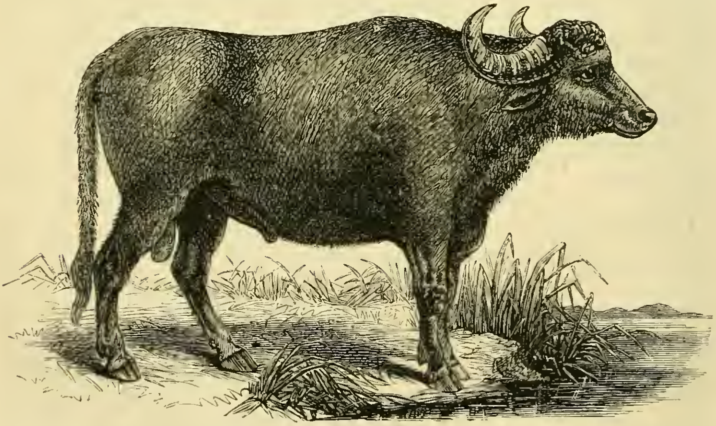
* See sketch in 'Illustrated London News,' October, 1873.

him, and with his long whip in hand, he looked every inch a Magyar. There was also a native waggon of hay to which four oxen were yoked, attended by a Hungarian teamsman and two Hungarian watch-dogs.

The Buffalo.

Examples of this singular species of the *Bovidæ* or oxen, were exhibited by the Agricultural College of Keszthely, Count Emerich Mikó, Josef Schuster, and other gentlemen. The accompanying sketch of a bull * will aid the following description in giving an idea of this animal. The colour is completely black, hair and skin, hoofs and horns, all partaking of this sable hue. The limbs are short and thick ; the body massive ; the head large ; the forehead arched and narrow ; the muzzle large and black ; horns low placed, triangular at base, furrowed across, and directed backwards and downwards, finally turning upwards towards the point. The hair is scattered somewhat thinly over the body in the full-grown animal, although the calves are well covered. The buffalo (*Bos Bubalus*) must not be confused with the bisons (*Bos Bison* and *Bos Americanus*), which are easily distinguished by their highly developed dorsal vertebræ, giving them an extraordinary height at the withers, and also by the long hair which covers the anterior portions of their bodies.

Fig. 9.—*European Buffalo Bull.*



The buffalo is indigenous to Asia, and is also found in Africa, as in Lower Abyssinia, and north of the Cape of Good Hope. It was introduced into Hungary by Attila (433-453), and

* 'Histoire Naturelle des Mammifères,' par M. Geoffray St. Hilaire et M. Frederick Cuvier, tome iv., pl. 417 (Buffle d'Italie).

into Italy by King Agilulf (591-616). It was carried into France in the twelfth century, although it never came into general use. In 1807 the Emperor Napoleon I. introduced the buffalo in the hope it might prove useful upon the "landes" of the west. This idea was not well carried out in those disturbed times. The animals were neglected and left to themselves, and at last, becoming almost wild, would speedily have been extirpated by fire-arms had not M. Lalane interfered in time to save a few of them. Upon the low lands on both sides of the Danube and Theis in Lower Hungary, in Transylvania, in Greece, in Piedmont, in Italy, and in Spain, the buffalo is found and esteemed as an animal of draught.

In 1870 there were 58,310 in Transylvania, 14,568 in Hungary, 263 in Slavonia and Croatia, and 12 in the military boundaries; making altogether in the Hungarian dominion 73,153 head. "Water and again water," is the life element of the buffalo. Where he cannot bathe for several hours daily, the water covering him entirely, with the exception of his nostrils, he does not thrive. This is no doubt a principal reason why the number of these animals has progressively diminished in the Banat since the regulation of the river Theis. He is esteemed most in fenny and humid districts, such as abound in South Hungary, where ordinary cattle are subject to diseases to a greater extent than upon higher grounds.

The buffalo possesses two excellent qualities: he is immensely strong, and his wants are easily satisfied. The strength of a pair of buffaloes is considered equal to that of four horses or six oxen. To draw a Hungarian waggon loaded with hay out of the mire is a work for which a pair of buffaloes is specially adapted. If, however, they run away in full gallop with their load, or attached to the plough, to cool themselves in some river or pool, it is no matter of surprise. They are quite satisfied with the roughest fodder, that even poorly kept oxen refuse, and the cow will give remarkably good milk upon even this coarse fare. Buffalo milk is an ingredient in the Transylvanian national dish (of Indian corn, groats and buffalo-milk) which cannot be dispensed with upon all great occasions. Buffalo cream makes good butter when sour milk is first added, a precaution which must not be neglected, since, without it, the cream contains such an excess of fat that butter is not easily made. Mr. Paget informs me that buffaloes are celebrated for giving a richer milk than is yielded by any other animal. In South Hungary and Transylvania no gentleman considers his breakfast complete without buffalo milk with his coffee. The cow is capricious in letting down her milk when offended. The largest milkers give 6 quarts per day, but 2 or 3 quarts is a more ordinary quantity. The flesh is "stringy," and gives off a mossy odour which spreads over the whole house, and also affects the milk. For this reason buffalo beef is seldom used, although the veal is considered good. The skin makes good leather.

The buffalo has not a sweet temper, and when roused his anger knows no bounds. With his convex forehead he can inflict a terrible blow, levelling his antagonist to the earth, and he then treads round and round upon him like a mad creature. With necessary food and good treatment he is quiet and good tempered, so much so that a herd of them can be managed by a boy, and their quiet and dignified demeanour at the Vienna Exhibition, where they were constantly surrounded by an admiring crowd, may be taken as evidence of their general placidity. They may be managed by kindness, but the rod of correction they cannot bear. Herr Josef Schuster, of Hermannstadt, already referred to, exhibited two Albino buffaloes which attracted much attention.

Sheep.

Above 1500 sheep were entered for competition, and comparatively few failed to appear. Of these entries England contributed 135; France, 69; Italy, 22; Germany, 377; Austria, 467; and Hungary, 431. Russia was scarcely represented in this or in any other section of the Cattle-show. Several of the best English races were present, and Italy contributed some characteristic and peculiar sheep, presently to be described. With these exceptions, as well as that of some hardy mountain sheep from Transylvania, and Duke Coburg Gotha's Zackel sheep, there were nothing but Merinos. Attempts have been made by some enterprising noblemen to cross the Merino with English sheep, and the result has certainly been encouraging. Such cases, however, are rare; and, as in the showyard so throughout the entire Empire, the Merino sheep is dominant and almost universal. They are in the hands of large proprietors, who breed them with great care, the peasants as a rule restricting their attention to cattle, swine, goats, and horses. The show of these sheep was probably the finest ever held, and offered a splendid opportunity for studying the various differences which exist under the generic name Merino.

England.

The English sheep offered a strange contrast to the files of Merinos which constituted by far the greater part of the show. It is important to remark that Merinos have ceased to be remunerative; and throughout whole regions of the northern part of the Empire, sheep are being, or have been, given up.

I shall presently give some account of Merino sheep, but it is as well to state at once that they are essentially a wool race, while the English races are excellent both for flesh and wool. We cannot rival the Merino in quality of wool, but when weight of fleece is taken into account, we need not fear competing with the finest super-super-electoral Merinos. The rapid rise in the price of meat has forced upon the Austrian and Hungarian agriculturists the need of attention to flesh as well as fleece. From 1855-60 beef was $3\frac{1}{2}d.$ to $4d.$ per English pound, and mutton $3d.$ to $3\frac{3}{4}d.$ From 1860-70 beef was $4d.$ to $5\frac{1}{4}d.$, and mutton $2\frac{3}{4}d.$ to $3\frac{1}{2}d.$; while in 1873 beef has been $5\frac{1}{4}d.$ to $7d.$, and mutton $3\frac{1}{2}d.$ to $4\frac{3}{4}d.$ These figures do much towards explaining the interest excited by the appearance of English Cotswolds, Lincolns, Southdowns, &c. They were evidently regarded as novelties and curiosities by the public, while they were readily purchased by the agents of the great proprietors. The objection has been urged that English sheep will not stand the heat of the southern portions of the Empire, but will suffer from *blut-schlag*, *i.e.* apoplexy or sun-stroke. This danger does not seem, however, to be imminent in a country where the universal practice is to house sheep during the hot hours of the day, neither does it seem to apply to crosses so much as to purely-bred English sheep. I hope in the course of this and the succeeding report to strengthen by facts the statement that a fine market is open to breeders of English sheep in Austro-Hungary.

Mr. Russell Swanwick, of the Royal Agricultural College Farm, Cirencester, showed six rams and as many ewes of the Cotswold race. Mr. Swanwick sold all his sheep but one, and writes as follows:—"The chief purchasers of my sheep were Count Braniski of Russia, Baron Magnus, Saxony; Count Vrondriavtziff of South Russia, Count Rudolf of the Tyrol, and Mr. Paget of Transylvania. Others went to North Russia. The highest prices were $30l.$ to $34l.$ Everybody expressed themselves astonished with the lustre of the wool, which they said was greater than that of any other long-woolled sheep. Count Braniski and Baron Magnus were the chief purchasers of the pigs."

Lord Sondes, of Elmham Hall, Norfolk, and his agent Mr. Fulcher, were both exhibitors of Southdowns and Shropshires respectively. Mr. Fulcher writes, "Lord Sondes's Southdowns were sold to buyers in Hungary, Galicia, Russia, and North Germany. My rams were sold to buyers in Bohemia, Hungary, Transylvania, Hanover, Wurzburg in Bavaria, and North Germany. The highest priced animal, a Southdown ram, was sold for $50l.$ to Herr von Gyiotti, a Hungarian landowner."

Lord Walsingham (represented by Mr. Woods) showed Southdowns. "The principal purchasers of our rams," writes Mr. Woods, "were the Archduke Albrecht for his estates in Austria; Count Fries, Czernahora, Moravia; Baron Magnus, Drehsa, Saxony; Herr Stahlschmidt, near Halle, Saxony; and Jean de Couriss, Couressonov, Russia."

Lord Chesham has favoured me with a letter, from which I extract the following: "Unfortunately I only took three rams and six ewes, all shearlings. They obtained First Medal in each class, which was all they could do, as the authorities would not allow the same exhibitor to take a Second Medal, having obtained a First. My object in taking them was to introduce the breed, and I therefore did not demand such high prices as I have made in England. The six ewes and one ram I sold to Baron de Rothschild, to go to his estate at Wetchamf, in Prussia, for 100*l.* (English money). The other two rams I sold to the Duc de Coigny for 40*l.* each; he would also have bought ten ewes, if they had been there, and I am sure I could have sold several more, both rams and ewes. I think they left such a favourable impression upon the minds of the breeders that I shall probably receive several orders both for rams and ewes. There is in the minds of some breeders a great reluctance to cross the Shropshire with the Merino, as they are afraid of spoiling their wool. Every one who is not prejudiced as to the infallible quality of the Merino wool, is very strongly of opinion that a cross would do no harm to the wool, and would very much improve the mutton, which is not worth anything in the Merino."

The Messrs. Russell of Horton Court, Kent, showed Hampshire Downs and Kentish Long-wools, and inform me by letter that most of their sheep went into Hungary and some into Russia, while a few remained in Austria or found purchasers in Prussia.

Mr. Dudding, of Panton House, appeared with Lincolns, and thus writes: "I got them all sold, and the highest price was 40 guineas. Some went into Germany with the idea of raising pure-bred Lincolns there; others into Hungary and Italy for crossing purposes."

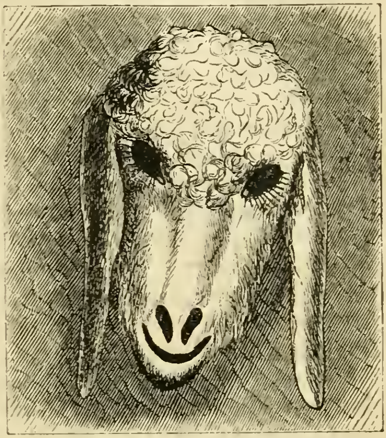
Mr. Treadwell, Upper Winchendon, showed Oxford Down sheep.

The English exhibitors were each and all rewarded with medals. Competition could scarcely be said to exist, for honours were awarded to all who showed animals up to a certain standard of merit.

Italy.

The *Bergamask* race was the only one represented from Italy. It is a middle-woolled sheep of remarkable appearance, white in face and fleece, standing high on its legs. The ears are long and pendulous, and the head is heavy, giving a somewhat ludicrous appearance. The accompanying sketch of a head was taken of a specimen from Cosenza. The body is correspondingly quaint.

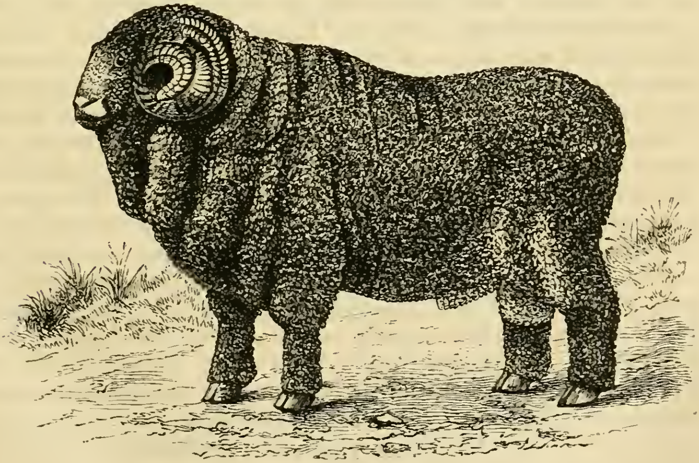
Fig. 10.—*Head of Bergamask Sheep.*



Merino Sheep.

It is impossible to report upon the Merino sheep exhibited at Vienna without first offering a few introductory remarks upon the character and qualities of this wide-spread and important race. I may here remark that in inspecting the sheep stock I was much indebted to the knowledge of my guide and interpreter, Mr. G. T. Yull, who, having acted as a practical sheep inspector in Hungary, was well qualified to give an opinion upon the

Fig. 11.—*Merino Ram, bred by Herr Hermann Kannenberg, of Gerbin, near Kösternitz, in Pomerania.*



relative merits of the animals exhibited. The best Merino blood appears to have been imported into Austria and Hungary by the Empress Maria Theresa, and many flocks still claim to be directly descended from sheep so introduced. The utmost care has been taken in breeding these sheep, and their classification according to quality of wool has become a distinct profession.

The Merino sheep have been divided into Rambouillet, Negretti, and Electoral; and these principal varieties when crossed have given rise to Rambouillet-Negretti, Electoral-Negretti, &c. Such was the classification adopted in the catalogue, a classification which, except in the case of the Rambouillet, scarcely seemed to be borne out by any observable differences between the sheep thus designated. Thus, the Czilchert and Hunyady sheep were entered as Negretti, although they were to all intents fine Electoral Merinos of remarkably high quality. The 'Wiener Landwirthschaftliche Zeitung' thus comments upon this point: "The catalogue gave us the usual names Electoral, Electoral-Negretti, &c., but we found that the names were often wrongly applied, referring, as they truly did, to the origin rather than to the present character of the flocks thus described. We could only discern two principles or ideas—the production of cloth-wool and combing-wool. The breeder works for one or the other, and aims at different degrees of fineness, and for the production of flesh. But the difference between Electoral and Negretti sheep, which existed fifty years ago, is entirely lost. It would be useless for us to look for, and impossible to find in the herds now called pure Electoral, the spindle legs, flat ribs, bald-headed, badly covered animals with excessively fine super-electoral wool, once characteristic of this section. Equally difficult is it to find the Negretti type, with its heavy fat wools which ten or twenty years ago was looked to as a means of improving flocks, although now-a-days very seldom found. The present cloth-wool Merino is well and strongly built, the head is of middle length and pretty broad; the neck short and fleshy, the shoulders and rumps wide; back straight, and the body round. The feet are firmly placed and well set. The wool is usually from Electoral to Prima fineness, and is soft, of middle length, with mild and not too rich fat. The animals have thickly-set wool, and are remarkably well covered, especially upon the belly, feet, and head. The extreme fashion for skin wrinkles has also happily been moderated." This description of a good cloth-wool Merino represents the greater number of those sent for exhibition from Austria and Hungary; and, whether they originally sprung from pure Electoral or Negretti flocks, or were otherwise bred, they may be rightly enough named Electoral-Negretti.

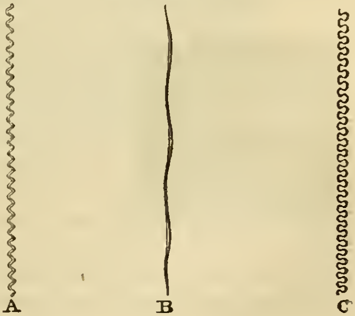
The *Rambouillet Merino* is of French origin, and certainly deserves a distinct notice. These sheep have their head-quarters at the Government sheep-stable of Rambouillet, and it was from thence that the specimens of the pure breed contributed by France were sent. The Rambouillet element was strong in the German section, but was entirely absent from the Austrian, and nearly so from the Hungarian section. These sheep are large and well formed, and possess superior fattening qualities when compared with other Merino races. The skin is usually free from those large folds of skin, so characteristic of the Electoral and Negretti. The wool is long, fine, thickly set, and strong.

These various sub-varieties of the Merino race are almost exclusively maintained for the purpose of producing wool. Accordingly we find all extensive flocks divided into several sections differing from each other in the fineness or quality of their fleeces. A large flock is divided as follows: (1) Prima; (2) Super Prima; (3) Elector; (4) Super-Elector; (5) Super-super-Elector. I am informed that in Saxony, the distinction is even carried higher, and that they make a "Super-super-super-Elector" grade. They also employ the term secunda, to represent a degree of coarseness below prima, making in all 7 degrees of fineness. The finest-woolled sheep are drafted into the stud or "pepinier" flock, and this promotion is determined by the quality of the wool rather than by form or flesh. Every April the sheep are classed according to the fineness, length, and thick growth of the wool, and the following points are considered important:—

Strength of fibre. This is indicated by the amount of grease in the wool—plenty of fat or grease indicating strength. The fat exists in three forms. Soft or liquid, which again may be a rich yellow or white; middle fat, yellow and white; and lastly, broken stiff fat, yellow and white. Of these, the oily or liquid fat is considered best in Germany, while in Hungary, the middle fat is more suitable to the climate.

Fineness. The wool should be equally fine over the whole body, but a coarser quality may be expected on the top of the shoulders and rump, and a weaker quality on the belly. It is with regard to fineness that the above classification of Prima, Elector, &c., is made. The finest samples of wool are usually not more than two finger-breadths in length.

Fig. 12.—*Crimps of the Fibre of Merino-wool.*

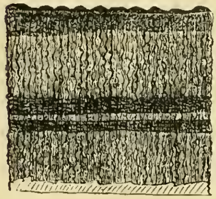


Curl. This is important, and refers to the minute bends or crimps which are seen in each hair; a long, straight, plain wave in the fibre, as in B, Fig. 12, is not liked, neither is an abrupt close wave which folds back upon itself, as in C. The best and most approved curl, that which gives spring and elasticity as well as preserves the strength of the wool, may be described as a minute and regular serration, and is shown by the line marked A.

Thickness. This quality refers to the thickness of the wool upon the skin, and is closely connected with the presence of those wrinkles so characteristic of the Merino sheep. Large folds of skin appear about the neck, and just above the tail (making "the rose"), in the true Merino, and especially in the rams. Young lambs, however, show the same peculiarity; and while the wool is short, similar but smaller wrinkles are observable over the entire body. The whole skin is completely furrowed with these wrinkles, and consequently, the wool-bearing surface is rendered very large. It is considered a point of excellence in Austria when these wrinkles are numerous, as they give a better "closure" to the fleece; but in Saxony, I am informed, a different taste prevails. The wool on the summit of the folds seen about the neck is a little coarse, but as the area is small, this is not allowed to be a fault—only a character. Fleischmann, as quoted by C. H. Macknight and Dr. H. Madden, states that a pure Merino sheep will carry from 40,000 to 48,000 wool fibres on a single square inch of skin.

Closure of stubble or fleece. The "closure" of the stubble or outer surface of the fleece is very important, for if the fleece is loose and open, dust and dirt find their way into the wool. The closure is effected by the abundance of the fat which rises to the surface of the fleece, and there mats the ends of the wool-fibres together, forming an almost continuous protection to the fine wool beneath. This is further added to by dust which adheres to the grease and makes that firm black limit to the fleece always observable in the Merino. The hand passes over the stubble as over a sort of scale armour, and when pressed the springiness of the wool is at once perceived. Opening a fleece for purposes of inspection, is to be done with knowledge, and indicates at once whether the operator is at home with his subject. Grasping the points of the fibres with both hands, the inspector parts the wool and discloses the beautiful white, or rich yellow, or orange-coloured wool below, and then closes up the fleece again without allowing any of the stubble ends to find their way down into the clean wool. The accompanying sketches, made on the ground, illustrate the effect, which is very striking, when a fleece is opened, and also what is called

Fig. 13.—*Section of Stubble.*



the *Blumen*, or flower (Fig. 16), when the wool is made to open like a cup and exhibit its rich yellow and white colouring right down to the skin, reminding the observer of a fine lily.

Fig. 14.—*Well-closed Stubble.*

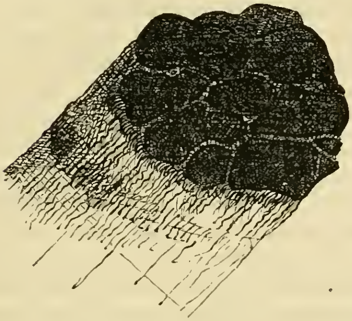


Fig. 15.—*Badly-closed Stubble.*

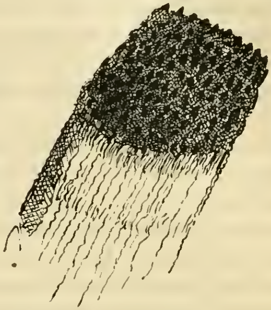
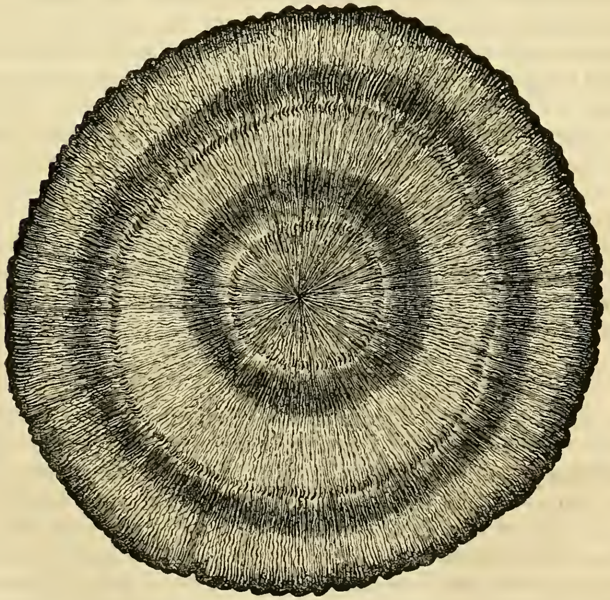


Fig. 16.—"*Blumen*," *or* "*flower*," *in Merino-fleece.*



A well-closed stubble has the ends of the wool gathered into large masses (Fig. 14), and as few openings or crevices into the fleece as possible. It is called a bad stubble when only a few fibres are caked together, giving the appearance of small dots (Fig. 15) instead of large bold blotches.

Growth. This point also refers entirely to wool, and not at all to carcass. The wool must be equally grown over the carcass. It must be equal in length on back, sides, and belly. The head must be woolled down to the nose, and over the entire ears; and the legs must be clothed with wool down to the hoofs. Fine wrinkles on the horns are looked for in selecting rams.

Length. The length of wool varies from one to about four finger-breadths. The Prussian and French Rambouillet are longer woolled than the Hungarian Merino.

Stature. This refers to the carcass and character of the sheep. The Merino is of a fair size, and derives his distinguishing characters from his head, horns, fleece, and general contour. The head is very handsome, and horned in both sexes. The head is Roman, and covered with wool over the ears and nose. It is short and broad across the poll or crown. The ears are short, and the horns must be open and wide between, well turned, and marked with fine transverse wrinkles. The nose is often pink, but is better dark. The neck is short but full, and gains much character from the heavy folds or wrinkles of skin, which adorn both males and females. The shoulders are very broad over the tops, and some are apt to be high or pointed in the withers. The body is long, the ribs deep and well sprung; the hind-quarters apt to sink. The legs are short, and the hocks are apt to be narrow or cat-hammed. There are also folds of skin gathered together over the tail, giving the puckered appearance known as the "rose."

Much remains to be said upon the Merino, but I defer further remark until I describe Hungarian and Austrian farming, when the management of the sheep will form a section. I now turn to the consideration of the many fine examples of the breed which appeared on the Show-ground.

France.

A small but choice selection of Merino and Rambouillet sheep were sent from France. I noticed several rams from the Government sheep-stables at Rambouillet. They were large, somewhat coarse in the wool, and were not very well closed in the fleece. There was an absence of folds of skin about the neck; but not in all cases. The ewes were very fine in the wool, and the sheep were good specimens of the variety they represented.

The Messrs. Russell, of Farningham, Kent, purchased four Merino ewes, in lamb, from M. Varin d'Epensival, of Epensival, near Givry-en-Argonne, Marne. They hope to save a ram or two to cross with their long-woolled ewes, and to cross the Merino with a pure long-woolled Kent sheep, for the purpose of gaining finer wool (see page 6).

Germany

Contributed 377 head, by far the greater number of which were Merinos.

Baron Magnus, of Drehsa, Post Tammritz, Saxony, showed some Southdowns from his flock of 600 head, which was established from 1857 to 1862, by direct purchases from the best English flocks. Since that period the Baron has continued to import rams to keep up the original character of the race (see page 38).

Herr F. Neide, of Seschwitz, Koberwitz, Prussian Silesia, has also begun to breed Southdowns, with the object of meeting the increasing demand for meat. He has a flock of 400, and the specimens exhibited were of good character, with a deficiency of wool upon the heads. Herr Georg von Schoenermark, Prieborn, Prussian Silesia, was another exhibitor of Southdowns, derived from the Merton flock. This gentleman has a Merino flock as well as Southdowns; but no cross was exhibited. Herr G. Stahlschmidt, Canena, near Halle, Prussia, showed 5 Southdown rams. He keeps up a breeding stock of 225 ewes, principally for fattening purposes. He also offers about 60 young rams, and many old and young ewes, for sale every year. The flock was formed in 1859-60, from the flocks of Lord Walsingham, Sir W. Throckmorton, and Messrs. Jonas and Henry Webb, of Cambridgeshire. Eight to nine English pounds is the average produce of unwashed wool per head.

Herr Ernst Böttcher, Gross-Lafferde, Hanover, showed eleven head of Oxfordshire-down sheep. The flock was only formed in 1870, from purchases made at Southleigh and Witney. Early maturity, high feeding powers, heavy carcasses, and abundant supply of wool, are the attractions which have led Herr Böttcher to select Oxford-down sheep. He states that he obtains an average of 7½ English pounds of wool after steam factory washing.

Herr A. W. Brauer, Skludzewo, Ostrometzko, West Prussia, also exhibited Oxford-downs to the number of 12 rams, from his flock established in 1869, and now numbering about 300. From 50 to 80 rams are annually sold from this flock. The same exhibitor showed three cross-bred Merino (Negretti) and Oxford-down sheep. The wool was intermediate between the two races; the faces and legs were white, and the carcasses greatly enlarged and improved in comparison with Merino sheep.

Herr A. M. Schön, Brestau, Linderode, Lausitz, Prussia, showed 8 Shropshire sheep as examples of his flock established in 1867, and now numbering 112 head. Since that period rams have been imported from England every alternate year to keep up the original character. The idea in commencing this flock is to produce meat and wool by effecting a cross with the Negretti Merino.

Such were the instances of English sheep bred in German hands. It will be noticed that the flocks have all been recently established, and, therefore, the possibility of a definite opinion is precluded as to the effects of change of climate, and other conditions. Some of the specimens, both of Southdowns and Oxfords, were, however, decidedly poor, and none of these transplanted English races could compare in bloom and beauty with what are yearly to be seen at the Royal Agricultural Society's meetings. It does not follow from this that the sheep have deteriorated in foreign hands; but it drives us to the conclusion either that the best blood has never found its way to these flocks, or that foreign food, climate, and management, tend to alter the original type.

German Merinos.—The first fine sheep noticed were those exhibited by Herr Robert Gadegast, Thal Oschatz, Saxony. Herr Gadegast is one of the first and most enterprising sheep breeders of Saxony, famous as that country is for its high quality of wool. His flock numbers 1000 head, and is devoted to the raising of breeding-stock for sale, and the production of good and fine cloth-wool. The sheep possessed, in a marked degree, those points of excellence already noticed, and the thick set of the wool, the fine curl in each fibre, and the abundant fat or grease, were especially noticed. The folds on the neck were finely developed.

Herr Adolf Heinrich Steiger, Lentewitz, Meissen, is another Saxon breeder deserving of especial notice. His flock, which is peculiar for the fineness of its wool, dates back to animals brought by Prince Reuss direct from Spain, in the beginning of the century; and since 1840 it has been bred with the Saxon Merino without any admixture of blood. The present stock numbers from 800 to 1100 head; and the production of "noble," elastic, and durable cloth-wool, of equable quality throughout the fleece, is the object of breeding. Rams clip from $7\frac{1}{2}$ lbs. to 15 lbs., and ewes $5\frac{1}{2}$ lbs. to $6\frac{3}{4}$ lbs. of wool; and the fattening of sheep is not practised.

Herr Alfred von Rudzinski-Rudno, of Liptin, showed Super-Electoral sheep from Prussian Silesia, very fine, thoroughly well-grown, and with a fine stubble. There is a flock of 1000 head, and the average clip is 3 lbs. of fine high-quality wool. These sheep gained medals in Paris (1855) and London (1862).

Herr Carl Hugo Kayser, of Haubitz, Grimme, Saxony, enjoys a great reputation as a breeder of Rambouillet sheep, and in connection with the same race, Herr Ferdinand Schwartz, of Lappenhagen, Hohenfelde, Pomerania, is worthy of notice. Specimens of wools, kindly presented by these gentlemen, may be taken as excellent samples of Rambouillet wool. These wools show great strength and fineness in their fibres, which are about $2\frac{1}{2}$ inches in length, very thick on the skin, and show a good closure of stubble. A pure Rambouillet ram, exhibited by the latter-named gentleman, clipped, as I was informed by his owner, $31\frac{1}{4}$ lbs. of unwashed wool, and this would represent $15\frac{1}{2}$ lbs. of washed wool. This sheep was much to be admired for his stature and unrivalled wool, which was grown down to his hoofs. He has two large folds, or perhaps more correctly three, in front, but has no folds, or "rose," behind. The fibres were very thickly set, and were about $2\frac{3}{4}$ inches long.

Herr Hermann Kannenberg, Gerbin, Kösternitz, and H. Robert Lehmann, of Nitsche, Alt-Boyen, Posen, well represent the Prussian breeders. The first of these gentlemen exhibited a fine lot of Rambouillet-Negretti sheep. The wool of a two-year-old ram was fully 3 inches (about four finger-breadths) long, and some from a two-year-old ewe, about $2\frac{1}{3}$ inches long. The fibres were very thickly planted, were of fair strength, very equal in quality, and the wool was extraordinarily grown on the feet and ears. The spring of the wool was also good, and the general figure of the sheep, wrinkles about the neck, and appearance, were grand (see Fig. 11, page 39). The sire of the ram which gave rise to these remarks clipped 27 lbs. of unwashed or greasy wool, and when washed with hot water there were 17 lbs. left. This I have on the authority of Herr Kannenberg himself. Such sheep represented the animals on which the longest wool is found. Rams for breeding shorter-woolled sheep were next inspected. The first carried a fleece three finger-breadths long, and the second two finger-breadths long. Another examined had a remarkably fine head, fine thick-set wool, splendidly covered paunch and sides, and was woolled down to the feet. Some ewes were also exhibited from the same flock. The first carried very strong "three-finger" wool. The head was completely covered, down to the nose and over the whole ears. The stubble was firm, and remarkably springy. A second example was lighter in the fat, but well woolled to the nose and feet. A third was a little "pitch pointed," with plenty of fat, and very thickly-grown all over and down to the toes. The flock of 600 yields an average of $5\frac{1}{10}$lbs. to $5\frac{1}{2}$ lbs., and deducting the lambs from the calculation the average will be $6\frac{1}{5}$ lbs. per head.

Herr Lehmann showed some very excellent examples of Negretti Merinos, from his well-known and extensive flock. This breeder maintains a breeding flock of 500 ewes, and his clip averages $4\frac{1}{2}$ lbs. He took high honours in London in 1851 and Paris in 1867.

European sheep have been relegated to four divisions. The Merinos, which have occupied so much of our attention up to this point, form a highly-cultivated variety of the species *Ovis aries*. The only true aboriginal sheep present at the Exhibition, according to Professor Wilhelm ('Wiener Landwirthschaftliche Zeitung,' June 21), were examples sent by Herr Philip Völcker, of Annweiler, Pfalz, Bavaria. They may be described as neatly-formed, middle-woolled sheep, hornless, with black faces and white legs. Some were white and some black, at the point of junction between head and neck.

Herr H. Sprengel, of Schillerslage, Burgdorf, Hanover, showed the only specimens exhibited of short-tailed sheep (*Ovis brachyura*). They figure in my notes as a small, sprightly, horned, mountain race, with black faces and long brown wool, of a coarse hairy quality, mingled with a fine down. They carry a top-knot of short wool between the horns and on the forehead. They are described in the catalogue as silver-grey heath sheep (*Haide schnucke*), and are from the Lüneburg Common. These sheep have received little attention, but the ease with which their wants are satisfied renders them valuable in the great district of heath land to which they belong. This tract, which is to be found on the south of the Elbe, in the north-east of Hanover, is being gradually broken up and subjected to agricultural improvements perhaps scarcely consistent with the prosperity of this hardy little race. The British Blackfaced race, which also belongs to the same ovine division, was not represented.

Austria.

The Austrian Sheep Show consisted of continuous pens of Merino sheep, interrupted in a few instances by the occurrence of English or mountain sheep, and a few English and other crosses. The Rambouillet type of Merino almost entirely disappeared here, giving place to the true Negretti and Electoral types.

There were a considerable number of Cotswold and Merino crosses, and a few examples of the pure breeds. It will be noticed that Cotswolds had no place in the German section, and further, it may be here observed, that no English races, except Mr. Paget's Lincoln crosses from Transylvania, were to be seen in the Hungarian department.

The Moravian Sugar Factory Company, of Keltschan, again appeared as exhibitors by sending specimens of Cotswold-Merinos, Cotswolds, Southdown-Merinos, Cotswold-Southdowns, and what they call the "Keltschaner" race.

The Cotswold-Merinos were well worthy of attention, being fine examples of sheep. They are hornless, with white faces, resembling Cotswolds, but with the pink noses of the Merino. The ears are slightly hanging; the top-knot is shorter than in the Cotswold, and not so abundant. They were shorn in July (1872), and the wool (June 9, 1873) was $4\frac{1}{2}$ inches long. It will be remembered that the longest Rambouillet wool examined, that of Herr Kannenberg's ram (see Fig. 11), was only 3 inches, while ordinary Merino is frequently $1\frac{1}{4}$ inch to $1\frac{1}{2}$ inch long, or even shorter. The wool of the cross is much finer than that of the Cotswold, is very bright, has a good curl, and is well filled with liquid yellow fat. It is also fairly thickly set on the skin, but cannot compare in this particular with pure Merino sheep. The fleece is not closed so completely as in the pure Merino, but the fleeces seemed free from dirt or foreign matters. The flesh is firmer than is usual on Cotswold sheep, and thicker than in the case of the Merino, both back and ribs being well covered. The girth, taken over the wool without pinching, was 5 feet 8 inches. The wool is scant below the knees and hocks, when compared with the Merino parent. The first cross is considered the best; the cross-bred animals are then bred *inter se*.

Count August Fries, of Czernahora, Moravia, showed crosses between Cotswold and Negretti Merinos. These sheep were good, but the wool was shorter than in the examples last mentioned. In samples of wool now before me the length is about $3\frac{1}{4}$ inches; the wool seems a little deficient in fat, and is somewhat loosely put together. It is not, however, improvement in quality of wool that must be looked for in crossing the Merino with the Cotswold. The attraction lies in the increased weight of carcass, the earlier maturity, and the improved fattening propensity.

It is becoming painfully clear that Merino sheep, yielding only some 3 lbs. of wool and nothing else, cannot be kept at a profit, and such sheep as those described above, supply a strong and reasonable hope that crosses may be introduced which will, as in England, meet the demand, not only for meat, but also for those qualities of wool now most in request.

The following remarks, by Professor Wilhelm, translated from the Vienna agricultural paper of June 21, are worth attention:—"In comparison with former shows, there appeared to be a stronger desire to attain weight of fleece. The admirers of high, fine, super-electoral wool may complain, but we cannot sympathise with them, looking, as we do, upon the agriculturist as a merchant who must keep up with the times and supply the wants of the market. As the public cease to ask for the very fine cloth which fifty years since was so highly valued for its beauty and durability, no one can wonder at the manufacturer turning his attention to the production of cloths of coarser quality, suitable to the present fashion. But since the manufacturer no longer requires the high fine wool in quantity, the price naturally falls, and the agriculturist ceases to produce an article that is no longer remunerative."

The Archduke Albrecht, Count Fries, and the Keltschan Sugar Company all contributed specimens of Southdown-Merinos, from Silesia and Moravia. Sheep similarly bred by Count Thun-Hohenstein, Peruc, were white or speckled in the face, and white legged; they were very well fleshed, and carried excellent fleeces. In comparing these sheep with the Cotswold cross it was noticeable that the Southdown-Merino wool was shorter, thicker on the skin, and scarcely possessed the lustre of the Cotswold cross. Count Thun's crossbreds are put up to feed at eleven months old. As the crossing of English sheep with the Continental races must be of deep interest to English breeders, the following statement has been translated regarding the proceedings of the Keltschan Sugar Factory Company, and the results they have arrived at after importing English pure-bred sheep. This statement derives greatly increased interest from the fact that thousands of estates now stocked with fine Merinos would be rendered more profitable by following the advice of this spirited Moravian Company.

"*The Keltschan Sheep Flocks in Moravia.*—Our leased farms, of 4400 Austrian joch (equal to 6258 English acres), are appropriated to the keeping of sheep on account of the hilly character of the land, and the fruit-trees which are planted over the pastures.

"The Merino flock which formerly existed on the estate was not calculated to produce a profit, on account of the low price of fine wool, and the small amount realised for the cull sheep. This was especially the case with the flock in question, which was hardly to be expected to pay for the rich food produced by the sugar factory by converting it into wool and mutton.

"It was our object to constitute a breed of sheep which would give us weighty animals likely to pay for this abundant and rich food.

"In order to attain this result with the least outlay we adopted crossing, and in the case of one flock we allied the good Merino ewes with imported Cotswold rams.

"The result of this cross not only completely satisfied our expectations, but a long way excelled them. The crossed produce were of strong constitution, and were quick in arriving at maturity, becoming prime fat at 12 to 14 months old. They paid more for their fodder than any other kind of stock, and we give this opinion after an extensive experience in cattle and sheep-feeding.

"Our January lambs are fed after weaning, with pressling (sugar beet-pulp) and a small quantity of oats, rape-cake, and hay. The wether lambs, which are kept separate, receive more rape-cake, to bring them more quickly forward. They are put on green food at the end of May, later upon mown clover, then on mangold, and by January of the next year they are fat. These lambs reach from 139 to 148 pounds per head live weight at from 12 to 14 months old, and find willing buyers—taken at the stall—at high prices. We sold the whole of our wether lambs in 1872, when shorn, at $3\frac{1}{2}$*d.* per lb. live weight, without any deduction.

"This satisfactory result, on the one hand, and the former experiments made by renowned breeders upon three-quarter blood Cotswold crosses, made it obvious that our best plan was to proceed by breeding our half-blood Merinos *inter se.* These animals satisfied us equally with the others, and we could find no difference between the 'two-fourth' blood animals and the direct half-blood as regarded their feeding qualities.

"A few three-quarter blood animals, bred for our observation, proved the results of former trials, and thus we determined to keep to half-breds, and, especially for sugar manufactories in Austro-Hungary, we cannot recommend them too highly.

"Our Cotswold-Merino flock numbers at present 340 head.

"With a view to the production of the heaviest possible animals, with large frames and good constitutions, we constituted a second flock.

"The ewes were partly large native sheep (*Ovis aries*) from the Carpathians, and partly large superior Merinos. As sires we used rams of any blood of extraordinary size and undoubted constitution. The first produce of these alliances we paired with imported Cotswold rams, and bred the result in-and-in without mixing any other blood. Thus resulted the present Keltschan flock exhibited at the Vienna Show for the first time. They are characterised by their robust health, weight, quick maturity, great fattening propensities, and they leave a good remuneration in the hands of the feeder.

"The weight of the 12–14-months-old wethers averages 173 English lbs. live weight. An 18-months-old ram weighed $228\frac{1}{2}$ English lbs., and a ewe, $160\frac{1}{2}$ English lbs. The flock numbers at present 500 head.

"The local circumstances of a third farm-yard allowed us to constitute a flesh-sheep* of middle weight with advantage. To obtain this we again had recourse to the principle of crossing.

* '*Fleisch-shafe,*' or flesh-sheep, is a term commonly applied in Germany to breeds which are more adapted to the production of flesh than of wool. It arises from the fact that the Merino sheep is bred and kept almost entirely for its wool, hence our heavy fattening sheep are spoken of as flesh-sheep, in contradistinction to wool-sheep.

"We had at our disposal a stock of Merino ewes, which we paired with Southdown rams from the flocks of Lord Walsingham, Lord Sondes, and Zöppritz. The results of this cross were partly half-blood and partly three-fourth Southdown blood. The flock thus commenced possesses good feeding qualities through the Southdown blood, and is well suited for middle quality of land. For rich land and good keep the Cotswold-Merinos, and, in a still higher degree, the Keltschan stock are the best. The last are especially recommended for the circumstances of the sugar makers. They are unequalled either by the pure Southdown, of which we hold a stock of 100 breeding-ewes of the best blood, or even by the Oxford-down.

"We look for, and find the profit of our breed of flesh-sheep in the sale of our 12–14-months-old fat animals. Also in the price for the comb-wool produced, which we have sold at an average, over all our improved flocks, of 1*s.* 9½*d.* per lb. The shearing weight is, in the case of Cotswold-Merino, 4⅕ English lbs. The Keltschan stock and the Southdown-Merinos produce three pounds per head."

Keltschan Post and Telegraph Station is in Moravia, near the North Railway Station, Bisenz.

The Archduke Albrecht has been mentioned as a breeder of Southdown-Merinos. Specimens were exhibited from Teschen, Austrian Silesia. They represented a flock of 750 Southdown-Merinos and 650 Southdown-Berki ewes, and a small stud flock of Southdowns. The production of meat and strong wool are the objects sought after. The wool is middle-fine, and was sold in 1872 at 2*s.* 1½*d.* per lb. The weight per fleece is reported at 3¼ English lbs. for one-shear sheep, and 3 lbs. per head for two-shear sheep. The Southdowns were purchased in England in 1868–70. The Saybusch flock consists of 200 head, bred between native sheep and Southdowns. The objects aimed at are the production of meat, and an increased weight of wool of coarser quality, for combing purposes. The ewes give close upon 7⅓ lbs. and the rams 13½ lbs. per head average. This flock was constituted in 1867.

It seems scarcely necessary to enter into a minute criticism of the Austrian Merino flocks after having devoted some pains and space to this part of the subject under the head of Germany. The general character of the wool was much the same, except that the long Rambouillet quality was absent. With reference to this famous variety of the Merino sheep, and in connection with what has already been advanced, it is only fair to state that the Rambouillet sheep have many points to recommend them for crossing purposes.

In Hungary it was found that the Rambouillet cross, although giving a large carcass, caused an open, loose character of wool, scarcely calculated to withstand the drying winds, hot sun, and dust of that country. The experiment was made by the late Mr. G. B. Smallbones, on his farm at Deutsch-Kreutz, in 1855, but was not successful. As the price of mutton increases, the wool question ceases to be all-important; and further, taking the whole extent of the vast Austro-Hungarian Empire, it is reasonable to suppose that the Rambouillet, as well as Downs and Cotswold, may be employed to give weight of carcass and fleece.

The following instances of first-rate Merino flocks may be useful as indicating the varying weights and value of wool obtained:—

Count Franz von Bellegarde, of Gross-Herrlitz, in Austrian Silesia, showed some incomparably fine-woolled sheep. The average clips of fine-cloth wool over the entire flock of 599 is $2\frac{7}{8}$ to 3 English pounds. Prince Schaumburg-Lippe, Post-Stalitz, Bohemia, exhibited comb-wool Merinos. These sheep are of compact form, and the wool is comparatively long, and not unlike Rambouillet quality. The prima wool reaches 5 to 7 inches in length, and $14\frac{1}{2}$ English lbs. is said to be the average clip of unwashed wool over 800 head. This loses 58 per cent. of its weight in factory washing. His Excellency Count Thun-Hohenstein, of Peruc, Bohemia, exhibited high-fine Merino sheep, the average clip of which was stated to be 4 English pounds of washed wool. The cull ewes are either sold or crossed with Southdown rams, giving the half-breds before noticed. Baron Albert von Klein, of Hemmersdorf, Austrian Silesia, the President of the Keltschan Sugar Company, is a well-known promoter of agricultural improvement and scientific breeding of animals. As representing the oldest existing flock in the Empire, the Baron's Electoral Merinos are deserving of special notice. The original flock was brought direct from Spain in 1770, and was bred without admixture of foreign blood till 1864. In 1865, two rams were introduced from the Oschatz flock, which brought with them a longer and more compact carcass.

Josef Maria, and Emma Aresin, of Partschendorf, and Erbsedlnitz, Stauding, Moravia, were exhibitors of "Original-Merino-Negretti" sheep, which, like those just noticed, claim a direct Spanish descent, as may be proved by documents. It is therefore, say the owners, to be considered as belonging to the Negretti or Infantado stock. The average clip of $3\frac{1}{3}$ English lbs. per head is high rather than low, as it includes a large number of winter and summer lambs, is of very high quality, and was weighed after warm washing. The wool has been sold as high as 245*fl.* per centner, or above 4*s.* per English lb. On account of the high character of both fleece and carcass, sheep from this flock are sold into Australia and South America, as well as into the neighbouring countries of Prussia, Poland, and Russia.

This notice of the Austrian sheep classes will be well closed by a reference to the Zackel sheep, exhibited by Baron Jakob Romaszkan, of Horodenka, Galicia. These represent the division of "long-woolled sheep" (*Ovis strepsiceros*), which will again come prominently into notice in treating of Hungarian sheep. They are of various colours, and are not fixed in their character, even with regard to horns. They are a long, coarse-woolled race, and the examples just referred to yield from 6 to $18\frac{1}{2}$ lbs. of unwashed wool, sold at from $6\frac{3}{4}$*d.* to 7*d.* per English lb. unwashed. The ewes are regularly milked, and are frequently let during the three milking months at 6*s.* to 7*s.* per head. The judges acknowledged the value of the Baron's work in improving these sheep by awarding him a Hamburg prize.*

Hungarian Sheep.

The same general character was traceable throughout the entire Austro-Hungarian sheep show. Here the Merino reigned supreme, apparently no other race dividing the attention of Hungarian breeders. Wallachian, Transylvanian, and Zackel sheep appeared, it is true, but they came as mountaineers, and did not enter into competition with the sheep of the plains. The Archduke Albrecht keeps Southdowns and Southdown crosses on his extensive Hungarian estates, but no specimens were forthcoming from these flocks.

English sheep, which have evidently gained a footing in Germany and the northern parts of the Austrian Empire, were here almost absent. The only cases, indeed, in which English blood appeared were examples of a very successful cross made in Transylvania between Lincolns and Zackel sheep. The Zackel or long-woolled sheep have been already mentioned in the report upon the Austrian section. This race is generally distributed over the mountainous regions of Transylvania and Galicia, and appeared in considerable strength in the section now under consideration. Professor Wilhelm has been previously quoted as the writer of an article upon sheep in the Vienna agricultural paper for June 21st. Regarding Zackel sheep, he writes: "We noticed 60 pure specimens and 30 crosses of this race from various flocks. Side by side with the robust coarse-woolled Zackel sheep from the Transylvanian Hills were superior Zigara or Cigarea sheep, with finer wool, from the flock of Count Emerich Miko, Klausenberg. There were also black Szekler sheep, and white-woolled Zackel sheep with black heads and legs. Also com-

* "Hamburg Prizes" are given by the city of Hamburg at certain Live Stock Shows held in Austria. Exhibitors from the Austro-Hungarian Empire are alone entitled to compete for them; and a separate jury was appointed at Vienna to adjudicate them.

pletely white sheep of the same type. Some Zackel rams had long horns, while others from Galicia were hornless." We have already noticed the good qualities possessed by Baron Romaszkan's Zackel sheep.

Mr. Paget describes the Transylvanian type as long-woolled, black or white, and horned. The sources of profit are wool, milk, and lambs, and it is reckoned that each season the lamb brings 4*s*., the wool 4*s*., and about 15 lbs. of cheese gives 4*s*. more, in all 12*s*.

The sheep bear the winter* without shelter, and each sheep consumes 240 lbs. of hay and nothing else during the winter. The lambs are separated from the dams at six or seven weeks old, on St. George's Day, April 25th. The ewes are milked till September 25th, and put to the ram at the end of October. Each flock consists of about half and half, black and white. When black tups are paired with white ewes the produce is nearly always black. The lambs' skins show a pretty, fine, curling lock, which causes them to be in great request. The following is the substance of a letter received from Mr. Paget, describing the Transylvanian Zackel sheep, and the results of his experiments in producing a crossed race with English Lincolns:—"It is about ten years since twelve of the principal landed proprietors of Transylvania met together at my invitation to consider the best measures for the improvement of our indigenous long-woolled sheep.

"In consequence of the competition of Australian short wools, our Merino and cross-bred Merino wools would soon have been beaten out of the market. The price of this commodity was falling day by day, while coarse long wool was improving in price. There had also been inquiries made by French speculators about the price of our sheep when fat, so that for the first time there seemed to be a chance of exporting mutton. This double stimulus turned attention to the native sheep, which is not a bad animal when compared with the unimproved races of other countries. The leg is short, the bone not too heavy, head fine, and wool long, although very coarse. What is called a good flock here is composed of about 300 ewes, half of which are black, and half white. To these, generally, but not universally, black rams are put, the object being to get as many black lambs as possible, black skins being of twice the value of white ones. On the other hand the white ewe gives more wool, which fetches

* The temperature of the mountainous district of Transylvania varies from + 93° Fahr. in the height of summer, to — 29° Fahr. in the depth of winter; but in the rest of the northern highlands the minimum temperature is — 5° Fahr. ('Skizze der Landeskunde Ungarns,' edited by Karl Keleti, Chef des Kön. Ung. Statistischen Bureaus.)

a better price than that from black ewes. The black ewe wool is indeed scarcely black, but of a dirty grey colour. The sheep on the mountainous parts are generally larger, and coarser in wool, and the horns are more fully developed.

"The horns of the Transylvanian sheep do not stand up in a spiral, like those of Wallachia, but are curled round like the Scotch blackfaces. The face and legs are often black, or more commonly spotted, and this character is not lost after two or three crosses. The lamb is often spotted, but after the first clip the fleece is white.

"These animals are tame and easily managed by the shepherd and his dogs. For a flock of 300 two men are required. Besides the lamb and fleece, the ewes give about 15 lbs. (English) of good cheese during the season, and this product is mostly consumed at home.

"Our objects in improving the breed were to obtain a finer wool, and at the same time, increase the quantity and keep up the length of the staple. Also to improve the feeding aptitude and form of the animal, while still keeping up its activity and hardihood. It was also proposed to keep up to a certain extent the milking properties.

"After due deliberation we chose the Lincoln as the best cross, on account of the length and glossiness of its wool. My late cousin, Mr. Charles Paget, of Ruddington, was kind enough to procure us 27 rams and 20 ewes of this breed. Every member of the society received 2 rams for his own use, and 3 were reserved with the 20 ewes to form a nursery for future use. Of this reserve it is not necessary to speak further, as in two years all except two or three ewes had died of tuberculous lungs. With the rams we were more fortunate, and some of us used them till seven or eight years old. The first and second crosses were everything we could desire. The wool was longer, the texture much finer, the gloss beautiful, the quantity doubled. The milk was not lessened by more than one-quarter, and although rather more difficult to milk than the unimproved breed while young, the teat grew longer after the second lamb. The form of the animal was greatly improved, especially across the loins, and the good effects of the cross could be recognised even in the skeleton by the change in the form of the ribs and false ribs. They fed much more easily, and the flesh had not that strong flavour which makes old mutton of the native breed not always pleasant. Better mutton than that of the crossed sheep I never ate. The price of the unimproved long wool is about $5\frac{3}{4}d.$ per lb., and the first year we sold the cross-bred wool at three times the price of that of the native breed, but alas! the manufacturers declared their machinery was not adapted for it, and it was eventually sent to England for sale. The price is now no higher than that of our common wool.

"Against all these advantages, owing to the introduction of Lincoln sheep, must be set a somewhat greater delicacy. There is a tendency in the heat of summer to sudden death from inflammation of the spleen, and if *bred too highly* there is a disposition to tuberculous disease of the lungs. I differ from many breeders in my practice of never crossing mine more than twice, and then breeding in-and-in to get the form as constant as I can. The award of the jury has confirmed me in my opinion. We suffered at one time from "scab." It took us three years to get rid of it, the closeness and length of the wool rendering treatment difficult, but for the last five years we have had no return.

"We do not expect to see a great increase in the numbers of this cross until we can get a market for our wool, and on the other hand we can scarcely expect a market till some more of our neighbours follow our example.

"From the interest exhibited at the Vienna Show it is likely that the idea will spread; and should it do so, we have the material already acclimatised, and may not only look for a fair remuneration for our labours, but hope for an opportunity of doing a good service for the country."

There is a breed of sheep on the borders of Transylvania and Wallachia which may be described as coarse, short-woolled, and of reddish-black or brown colour, hornless, large, and leggy. They are bred on the mountains, and towards winter they are driven down to the plains of the Danube in Wallachia, where they remain till spring.

They are attended by their owners, who migrate backwards and forwards with their families, and live during summer in the open air. These men are often possessed of 4000 to 5000 sheep, and occasionally of from 15,000 to 20,000. They slowly migrate with their flocks downwards to the valleys and up again to the mountains as the seasons alter, and have comfortable wooden *châlets* for the winter.

Returning to the Zackel sheep, it is not a matter of surprise that an attempt should have been made to cross them with an English race. It is about ten years ago since the first Lincoln ram was imported into Transylvania for this purpose, and the example of the crossed race exhibited at Vienna certainly spoke very favourably of the result. These were supplied by Baron Banffy, Count Emerich Miko, M. Ladislaus Tirza, &c. The improvement of the frame, refinement in the bone, and improvement in the wool were quite noticeable. The judges acknowledged the services of the first undertaker of this cross, our countryman, Mr. John Paget, of Gyeres, near Torda, Transylvania, whose experience is above related, by awarding him a Hamburg prize. The Zackel sheep of the Moravian Carpathians were used as the base of the Keltschan "flesh" breed, which has been already noticed.

Hungarian Merino Sheep.—The Hungarian Merinos were all of the Negretti-Electoral type. As has been previously stated, the Rambouillet cross was never much in favour among Hungarian breeders, on account of its openness of fleece, which allowed the sun and hot winds to dry the wool, while dust and dirt at the same time gained access. The wool is generally very short, well closed, and very full of fat.

The flock of Count Alois Karolyi, Stampfen, was the first visited, and it was there that I first saw the Hungarian Schäferei or sheep-stable, and was introduced into the mysteries of examining or inspecting a Merino fleece. The Stampfen flock is one of the most celebrated in the country. Half-a-dozen wool samples from this flock now before me, vary from 1 inch to $1\frac{1}{2}$ inch in length, and are of marvellous fineness, and mostly of rich orange colour from the grease or fat. The colour occurs in deep bands, which shade into a light yellow, and the samples have a rich candied appearance as though they had been immersed in a rich sugary syrup.

Another flock worthy of honourable mention is that of Count Emerich Hunyady, of Uermény. These sheep are celebrated not only for the high quality of their wool, but for the size and compactness of their frames, as may be seen by inspecting the stud flock at Tarány. The wool is less abundant in fat than that from Stampfen, is a shade longer, and is whiter in colour. This is the flock from which the Imperial flock at Gödöllö, on the railway from Pesth to Vienna, was derived. The animals exhibited from Gödöllö were, however, inferior to the representatives of the "father herd." The Uermény flock carried off the highest honours given in the section. The Countess Henckle, of Karlburg, possesses a splendid flock of Electoral-Negrettis carrying wonderfully fine wool, of which I was also fortunate in obtaining eight fine samples. It varies from under 1 inch to about $1\frac{1}{2}$ inch in length, and is of the same rich character and colour as the Stampfen wool.

Count Czilchert, estate near Somorja, a nobleman who has long been a leader both in the breeding of animals and in agriculture, showed some exceedingly fine, short, high quality wool. It is $1\frac{1}{4}$ inch long (these measurements are all given without stretching the wool out to its full length), finely curled, and coloured with beautiful regularity in four distinct zones, varying from almost white to rich orange.

Widow Geist, Pesth, also showed specimens of that flock for which her husband was in such great repute. These sheep carry a very strong, heavy quality of wool, for which there is a great demand, and many animals are sold yearly for breeding purposes.

Swine.

Two hundred and seventy-seven swine were entered in the catalogue, few of which were missing. Of these, 24 came from England, 8 from Italy, 72 from Germany, 48 from Austria, and 125 from Hungary.

English Breeds.—Both white and black were fairly represented by specimens brought over by some of our best and most enterprising breeders. Mr. J. K. Fowler, already mentioned as an exhibitor of Shorthorns, showed breeding swine of the Berkshire, and of the small white races. Mr. Russell Swanwick brought a dozen Berkshires from the long-established herd at the Agricultural College Farm, Cirencester, which were greatly admired, and for the most part well sold. As an instance of the endurance of the race, it may be mentioned that Mr. Swanwick's well-known and handsome boar "Lord Liverpool," after winning honours at Vienna, returned to take prizes at English Agricultural Shows.

The Messrs. Duckering sent examples of their celebrated white pigs from Lincolnshire, and this concludes the list of English exhibitors.

In no case was the superiority of English stock better illustrated than in the pig classes, and it may be here remarked that English crosses are by no means uncommon over the whole Empire. These crossed animals are easily identified by their finer white skins and general English look, and are usually derived from the union of the native breed with white Windsor pigs. The ready sale which English pigs met with, at good prices, and the universal extent of country over which they might be distributed with advantage, indicate a market in the future, as the agriculturists of South-eastern Europe gradually come to recognise their excellences.

Italy was here represented, as might have been expected, by the fine, hairless, black, long-nosed, and somewhat leggy Neapolitan race, from which our own improved Essex derives his colour and character. They were eight in number.

Germany.—Of the 72 head from Germany *all* were of English origin. Baron Magnus contributed a boar and three sows, of the Windsor race, from his herd at Dresha, in Saxony. This herd was established in 1862 by direct purchases made in England, and since then recourse has been again had to the mother country for fresh blood.

Messrs. Schütt and Ahrens, salesmen at Stettin, in Prussia, showed some fair Lincolnshire swine, and nine young Berkshires —three to six months old.

The 20 Berkshire swine sent by the Agricultural School of Eldena, Pomerania, could not bear comparison with English-bred pigs of the same race; the heads having been allowed to become narrow and long. These swine were from a herd of about 150, established in 1860 by importations from England.

Herr A. M. Schön, Brestau, Linderode, Brandenburg, Prussia, showed Berkshires, from his herd of 53 head. These swine were originally purchased from Sir Watkin Wynn, and fresh boars are imported every second year from England. The heads of these animals were also defective, the noses being exceedingly long, and therefore quite out of character with the best examples of the race.

H. Josef Diethelm, Brandenburg, Prussia, was an exhibitor of Yorkshire and Suffolk crosses, which may be spoken of as very excellent swine, the descendants of animals imported from England in 1863.

Austria.—Nothing but English breeds of swine appeared in this section. Taking both the German and Austrian sections, the conclusion seemed inevitable that English races have deteriorated, or, at least, materially altered in character, in foreign hands. They have lost roundness of form, and acquired an inordinate length of head and legs. There were exceptions to this rule, among which may be mentioned a fine hog, exhibited by Herr Johann Wilfort, of Lower Austria—a cross between English and Chinese swine; several fine Lincolnshire swine, exhibited by Prince Franz Salm-Reifferscheid, Bohemia; some good swine of English race, shown in the collection of the Royal Agricultural Society, Vienna; and some good Suffolks, exhibited by Herr Domäne Smiritz, Hovrenoves, Bohemia. A sow (133), exhibited by Herr Alois Sommer, was also a great attraction. She was white, and of Yorkshire race, bred in Moravia. She was accompanied by nine remarkably fine suckers, very large for their age, and these were all sold on the first day at 6*l.* sterling each, and many persons who came later to buy were disappointed.

Hungary.—The English races were scarcely found in this section. Herr A. L. Blaschko, Szegedin, showed a black sow, the result of a cross between Hungarian and English swine. The principal point to be observed was that this sow had littered five times in two years, and produced 16 to 18 young ones on each occasion.

With regard to Hungarian races, it may be stated that they are exceedingly unsightly, and even disgusting, in appearance to an English eye. Such at least was the impression conveyed to me; others, well accustomed to English swine, shared in it. This impression was partly the result of the contrast they offered to our highly-bred pigs, and partly of the peculiar reddish-brown colour of the skin, the grizzled and abundant hair, and the patchy covering of soft dirty-looking wool which very frequently underlies the longer bristles. The swine are long-nosed, flat-sided, of flat, oval form, and are much esteemed in their own country for the lard, which is largely used in the Hungarian *cuisine*. The Hungarian pigs abound over the whole country, and especially among the peasantry, and English crosses are not very frequently seen.

One of the most widely distributed races is the *Mangalicza*. It is divided into three sub-varieties—(1) black, (2) light-coloured, (3) black above, and light below. All are covered with bristles and an under-covering of down or wool, and are valued as excellent lard pigs. Count Wenckheim, of 'O-Kigyós, showed crossed Mangalicza and Miloser, thick, well-fleshed, and covered with a thick pile of silver-grey hair; the ears were over the eyes, and the heads wedge-shaped, and of moderate length. Herr Bernard Deutsch, of Arad, in Lower Hungary, sent specimens of Mangalicza (Mezöhegyeser) swine, which might be described as thick, deep, oval-formed animals, covered with bristles and grey wool.

The Hungarian race may be described, from specimens sent by H. Alexander Bàngi, of Hermanstadt, Transylvania, as large, coarse, and flat-sided, spotted in colour, long-nosed, standing high on the leg, and of unpleasing appearance. A cross-bred pig between the Servian and Hungarian races certainly seemed to possess a most unnecessary length of nose and leg, was 3 feet 11 inches high, and of unprepossessing appearance.

Kïs-Jenöer and Szalontaer Races.—These are great favourites, and the former can be fattened at two years old. Specimens of the Kïs-Jenöer examined were very long and fine in the nose, flap-eared, high on the leg, narrow on the crest, lank in the neck, moderately well formed in carcass. The skin was black, covered with long, red hair, especially thick on the main, and underlaid in patches with red wool, of which samples were brought home. The Szalontaer race greatly resembles that already described. The excellence of its bacon and hams would render it a valuable breed if it arrived more quickly at maturity; but at present they can only be fattened at three years old. Russian swine exhibited from Theodoraki, and not described as belonging to any distinctive race, were black, with black hair, and reddish wool.

In the Hungarian section a very thick, well-made pig, describedas English and Syrmier, was noticed, which, so far as one example can do, pointed out the advantage of the English cross.

Ten specimens, described as English-Syrmier, were very excellent. Three of them weighed respectively 809, 835, and 850 lbs., and a fourth, a cross between a Syrmier sow and Suffolk pig, weighed 907 English lbs. live weight. All were three years old, and exhibited as fat.

Mr. Paget, who has had a long experience in Transylvania, informed me that English swine are not fitted for the occupation of hunting acorns, and grubbing up roots. This is a misfortune in a country where acorns form a staple winter food for pigs. Our swine have lost power in their nasal muscles through high breeding and ringing, and they cannot now throw up the ground with the requisite vigour to find food and roots. Also the shortness of their legs is considered a fault. A sow must be sufficiently long in the leg to wade through a foot deep of snow. If short in the leg, her paps are very liable to be cut off by the snow. These objections, valid though they be in Transylvania, cannot be held as applying to other parts of the Empire, and it is more than probable that, as in Austria and Germany, so also in Hungary, we shall find an increasing demand for English breeding-swine.

Mr. Paget further informed me that Transylvania was formerly supplied, to a great degree, with short, high-backed, long-haired pigs from Wallachia, of bad quality, and feeding very hardly. Within the last twenty years the *Syrmier* race has been extensively introduced. This race fattens easily, and at the completion of its second year arrives at a weight of from 240 to 480 lbs. It bears the extremes of climate well; is enabled by its strength of snout to root in the woods, and seek for acorns, beech nuts, &c., and to feed upon stubbles during the autumn. Large landowners frequently keep 50 to 300 or 400 sows, and in extreme cases even as many as 1000. All are required to drop their pigs at one time, *i.e.* within ten days of each other, and this generally takes place in January. The swine are sold either at 9 or 18 months old.

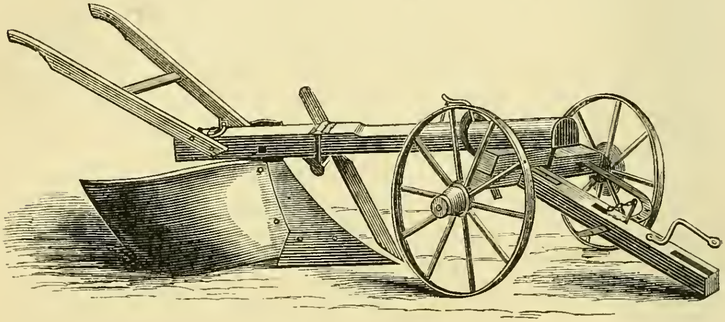
Show of Implements.

In no department of the Vienna Exhibition did Great Britain so completely take the lead as in Agricultural Machinery. We may say, without fear of serious dereliction from absolute truth, that British agricultural implements, or implements constructed upon British models, were in quiet possession of the field. As yet, the representative of one of our leading firms informed me, they simply ignore foreign competitors, unless American makers come under that designation. It was singular to notice the crude designs and rough finish of many of the non-English implements; and on the other hand, it was interesting to note how certain firms had been content to accept English guidance, and to exhibit implements the counterpart of what appeared at the English stands. In my report on the rural economy of the various parts of this vast empire, I shall be able to show good reason for the statement that England and America are almost exclusively looked to for a supply of agricultural implements in Austro-Hungary.

Professor Fuchs, in an introductory article upon the Agricultural Machinery of the Vienna Exhibition, 'Wiener Landwirthschaftliche Zeitung,' June 5th, writes as follows:—"At the end of our round we were still convinced that in the manufacture of agricultural machines, England is the first among the European nations. We say this without jealousy, as we were fully convinced of the fact both by the extent and excellence of the English section. No feeling of admiration touched our souls as we passed through the Machine Halls of Germany, Austria, and Hungary." The Professor proceeds to complain of the want of attention which has been bestowed upon this branch; the low estimation in which it is held by their own mechanical engineers, and the small belief which exists in it as a profitable investment of money. Surely, he asks, "the countries of Krupp, Barsig, Schwarzkopf, Sigl, and Ganz, can compete with the country of Clayton, Ransome, Hornsby, &c.?" The answer is conveyed in the question, and there is no doubt that when the agricultural implement manufacture is taken up by the great firms of the country, a severe struggle will at once ensue between the English and Austrian firms. Sigl has already led the way; and if he adds an agricultural implement factory to his gigantic works in Vienna and Berlin, he will prove an awkward rival to English makers.

Entering the Eastern Agricultural Hall, a very quaint display of ordinary implements was observable from Russia, comprised of winnowers, horse-rakes, drills, horse-power threshing-machines, &c. All brought forcibly to mind the illustrations of agricultural implements seen in old editions of Tull and other writers, and the finish was rough. A Polish firm showed a large assortment of implements, among which were many quaint instruments of cultivation almost identical with ancient Egyptian, and early Saxon ploughs, associated with Crosskill's clodcrusher, drills after Garrett, and portable engines, bringing us suddenly back to the present time. From Russia the visitor passed into the Hungarian section. Here, attention was arrested by the excellent show of Hungarian ploughs, exhibited by Stephen Vidats, of Pesth. This manufacturer is the great Hungarian ploughmaker. He makes and sells 4000 to 5000 ploughs in the year at the very moderate sum of 30 to 35 florins (£3 to £3 10*s.*) each. There was also a creditable show of drills with revolving seed boxes, and a scuffler with a faulty arrangement of the teeth or tines. Karl Stadel, of Raab, may be mentioned as an enterprising Hungarian maker, whose winnowing-machine was noticed as good. Peter Polgár is a country plough-maker in Lower Hungary, and deserves notice for some well-finished ploughs, well fitted for the requirements of the country. Strobl and Baris are enterprising agricultural implement makers at Pesth, and exhibited some good and well-finished ploughs, with the characteristic forecarriage and abrupt mould-board, generally used in Hungary, of which the accompanying sketch gives a correct idea.

Fig. 17.—*Messrs. Strobl and Baris's Hungarian Plough.*



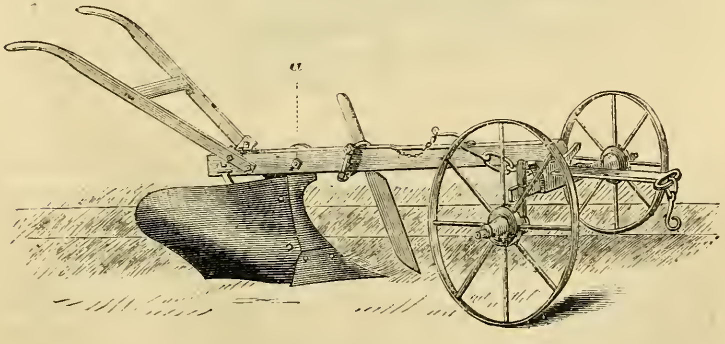
Mr. G. T. Yull, who in early life left England to join the late Mr. Smallbones, in Hungary, has paid special attention to the improvement of the Hungarian plough, and he is allowed to be the originator of the form now sold by Clayton and Shuttleworth for Hungary and other countries. I am indebted to Mr. Yull for an interesting note, the substance of which may be suitably introduced here.

Austrian and Hungarian Ploughs.—"Twenty years ago it was nothing strange to find ploughs entirely made of wood —not even an iron nail about them. In fact, the only piece of iron in the whole implement was the share or sock, which was made of sheet iron, and was held in its place by a wooden pin. This implement had at that time begun to fall into disuse among the larger proprietors with the introduction of a deeper system of cultivation, and the Ruhadlo, Hohenheim and Zugmayer ploughs had to a certain extent displaced them. These latter were short and abrupt in the mould-board, and their work was not calculated to please those who loved to see fine smooth ploughing. The prevalence of English ideas, and the visits of Hungarian noblemen to England, led to the introduction of Howard and Ransome ploughs; but these never became general on account of difficulties connected with the yoking and driving of bullocks. The oxen are driven without reins, and the teamsman had sufficient to attend to in turning his oxen with his whip, and had no time to attend to the implement. The plough was thrown on its side, and allowed to find its way round as best it could, and this became a serious difficulty, bending the wheels and doing other damage. The evident superiority of their actual work, especially after the Agricultural Shows of Vienna and Pesth, in 1857, convinced the native manufacturers that reform was necessary, and in 1859, at a great ploughing competition at Eresin, near Pesth, several new forms were submitted for trial. These combined the advantages of the English bodies and turn-furrows with the independent fore-carriage so generally used on the Continent, which enables the plough to be thrown upon its side in turning at the ends. The two gold medals offered were awarded to two ploughs of this construction; the one made by R. Hornsby and Sons, Grantham, and the other by A. Gubicz, of Pesth, on Howard's principle.

"The leading makers of these ploughs are Vidats, and Strobl and Baris, in Pesth, above-noticed; Kühne, Wieselburg, and Burg and Son, Vienna. At the Agricultural Show of 1861, in Vienna, Messrs. Clayton and Shuttleworth exhibited ploughs of similar construction, which speedily were in demand. Messrs. Ransome, Sims, and Head are also now doing an extensive trade in these and other ploughs all over the Continent. The old wooden ploughs are now rarely to be seen; but in the plains of Hungary some of the old class peasants still scratch away three to four inches deep with the ancient type of implement.

The following figure represents Clayton and Shuttleworth's plough, made especially for the country. The fore-carriage is of

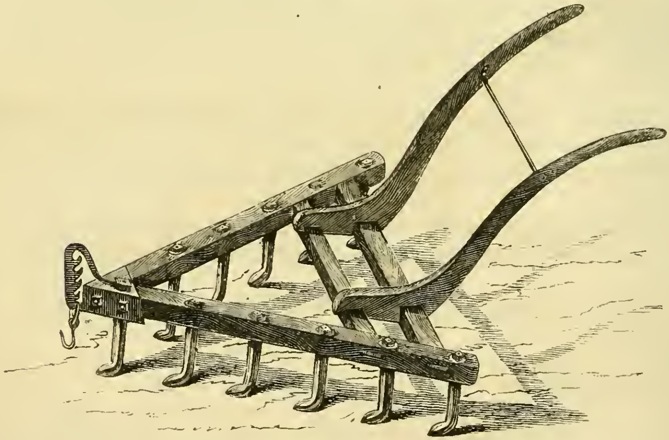
Fig. 18.—*Messrs. Clayton and Shuttleworth's Hungarian Plough.*



wrought iron, and the furrow-wheel is movable, thereby improving on the plough made by Strobl and Baris. The depth is regulated by a screw-nut behind the beam revolving on the nut *a*. This plan is good when the share, as is commonly the case here, is a fixture.

Edward Kühne, of Wieselburg, above-mentioned in connection with the Hungarian plough, exhibited a good assortment of implements which, by their construction, showed a keen appreciation of new improvements. He has sent out above 1300 drills in two years. Garrett's drill, Read's subsoil plough, Howard's zigzag harrow, Crosskill's roller, Howard's raised ridge harrow, Page's horse-hoe, and horse-rakes and winnowers of English form, have also been adopted, and if not all present in the Exhibition, were described and illustrated in the catalogue. The following illustration of native implements now manufactured by the same firm, will indicate the crude ideas which must have prevailed universally some twenty years ago; but which are now being dis-dispelled by our skilled machinists. The first implement (Fig. 19), is a cultivator for ridding land of couch (*Queckenreiniger*).

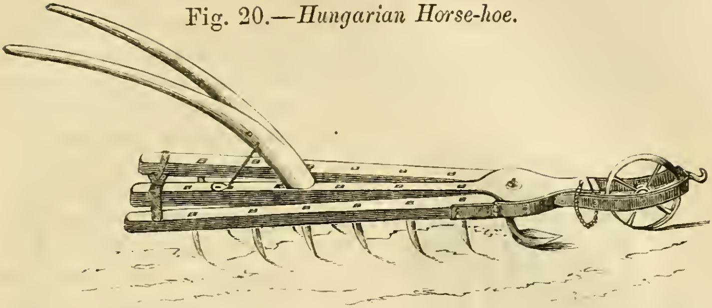
Fig. 19.—*Hungarian Scarifier.*



The faulty arrangement of teeth, their perpendicular position, and abrupt bend at the points, bring back to the memory forms long abandoned by English makers. The reader must imagine the above implement drawn by bullocks in order to completely realize its primitive appearance.

The one-row horse-hoe (Fig. 20), with eighteen teeth, formed and arranged in a manner to be at once heavy and ineffective, is another startling apparition in 1873, but interesting as forming a link between past history and future progress.

Fig. 20.—*Hungarian Horse-hoe.*



The next figure (21) represents a characteristic implement, extensively used on light lands for covering seed. It is drawn by a pair of bullocks, and covers rye and other cereals sown broadcast on a harrowed surface. Small peasants use a seed-plough (saat-plüge), with three shares and a double beam, mounted on two wheels.

Fig. 21.—*Hungarian Seed-coverer.*

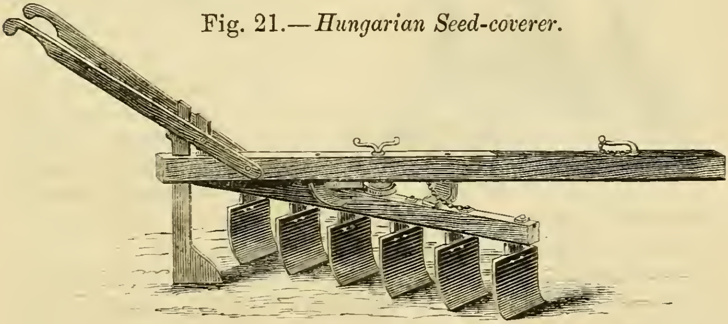


Figure 22 represents a roller in common use in Hungary, after ploughing. The action is not unlike that of a Cambridge roller, and the position of the discs secures a constant self-cleaning as well as grinding action. This implement is made by Strobl and Baris.

Fig. 22.—*Hungarian Double-roller.*

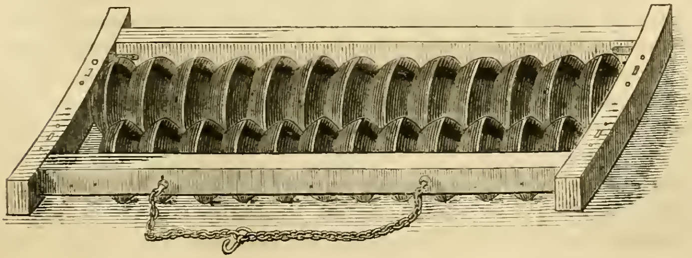
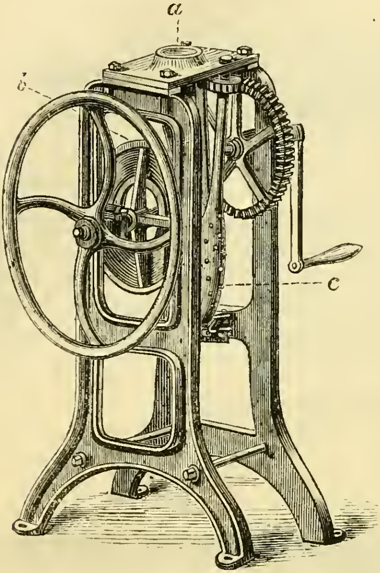


Figure 23 shows Messrs. Clayton and Shuttleworth's hand maize-kibbler for removing the corn from the cobs. The cobs are fed into the orifice *a*, and as they pass down between the revolving disc-wheel *b*, and the revolving "club" *c*, are stripped by the rapidly-moving projections seen in the drawing.

Fig. 23.—*Messrs. Clayton and Shuttleworth's Hand Maize-kibbler.*



Eichinger and Sons, of Szegedin, may be also noticed as prominent Hungarian makers, and at their stall might be noticed an excellent, although slightly complicated, corn-dressing machine. Závár and Stoye, of Oedenburg, also showed a well-made drill, with steerage which worked from behind.

Passing onwards into the Austrian section one came upon a wonderful assortment of antiquated-looking machines, which seemed much out of place, except as curiosities, in an exhibition of modern agricultural implements.

Franz Kugler, of Vienna, showed some excellent drop-drills, for which he is justly noted; ploughs, after Clayton and Shuttleworth models; harrows, after Howard's zigzag principle. Herr Hofherr, of Erlachgasse, Vienna, received his training at Clayton and Shuttleworth's Vienna works, and is now an independent manufacturer. His stand was characterised by its good arrangement, and his implements by first-class workmanship. Hofherr turns out excellent mowers and reapers, and his little factory is a model of neatness. I shall have occasion again to refer to him in the Report of the Agriculture of the country. A. Burg and Son, of Vienna, belong to much the same class of manufacturers as the last, and the present Herr Burg was two years resident in England studying his profession. At this stand was a good broad-cast sower, a good winnower, some excellent ploughs, &c.

Clayton and Shuttleworth are undoubtedly the leading agricultural engineers in the Austrian dominions. This firm is so intimately connected with the agricultural progress of the country that they will be again referred to on a future occasion. The superiority of English workmanship and style was at once evident on approaching this stand, although the exhibits were many of them made in Vienna. Among implements especially constructed with a view to the wants of Austro-Hungary may be mentioned their Indian-corn sheller, adapted both for steam and horses, with dressing and sacking apparatus; and, in addition to their former numerous implements, they have now added a light drill to suit the country, and four and six-horse power threshing-machines adapted for horse gears.

Sigl, of Vienna, was an exhibitor in the Austrian agricultural section. Sigl's works in Vienna are very extensive, even when compared with the leading engineering works in England. He exhibited engines and threshing machines on the principle of Hornsby, of Grantham, and the whole of his work showed first-rate skill. Carow, of Prague, also showed neat and handsome agricultural machinery.

French and German Departments.—MM. Albaret and Son, successors to M. N. Duvoir, were the principal French exhibitors, and showed a large assortment of implements from their works at Liancourt-Rantigny, in the Department Oise (head office, 29, Rue de Viarmes, Paris). Their portable engines and horse-gears for threshing purposes, their threshing-machines, reapers, chaff-cutters, root-pulpers, &c., were all essentially English in design, although I have no wish to give the impression that they were mere copies of any particular English machines.

The collection of agricultural implements sent by M. Pernollet, of Paris, who is famous for corn-screens, and makes other agricultural machinery, was also noticed.

The German section was well filled by a large number of stands representing many good firms.

Here I cannot refrain from finding fault with the official catalogues, which rendered it exceedingly difficult to follow the order of the exhibits. Had there been an alphabetical or numerical order, or, in fact, any sort of correspondence between the catalogues and the objects exhibited, the task of reporting would have been much simplified. Since there was none, it became exceedingly difficult to construct order out of such a disorganized medley. Many names of exhibitors did not appear in the catalogue, and others were found with the greatest difficulty. In the official general catalogue, Group XIII., now under consideration, was entirely omitted, although it occupies fifty pages of the separate German catalogue.

Among the most interesting stands in this section was that of Mr. J. D. Garrett, son of Mr. R. Garrett, of Leiston, Suffolk, now well established, and making machines adapted for Continental requirements, at Buckau, near Magdeburg. Among the implements which have been modified to suit the habits of the people and other altered conditions, was a simple and light horse-hoe, fitted with a pole, and exceedingly easy to manage. The drill is also fitted with a pole, as being more suitable for bullock labour. Portable engines and threshing-machines were very similar to those usually seen in England.

Siedersleben and Co., which firm, like that of Garrett, is not named in the catalogue, showed a monster drill with twenty-nine coulters on a 14-feet frame, and with glass in front of the cups; also a drop-drill, which acts by the revolution of a wheel furnished with projections. These projections press down a lever, which again returns into position by means of a simple spring. The alternate rise and fall of the lever opens and shuts a valve in the coulter which arrests or drops the seeds as the implement moves on.

Drop-drills are in great favour abroad among the growers of sugar-beet, and one of similar construction to the last was observed at Zimmermann's stand, representing works at Halle. This manufacturer deserves a word of praise for the good construction and finish of his implements.

The brothers Eberhardt showed some good strong ploughs, and one with three turn-furrows and no coulter, furnished with apparatus for lifting it out of the ground.

Eckert, of Berlin, showed some ploughs of peculiar construction, with abrupt mould-boards, fixed shares, and cranked axles to the wheels for altering depth. Frowe showed a plough with projecting knives from the face of the mould-board to further cut and pulverize the furrow. Mackean and Co., of Breslau, also deserve notice for their excellent drill.

English and American Departments.—It was not the wish of the Journal Committee that implements should occupy much space in this report. They considered that a detailed account of the departments devoted to agricultural implements would be unnecessary, when the same implements are yearly seen, and reported upon, in the agricultural show-yards and press of this country. I cannot, however, pass without notice the magnificent display of English agricultural implements which occupied a great part of the Western Agricultural Hall at Vienna. It was a sight of which any Englishman might be proud, for here he might see the excellence of English engineering skill, in its application to agriculture, in strong relief against the distinctly poorer class of work contributed by Continental makers.

America appeared, but almost solely as an exhibitor of reapers and mowers—a department in which she has always been distinguished since the first appearance of this class of implements in 1851.

Messrs. Clayton and Shuttleworth have been already noticed as exhibitors in the Austrian section. They also appeared among their fellow-countrymen with a large assortment of well-finished and very strong and simple agricultural implements. Messrs. Clayton and Shuttleworth have purchased the right of making Ransome, Sims, and Head's patent straw-burning apparatus, which enables straw to be used as fuel. In general, similar implements to those employed in England are also valuable for foreign use. The following information, communicated by Mr. John Shuttleworth, takes up the principal points in which their implements intended for the Austro-Hungarian dominions differ from those intended for English use:—

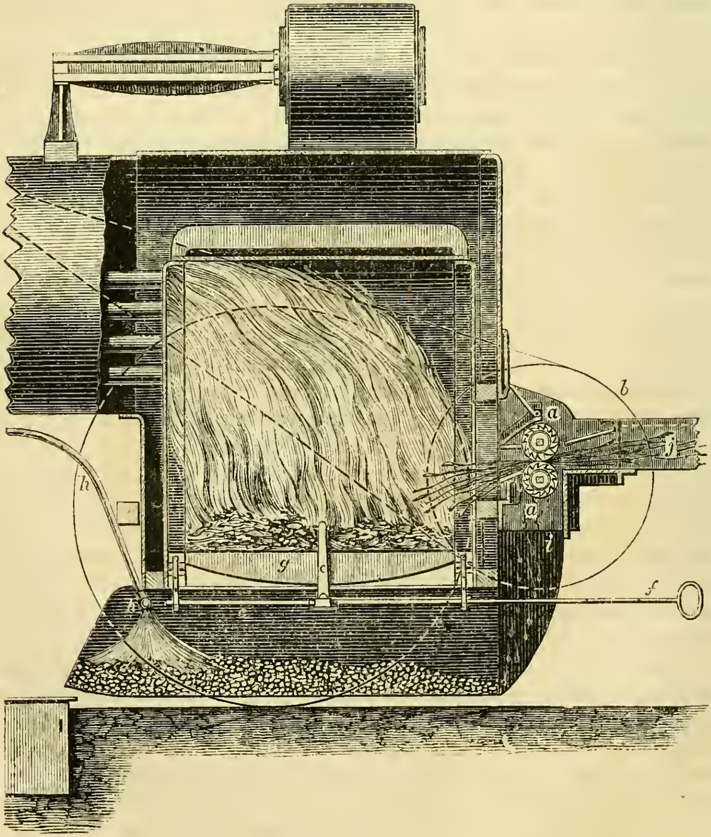
"In Austro-Hungary and the Principalities, portable engines must have larger fire-boxes, and brakes must be provided for Bohemia. All complications must be avoided as much as possible, and the various parts of the machine must be made upon what is called the 'interchangeable' principle. This system involves the various castings used in Clayton and Shuttleworth's machines being formed, as far as is possible, so as to replace each other. It is to make replacement in case of breakage as simple as possible. The threshing-machines supplied are simple, and of much the same construction as are required in England. The revolving-screen is avoided, and double blowers are used. In Bohemia all the machines have corn-screens, but the artisans are more able to cope with complicated machines there, than in Hungary and the Principalities. A wider mouth for feeding is required, and some protection around the mouth to prevent accidents is indispensable. Wilder's patent 'self-feeder' is being bought by Messrs. Clayton and Shuttleworth. Strength, durability, and simplicity, are much insisted upon by Mr. Shuttleworth. A break-down is the worst thing possible in out-of-the-way districts, where a good repairing or blacksmith's shop is not to be found nearer than Pesth or Vienna."

Messrs. Ransome, Sims, and Head deserved great credit for the business-like energy, great engineering skill, and appreciation of the requirements of the Empire, displayed in the large collection of agricultural machines sent by them to Vienna. It is far from my wish to give undue prominence to any particular firm, but it is impossible, in reporting upon the agricultural features of the Exhibition, to avoid giving Messrs. Ransome, Sims, and Head a very high place. Much and deserved attention has been given to their portable engine for burning, as fuel, straw, cotton and maize stalks, reeds, tiben, &c., as well as coal or wood.

The following account of this important invention appeared in 'The Engineer' of May 23rd, 1873. The figures (24 and 25) are reductions of two of those which illustrated that account:—

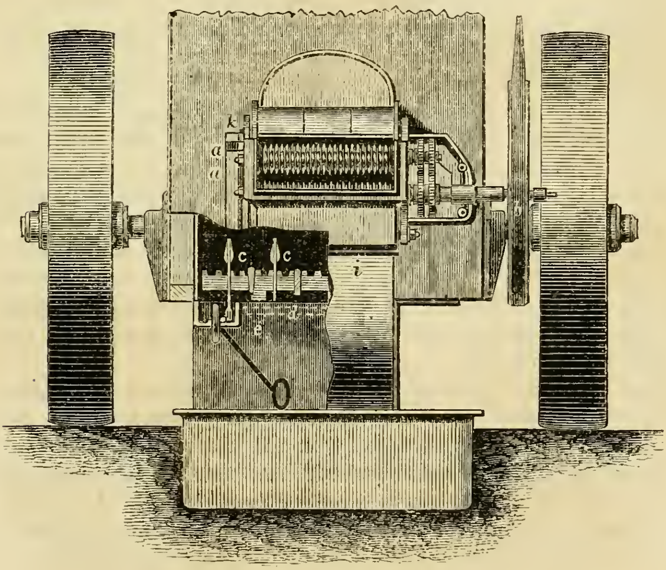
"It occurred to the late Mr. Schernioth, a Russian engineer, that if the straw was forced into the fire-box of the engine by means of rollers, so that it could enter in the form of a fan, it would cause each straw to come under the action of the flame, and the combustion would be perfect. He confided his invention to Messrs. Ransomes, Sims, and Head, who have devoted much time

Fig. 24.—*Longitudinal Section of the Fire-box in Messrs. Head and Schernioth's Straw-burning Portable Engine.*



and attention to bringing his somewhat crude ideas to a practical result. During the early experiments it was found that the silicious particles of the burnt straw deposited themselves on the bars, forming a clinker which very much impeded the ingress of atmospheric air, and in order to get over this difficulty a simple arrangement of sliding blunt knives was devised, which cut out the deposit when it became too thick. A jet of water was also arranged to extinguish the burning ashes in the ash-pan before they could be blown about. The apparatus for feeding the engine with straw, &c., is self-acting, and driven from the boiler by means of a strap, but it can be easily disconnected, and the ordinary fire-door substituted in its place, when it may be expedient to burn wood or coal. When it is necessary to get up steam, straw may be employed in the same way as any other combustible, by attaching a handle to the feed-rollers and turning them by hand instead of steam power. The straw is usually placed alongside the trough, and one man only is required to supply the engine with fuel when it is at work. The average consumption of straw is about four or five times the weight of coal, and, according to experiments made both in England and Russia, ten to twelve sheaves of straw are required to thresh 100 sheaves of wheat. * * * * Fig. 24 is a section of the fire-box, and Fig. 25 an end view, of which the following is a description.

Fig. 25.—*End View of the Fire-box in Messrs. Head and Schernioth's Straw-burning Portable Engine.*



* * * * * *a*, *a* are teethed rollers fitted with malleable teeth and connected with the engine by means of a pulley *b*, driven by a strap from the crank shaft. These rollers make 48 revolutions per minute, and can be turned by hand when getting up steam. *c*, *c* are the movable sliding blunt knives, or rake, attached to a cross-bar *d*, sliding on guides *e*, *e* below the grate. This rake can be moved with a forward and side motion by the stoker, by means of the handle *f*, and thus break up the silicious crust deposited on the grate bars *g*. *h* is a perforated pipe for injecting water on the burning ashes. *i* is a shoot for carrying any small pieces of ignited straw back

into the ash-pan. *j* is a wooden trough to contain the straw which is to be fed into the furnace, and which can be removed when the engine is travelling.

"The whole apparatus swings on a hinge *k*, and can be taken off in a few minutes, and the ordinary fire-door substituted when coal or wood is burned."

Much attention was also attracted to the steam threshing-machine for hot countries, constructed at the Orwell Works. The object of this machine is to deliver the straw in the same softened and broken condition as when it has been threshed by horses or cattle. This is done by a straw chopper, into which the straw passes from the machine. The apparatus is figured and fully described in Mr. Roberts's Report upon the Implement Trials at Cardiff, vol. viii. part 2, 1872. Since that time, a greater amount of simplicity has been introduced by means of the "knife-drum." Projecting knives from the periphery of the drum pass between the slotted edge of the feed board, and this not only threshes the grain, but at once bruises and softens the straw and renders any subsequent operation unnecessary. Messrs. Ransome, Sims, and Head exhibited a large assortment of ploughs, many of which were of forms familiar to English farmers. The Hungarian plough already figured and noticed was here present as the H. B., H. C., and H. R. plough "adapted for light and medium soils."

A patent wrought-iron (G. F. R. W.) plough, adapted for bullock labour in Moldavia, Wallachia, and the great wheat district between the Carpathians and the Danube, was furnished with a small out-rigged wheel, upon which the plough is thrown when turning at the headlands. The driver can then give all his attention to the bullocks, and the plough runs round without requiring holding. The double-furrow ploughs exhibited were furnished with levers for lifting the shares out of the ground, and thus facilitating turning by allowing the implement to run round on two wheels.

Another contrivance with the same object was seen in the shape of a bowl or hemispherical land-wheel, upon which the plough may be turned easily in either direction.

A three-furrow plough, supported on two high wheels at the opposite ends of a cranked axle, and a third wheel in front, is also worthy of notice. By means of these and a lever, the plough may be raised at the end of each furrow 10 inches clear of the ground, and will then run easily round on its wheels, or be taken from place to place.

Messrs. John Fowler and Co., Leeds, exhibited a 6-furrow balance plough with high, deep and abrupt mould-boards, upon the same principle as the Wanzeleben plough, taken to England from Magdeburg by Mr. Eyth. Also a 24-horse-power engine, all steel and wrought iron, with a large fire-box and wide fire-bars, for turf and wood burning, broader wheels than usual, and weighing

16 tons. There was also a beetroot lifter, consisting of teeth attached to a frame. Each tooth takes two rows, and six rows are taken in each journey. Fowler also had a portable engine and agricultural waggons (60*l.* to 75*l.* each) for bringing peat to the ploughing engine, or for carrying agricultural produce generally. The largest waggon will carry 6 tons, and is on four wheels; the smaller carries 3 or 4 tons. They are furnished with sides or eaves, and the one examined was rectangular, and 18 feet 6 inches long, by 7 feet deep. It would carry $2\frac{1}{2}$ tons of grain in the straw, built up as in a cart or waggon, and $2\frac{1}{2}$ tons of peat or manure without the sides. One side is hinged and falls down like the side of a cattle-truck. The whole of the above apparatus had been purchased by the Archduke Albrecht. Mr. Fowler has availed himself of Head and Schernioth's patent for burning straw as fuel.

Messrs. Howard, of Bedford, also showed a four-furrow steam plough, with a deep and abrupt German mould-board, and his horse ploughs were constructed so as to throw over at the ends as before explained (see Hungarian plough, page 64). Reapers and mowers and other familiar implements were also exhibited in profusion, and constituted altogether a handsome exhibition.

The steam-plough is as yet scarcely known to the agricultural practice of the Empire. The Hungarian ox is so highly esteemed as to remain a very formidable rival to the iron horse. The shocking state of the lines of communication (for they cannot be called roads) in Lower Hungary, offers another serious difficulty in the way of ploughing-engines weighing 16 tons, or even less. The field is extensive, level, rich, and enticing, and it would have been pleasant to have seen some system brought out at the International Exhibition of Vienna, combining lightness with strength, and cheapness with a greater adaptability for other uses besides that of cultivating the land. Where were our Smiths and Fiskens?

Messrs. Roby and Co., of Lincoln, have paid special attention to the requirements of the Austro-Hungarian Empire, and have established works at Pesth. Their threshing-machine has the following points to recommend it for hot countries, bad roads, and unskilled labourers:—

1. A patent iron frame.
2. Longer sieves than are used in England.
3. Sieves all of one size, so as to be easily changed.
4. Corn elevators inside the machine.
5. Safety boards around mouth, to protect the feeder and his helpers.
6. Plenty of room behind the concave to prevent choking.
7. A simple construction, so that men can easily get at every part.

The engines are made with large fire-boxes and boilers, for the bad fuel and bad water of the country, and are fitted with patent self-acting expansive governors, which act upon the slide with cut off ranging from $\frac{1}{8}$ to $\frac{3}{4}$ of stroke, thus effecting a saving of fuel. The engine rests on a wrought-iron carriage, securing strength and lightness, and travels on an improved travelling wheel with cast-iron nave, chilled bush, hollow wrought-iron spokes, felloes, and wrought-iron tire.

Messrs. Marshall, Sons and Co. also appeared as exhibitors of threshing machines with Roby's iron frame, and lined with iron. Also a compensating and regulating contrivance to counteract contraction and expansion of the boiler.

Messrs. Ruston and Proctor (Lincoln) brace their threshing-machine with iron, and employ a cast sill for the drum. They also send out a straw-bruiser upon a similar general principle to that of Messrs. Ransome, Sims, and Head. This they informed me was useful in South Russia, but was not asked for in Hungary. There was no protection for labourers around the mouth of the threshing-machine, a precaution which should on no account be omitted in machines for these countries, as accidents are fearfully common every season. Messrs. Ruston and Proctor were, however, not peculiar in this omission, for the same fault was noticeable in many other machines. Hornsby's Anglo-American plough may be noticed as likely to suit Hungarian agriculture, as will also their simple and efficient horse-hoe. The reaper with seat projecting from the bearings of the driving wheel is also to be commended. All reapers for Austro-Hungary should be provided with a seat. Mr. J. Coultas (Grantham) exhibited, among other things, a beetroot drill, with manure distributor on Chambers' principle, and apparatus for dropping the seed at intervals. The Reading Iron Works Company exhibited portable engines, threshing machines, horse gearing, &c., constructed in several cases with a view to the wants of the East of Europe. These requirements have already been noticed. This company showed several specialities, but it scarcely falls within our province to describe them. Messrs. Wallis and Steevens (Basingstoke) showed a horse gear and threshing-machine mounted on one truck for easy transport.

Messrs. R. Garrett and Sons (Leiston) showed an engine for burning straw instead of coal on a principle different from that formerly noticed. The Leiston firm have been manufacturing these engines "on a large scale for the last two years, and can give reference to at least fifty farmers who are using them successfully." (Letter received October 14th, 1873, from Messrs. Richard Garrett and Sons). The following account is taken from 'The Engineer' of August 22nd, and the Figures 26 and 27 are reduced from illustrations which appeared in the same number :

"Messrs. Garrett and Sons, of the Leiston Works, Suffolk, were in the field some time ago, and took out a patent dated November 15, 1871, for burning straw, as a communication from M. Paul Kotso, of Pesth. The engine exhibited at Vienna is constructed substantially in accordance with this patent. Very little explanation is necessary to make the arrangement quite intelligible. The furnace, capable of being fitted with the ordinary grate for burning coal, as shown by dotted lines; this grate is made removable in order that the furnace may receive another grate, as shown, for burning straw and other light combustible matters. In front of this second grate and on a level therewith is a spout through which the straw is introduced to the grate; this spout is closed air-tight by a hinged door, and forms in fact a kind of hopper extension of the furnace, the capacity of which is greatly enlarged to enable it to contain a proportionate quantity of the light fuel. The water jacket of the boiler is carried sufficiently far below the level of the straw grate, as shown, to permit of the calcareous and other deposit from the water taking place below the efficient heating line of the fire and to protect the walls of the furnace. The furnace when arranged to burn straw, instead of terminating in an ash-pan, as shown by dots, is made open at bottom to allow of the ashes being discharged into a pit dug in the ground for the purpose of receiving the ashes, the ashpan being for this purpose removed. When the engine is brought over such a pit, access of air through the ash-pit to the furnace may be prevented by means of loose covering plates, and by throwing up a mound of earth round the bottom of the furnace. A regulated supply of air can be admitted through a damper provided for the purpose below the straw grate, and in front of the ash-pan extension of the furnace, which extension is slidden into and out of place and is supported by flanges, as shown. When using the furnace as a straw-burning furnace, the door by which fuel is admitted to the fire-bars is kept closed to prevent the in-draught of cold air above the fuel.

"As regards the efficiency of this apparatus we may quote the following extracts from a letter written to Herr Kotso, the inventor, by Herr Ludwig Von Karolzi:—'I,' writes Herr Karolzi, 'have had the straw-burning engine these two years constantly in use, and drove my mill of two pairs of stones, as long as my stock of straw lasted, by straw firing, and the threshing machine as long as the threshing was done, constantly with straw fire only; even in some cases where there was a stock of old chaff, useless for any other purpose, or maize straw, I burned this material with great success. In regard to the proportion of work done by the engine to the consumption of fuel, you can judge from the following facts: I was threshing 400 mandelu (mandelu equals 15 sheaves) daily, and used one load of straw of 20 cwt., that is about 3 per cent. of the threshed straw; the value of this straw is in our country two florins (equal to 4*s.*). I was grinding 120 cwt. of corn into flour, and wanted for firing two loads of straw of 40 cwt., the value of which is about four florins (equal to 8*s.*). I threshed, as a trial, 400 mandelu, and required 9 cwt. of coal bricks from Funfkirchen, which cost about 1 fl. 5 kr. per cwt., altogether say 9 fl. 50 kr. I ground 144 cwt. of corn, and wanted 24 cwt. of the same coal (peat coal), which cost per cwt. 1 fl. 95 kr. = 25 fl. 20 kr. Therefore for the same work in the one case (*i. e.*, for threshing), 20 cwt. straw was equal to 9 cwt. coal; therefore 1 cwt. straw = 0·45 cwt. coal. At the mill I was able to do more work with coal, but even here the proportion of 40 cwt. straw to 10 cwt. coal, say 1 cwt. straw to 0·45 cwt. of coal, is favourable enough to show that in employing your engine, 1 cwt. straw is like 0·36 cwt. of coal, in the average, or in regard to price, 1 cwt. straw, 10 kr. = $2\frac{1}{2}$*d.*; 0·36 coal, 38 kr. = 9*d.* The coal cost, therefore, nearly four times as much as the straw for the same work.

"'My engine enjoys, as I state with pleasure, a great reputation in the whole district, so that I never am obliged to look after, or ask the parties for threshing, but they come on their own account. I have, as the parties publicly state, to thank the excellent saving of time and money, in consequence of the straw firing, for this. Facts are stubborn things; a proof of this is that there are already in this short time, within a distance of a few miles, five of your straw-burning machines in activity, and are competing with me. As you see, I can only give you good news, and should conclude my writing with these few words, that I never had the least difficulty either in the treatment or working of the locomotive with straw for straw firing. You have made the whole process of firing your locomotive by straw quite in accordance with the method the farmer employs in firing his baking and warming stoves. He stands before the hopper-like opening, on the lower part of the locomotive,

Figs. 26, 27.—*Showing Side and End Elevations of Messrs. Garrett and Son's Straw-burning Portable Engine.*

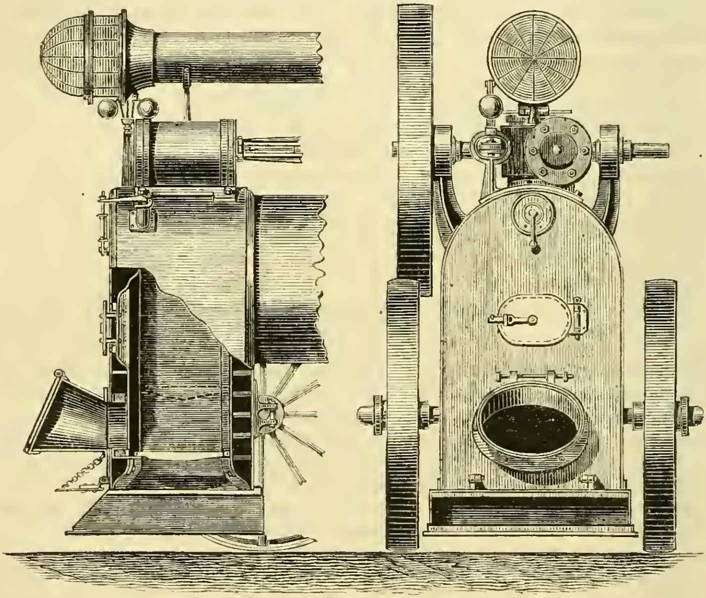


Fig. 26.—Side Elevation. Fig. 27.—End Elevation.

with a long fork fastened on a long wooden handle; as soon as he thinks it necessary to get the stiaw into the box, which he must know at a glance at the fire-box and the pressure gauge, he puts his fork into the heap of straw a few feet distant from him, and gets a quantity of 3 lbs. to 4 lbs., shakes this properly, whereby the straw which is perhaps too damp falls down, and puts the dry and useful straw in a loose state by his fork into the fire-door. At the same time he observes the condition of the straw previously in process of consumption, and shakes the cinders, if it appears necessary, with his fork to prevent the accumulation of slag, which is as troublesome when burning straw as household coal, and on the removal of which depends the whole firing. An essential point in your engine for practical use is the top fire-door intended for coal fire. The same must, on firing with straw, be sometimes opened in order to remove by an ordinary broom the cobweb-like cinders which are raised by the draught, and settle down on the mouth of the fire-tube, that is to prevent the flames to come into direct contact with the tube plate.

"'As you see from this, the practical employment of your engine shows things of which, perhaps, you did not think at all, and which will cause you to avoid any alteration perhaps already intended. Since I find the introduction of your straw-burner to be in the interest of agriculture, I leave it to you to send this letter to Messrs. Garrett's for consideration, and to regard this letter as a public one in every respect.'"

Messrs. Garrett's threshing-machine is furnished with a heavy drum, a fan blast for elevating corn running on the drum spindle. There are no straps on one side of the machine, and only two on the other. The frame is of iron. The concave is cut longitudinally into two halves, so that when worn at the lower edge it can be turned. The straw shakers are latticed to prevent broken straw (straw is exceedingly brittle in Austro-Hungary) from falling through, and the caving screen and riddling surface generally are made large.

American Implements.—America was almost exclusively represented by reaping and mowing machines, and as these implements are so well known, it seems unnecessary here to enter into details. Strength and simplicity are of especial importance in these, as well as in other implements intended for Austro-Hungary; and in my tour through those countries I heard frequent complaints against the light and unsubstantial character of many reaping machines. It may also be observed that owing to peculiarities in the training of bullocks, the platforms must be placed on the left-hand side of the pole instead of the right as in England.

Agricultural Products.

A detailed description of the agricultural products would be apt to carry us insensibly into the domain of general industry. The "agricultural features" of the Vienna Exhibition is a wide term, embracing not only domestic animals and implements, but wine, flax, tobacco, oils, furs, woods, &c. The consideration of these would carry me beyond all contemplated limits, and without the objects before the reader, the task would be unprofitable: I shall, therefore, confine myself to a very general notice of products.

So large a proportion of the Austro-Hungarian Empire is devoted to forests and agriculture, that natural and raw products occupied a large share of the Exhibition buildings.

Take for example the East Agricultural Hall. Upon entering it at the south-eastern doorway the visitor passed through a large assortment of wines, many of which had received familiar foreign names. Bordeaux, Lafitte, Sauterne, Alicante, Bourgogne, &c., were associated with Russian names, to me alike unreadable and unpronounceable. There were fine shows of flax, herbs, cereals, agricultural seeds, tobacco, maize, wools, perfumes, &c., and a rather poor show of skins.

In the Hungarian department wine held a prominent place, and there were also flax, hemp, Indian corn, dried grasses, hops, seeds, silk, mineral waters, sago, starch, honey, mineral oil, wax, candles, animal products, such as bladders and dried meats, woods, and wool. The skins embraced those of the fox, wolf, otter, badger, and hare. The wool collection was extensive, and some of the finest samples were contributed by Count Hunyadi, of Tarányi, Prince Esterhazy, Counts Czelchert, Waldstein, N. J. Zichy, Alois Karolyi, Festetics, Henckle, Moriez Palffy, and Primus Janos Simor, of Gran.

Passing from the Hungarian into the Austrian section the visitor passed through a continuation of wines, spirits, beer, preserved fruits, and a collection of samples of beetroot sugar.

The stand of the Pesth Company for extracting potash from wool formed a relief to this somewhat tedious repetition of bottles and sugar loaves. Another striking feature was the large space given to wheat flour, milling having been brought to wonderful perfection in Hungary and Austria. To give an idea of this let us pause for a moment before the stand of the Nagy-saros steam-mills in Hungary. The finest quality of wheat flour is zero, and the series becomes coarser from 0 to 8, which last is bran. In order to obtain these qualities, the wheat is subjected to a number of operations. First, there is the whole wheat from which entire wheaten flour is made; second, there is "kibbled" wheat stripped of its embryo and tail; third, wheat stripped of its bran; fourth, wheat reduced to the form of groats; fifth, a smaller and finer groat; sixth and seventh, still finer groats, leaving a small round kernel. From each of these a meal is made, ranging from the finest zero quality, made from the centre of each wheat grain, down to entire wheaten flour. The Debriczn steam-mills may be mentioned as among the most perfect of these establishments, as may also those of Louisen, of Pesth, and the Concordia steam-mill. Passing onwards, the Archduke Albrecht's milling-stand is passed, representing steam-mills at Altenburg, and a little farther his fine hemp and flax trophies, also reeds for thatching, 20 feet long. These were succeeded by imposing but scarcely interesting wine and spirit trophies, and repetitions of what has already been noticed.

In conclusion, I wish to ask some indulgence for the imperfect nature of this report. The short period which I was able to devote to the inspection of the Exhibition, and the difficulties connected with foreign languages, together with a defective catalogue and a puzzling arrangement of the exhibits, all tended to make the task of reporting somewhat difficult.

II.—*Report on Spring-sown Wheats in* 1873. By John Chalmers Morton.

An attempt was made in this Journal, five years ago, to collect and relate the agricultural experience of some of its readers for the advantage of the others, during a season of remarkably dry weather. Inquiries were addressed to many of the leading tenant-farmers on the roll of the Society's membership, about land drainage, steam cultivation, stubble seeding, catch crops, altered rotations, and methods of supplementing the very deficient winter supply of food for live stock which existed in the country in the autumn of 1868.

These subjects, during a drought and following it, were either of pressing urgency in their importance to the farmer, or were likely to include a great deal coming under the eye of an observant agriculturist in such a season that would be of use hereafter. And, accordingly, the paper "On some of the Agricultural Lessons of 1868," in the volume of the Journal for 1869, will be found to contain a good deal of information on the advantages of drainage and deep cultivation; on the value of mustard, trifolium, cabbage, rye, Italian rye-grass, stubble turnips, and rape, as rapidly growing food for sheep and cattle; on the possibilities, by good management, of economising such food, when it is scarce, without much loss or injury to the feeding process; and, above all, on the need of ample liberty of cultivation being given to the cultivator, if he is to cope successfully with the exceptional difficulties of our English climate.

The paper began with the assertion that the general prevalence of anything unusual in the natural conditions under which the crops of any large district of various soils have been grown, becomes, when its results have been carefully collected and arranged, virtually a well-arranged agricultural experiment of the highest interest, because upon the largest scale. A similar statement might very properly introduce the present report. A period of unusual rainfall is just as likely to furnish useful agricultural lessons as a period of unusual drought; and it may be said of last year's wheat crop, as it was of the green-crop of 1868, that it was grown under conditions so extraordinary, that the agricultural history of the year could hardly fail to be instructive. "October of 1872 was a mild, wet month, with a rainfall everywhere much in excess of the average." "November was a very wet month, with very little frost; rivers flooded and lowlands covered with water; wheat-growing greatly interfered with." "December was a very wet, mild month, with at least one-half more than the average rainfall." These statements, taken from a Farmer's Almanack, represent the facts to an ordinary reader quite as effectively as the figures and decimals of rain-gauge and thermometer which might be extracted from the meteorological reports in volume ix. The autumn was undoubtedly unusually wet. During a journey on two successive days in November, by Peterborough and Stamford, to Market-Harborough, Wellingborough, and Bedford, and back again to London, crossing the valleys of the Ouse, the Nene, and the Welland, at points 20 or 30 miles or more apart, I must have actually seen 20 or 30 square miles of water beyond the river banks, fairly inferring at the same time, from what could be seen out of the railway carriage, the existence, in these valleys alone, of at least 100 square miles of flooded lowland. Everywhere indeed in England, except perhaps on the chalk and on upland gravel soils, whether by constant wetness of the soil, or by actual flooding, the difficulties of the seed-time for the wheat crop, owing to the excessive rainfall, were extraordinarily great, and to a considerable extent insuperable.

A larger extent of wheat was thus sown during spring in 1873, than had ever before been sown out of the usual season in this country; and it seemed worth while to try to collect the year's experience for publication here. There was a possibility that useful information might be forthcoming on the power of the cultivator to deal with difficulties of the kind which beset him on that occasion. The advantage, possibly, of particular methods of cultivation; the fitness of particular sorts of wheat to the unusual circumstances; the behaviour of autumn wheats when sown, in default of the proper spring varieties, during the spring months; and the relative serviceableness of the various so-called spring wheats;—all these were subjects on which information might be obtained. A circular was accordingly addressed to agricultural correspondents in many different counties, in which, after inquiries about the character, extent, and general management of the farm, and the extent of wheat commonly sown in autumn and in spring respectively, questions were put as to the difficulties of the wheat seed-time of 1872-3; the kinds of wheat sown; the date of sowing; the treatment of the crop; and the character and date of harvest. Specimens of wheats in ear were also asked for; and some of those received have been engraved on a scale of one-half the natural size. The reports received in answer to these inquiries, which I now proceed to transcribe, are thus made to convey to the reader, as nearly as possible, all that the writers desired to communicate.

It was especially of importance to learn the behaviour of ordinary winter wheats when they had been sown in spring; and, besides the almost universal testimony to the generally disastrous character of the wheat harvest of 1873, a good deal of useful information on this point will be found communicated in the following reports. Almost invariably it will be found that the fortune of the crop, as a whole, is irretrievable if the ordinary seed-time has from any cause been lost.

In order the better to ascertain the lessons which the several communications teach, they are here arranged in three classes, as they come from heavy, medium, or light soils, respectively.

14 REPORTS FROM HEAVY SOILS.

1. Chadbury, near Evesham.

(380 acres Arable, and 220 Permanent Pasture.)

The Soil varies from poor thin clay, upon a subsoil of blue lias, to strong, deep, productive clay, and there are about 60 acres of gravelly loam. Climate very good.

The Rotation of Crops:—Upon the poor clay—Wheat every alternate year, with artificial manure; the intermediate crops being either vetches or mixed seeds, fed off by sheep eating cake or corn. This part of the farm, about 60 acres, is inaccessible to the dung-cart. It has not had a load of farmyard-manure in the memory of man.

On the better clay-land:—

1. Fallow crops (manured), *i.e.* either vetches, cabbages, mangolds, rape, or turnips.
2. Wheat.
3. Clover.
4. Wheat.
5. Winter beans (manured).
6. Wheat.

On the lighter land:—

1. Ryegrass, vetches, or early cabbages fed off, then turnips (manured).
2. Wheat.
3. Mixed seeds.
4. Wheat.
5. Mangolds (manured).
6. Wheat.
7. Clover.
8. Wheat.

In ordinary years I sow no wheat in spring, though occasionally some of the land after roots is planted as late as January; but all with winter wheat.

The wet summer of 1871, and a continuance of the like weather throughout 1872, indicated clearly enough that the wheat seed-time of the latter year would be a difficult one. I endeavoured early to meet the difficulty in this way: I have had my own steam-cultivator since 1857, but, not satisfied with using this only, I hired another to plough 100 acres for wheat and winter beans, immediately after harvest; still all I could do was to get one-half my wheat sown in the autumn, and this, notwithstanding that the whole farm is effectually drained, and has been cultivated by steam for 16 years. About Christmas we were told in the 'Times,' by an eminent theorist, that where the land was drained, and the occupiers had used "ordinary diligence," there had been no difficulty in wheat sowing! Verily farmers should be philosophers. The season had been a sore trial of patience, but this piece of impertinence was even more hard to bear.

The effect of early steam-ploughing was that wheat planted in the autumn did not perish, which to a great extent was the case in this neighbourhood; but the seed-bed was unhealthy, and the plant did not tiller as usual. It became impossible to plant the other half until February, when the land worked well. So I had about 95 acres of autumn-sown wheat, and the same quantity sown in spring. My first efforts having been directed to the planting of the heaviest and worst portion of the land intended for wheat, it followed that the spring-sown portion was all upon the best land. The result was, that the autumn-sown, as well as I can estimate it, may be 4 quarters per acre; the spring-planted, not more than 3 quarters—the average of previous years being 5 quarters. All the spring-sown wheat was mildewed more or less, the worst being a field of 25 acres—good land in high condition—which I had the misfortune to be prevailed upon to sow with "Hallett's Pedigree Victoria Wheat;" the temptation to do so being the offer of the seedsman who supplied me with it to take all I grew at 5*s.* per quarter more than it would be worth to grind; and the seed being a very fine sample. For some time after going out of blossom this piece looked like growing 6 quarters per acre. Nothing could be more promising; but it blighted, and is almost worthless; fit only for fowls and pheasants. The gamekeeeper has bought part of it in the straw, as he said "there was just enough in it to employ the birds and keep them at home." So much for neglecting the old adage, that it is wise to "let well alone." The other wheats, "Lincoln red" and "Essex rough chaff," though mildewed, are not so much so as to affect the quality; and if I had sown either of them upon this 25 acres, I should have been better off by at least 200*l.* I send two ears of the "Lincoln red;" the "Essex rough chaff" is very well known.

As to the preparation of the land for wheat, we never, or very rarely, apply farmyard-manure immediately to that crop; it always goes to the preceding crop—roots, vetches, cabbages, or beans. Mangolds are our main root-crop, manured with 30 tons per acre of good dung and 4 cwt. of guano, when it was to be had, and since then, with an equal cost of some artificial manure. This preparation leaves enough in the land to grow wheat; and the clover after it rarely fails. All green crops, except mangolds, are consumed on the land by sheep, which, for a great part of the year, have cake or corn. We hand-hoe the wheat crop twice, and weed it.

Harvest was finished in September—a showery, tedious time, but not wet enough to cause any serious injury. There was only about ten days' difference in the time of ripening between the autumn- and spring-sown wheat, partly owing to the latter being grown upon warmer land. None has yet been thrashed.

I may mention, as an illustration of the difficulty of the wheat seed-time of 1872-3, that in a parish near Birmingham, which I went over in September—chiefly strong land in a backward climate, well drained—only a small portion of the wheat had been sown in the autumn; of this fully four-fifths had perished, the other fifth was blighted, and worth little. The land unsown in the autumn, as well as that on which the plant failed, was sown in the spring, part with the bearded April wheat, part with old Talavera. Both were very much better than any of that sown in the autumn, even where there had been no failure of plant. So much for the vanity of our calculations, and so much for the effect of "diligence" in such a season as 1872. Those who did least in the parish I allude to fared best. Happily this is not often the case!

C. Randell.

2. Ewell Farm, West Farleigh, near Maidstone.

(78 acres of Arable Land, and 28 acres of Permanent Pasture, besides Hop and Fruit- and Wood-land.)

The Soil is a stiff, clayey loam, upon the greensand formation. The climate is comparatively mild, and the rainfall not usually excessive.

Rotation of Crops.—No regular or systematic rotation of crops is adhered to. As there are nearly 100 acres of hop and fruit land upon the farm, it is requisite to grow as much straw as possible, to make farmyard-manure for the hop and fruit plantations; and a wheat crop is occasionally taken out of due course. The principle upon which one desires to work the farm is that of the four-course rotation, with much use of catch crops of every kind for soiling cattle, for feeding ewes and fattening lambs, and for ploughing in to manure the land for the corn crops to follow, as but little farmyard-manure can be spared for the arable land.

From 15 to 25 acres of wheat are usually sown per annum.

Early in October, 1872, 12 acres of clover lea, which had been twice cut for hay during the summer, were put in with wheat, which went in fairly well. Six acres of stale ploughed land were sown in November with wheat; this went in most miserably, and ought not to have been sown at all. The horses sank in the ground up to their fetlocks; the ground was very much kneaded and left in deep holes where the horses had trod, which were filled with water during the winter. Very heavy rains followed the sowing, beating down the land as if a heavy roller had passed over it.

The 6 acres alluded to above were resown with spring wheat, the autumn-sown wheat having rotted in the ground.

Red Lammas and Rough-chaff White, from Messrs. Raynbirds and Co., Basingstoke, were sown in the autumn, mixed in equal proportions. Mixed red and white wheats do well on the farm.

Nursery wheat, from Messrs. Raynbirds and Co., was sown in the spring. This was very good seed, weighing 63 lbs. per bushel. The crop was wretched; the straw not deficient in quantity nor short, but much blighted. The corn was wretchedly thin; the ears very small and badly blighted. This wheat was sown on the 25th and 26th of March, 1873.

Two successive green crops of mustard had been ploughed in for the autumn wheat, which was replaced by the nursery wheat; there having been a deal of couch, it was thought that the mustard would smother it, which was the case. The autumn wheat of course took nothing out of the land, for it did not come up. The land was well "Bentalled;" 2 bushels of the nursery wheat were drilled per acre, half the piece had 6 cwts. of superphosphate per acre, the other half 4 cwts. of Odams'. No difference was noticeable in the effect of the two manures. The wheat went on very well, and was not hoed.

The dates of harvest were as follows:—The autumn wheat—12 acres—cutting began August 8, and it was carried on the 16th of August. One stack thrashed out lately yielded at the rate of 4 quarters 5½ bushels of head-corn per acre, with a fine lot of well-grown straw. The nursery spring wheat was cut in the last days of August and carried September 5. Weather showery. This wheat has not been threshed out, but it is believed that there will be no head corn at all—nothing but chickens' food; and the straw is of bad colour, very much mildewed, breaking easily.

Charles Whitehead.

3. Rectory Farm, Loughton, Bucks.

(About 220 acres Arable, 80 Pasture.)

Soil.—Chiefly clay, with chalkstone in subsoil.

Rotation.—No regular system followed, but on the portion best suited for turnips, a five-course shift generally practised.

75 to 80 acres of wheat are annually sown; all in autumn, if possible.

The difficulties of wheat seeding in the autumn of 1872 were so great, and the utter impossibility of getting on with that or any other kind of work on the land, either with horses or steam, such that I threw up the farm in disgust. For three or four weeks, in order to fetch up arrears, if a chance should offer, I kept on the place Fowler's double set of steam cultivating machinery, and also Smith's single engine tackle. Throughout the whole period I think we never made more than one whole day's work; and what we did, owing to the rain falling on it immediately after it was moved, was irretrievably damaged for the time as regarded ulterior operations. Only one field, consisting of 23 acres, was planted in anything like a satisfactory form. Another piece, of 17 acres, was, after smashing up, sown broadcast, and the harrows smeared it over, some of the seed being nearly a foot deep, and some sticking on the top. One or two pieces were sown broad-cast and ploughed in. All was "mauled" in somehow during the winter, except 17 acres, which were left until the spring. Of these, 10 acres were sown on 21st February with Golden Drop, at the rate of 2 bushels per acre, and 7 acres were sown, 22nd February, with Rivett's. I should not have ventured to sow this kind, but the seed had been dressed with Down's Farmer's Friend in October, and I determined that at any risk it should be sown. Owing probably to the length of time it had been dressed, and the wretched manner in which it was then got in—not more than half a crop came up —I resolved to go to no expense with it except hoeing, at the same time booking it as worthless. Contrary to expectation, it ripened fully and kindly, but not so early as if it had been thicker on the ground. I cut it, and threshed it as I carried it, about the middle of September, with the result of about 2½ quarters of good plump grain. With a full plant, I think there would have been 5 or 6 quarters. I could not have expected more, as the land was poor, and it was the last crop of the shift.

The Golden Drop was got in somewhat better, and came up a moderately good plant. It appeared to ripen very kindly until two or three days before reaping, when the straw became very much mildewed and discoloured, having a red appearance. The grain, however, did not seem to suffer, but is of nice quality. The ears, however, are small; and I estimate the yield when threshed to be about 3 quarters per acre. At the time of hoeing, it looked so sickly that I thought it would hardly be worth harvesting.

None of my wheat received this year any top-dressing, but all that was drilled was once or twice hoed.

Harvest was later than usual, and, after the first week, very catching; but sunshine followed shower in such quick succession that no damage beyond delay was caused. The 17 acres referred to as having been scratched in after steam culture was decidedly the best on the farm, and yielded exactly 4 quarters of white rough chaff. I do not expect more than 3 quarters from any other portion. A wet season is always fatal to the wheat crop on this land, no matter how promising it may look, and whatever the bulk of straw.

F. Bignall.

4. College Farm, Pertenhall, Beds.

(400 acres Arable, 320 Grass.)

Soil.—The arable land is clay, with the exception of a small portion partially mixed with gravel. A portion has been brought into cultivation from grass and wood during the last 20 years. The remainder is an ordinary clay soil; some of it liable to run together and bind—the worst land possible for a wet season. With the exception of a few acres, the whole is drained 4 feet deep.

Rotation.—The four-course system is generally followed, except on the new land, where wheat is sometimes sown after oats.

The breadth of wheat is generally about 120 acres, sown in the autumn and early part of the winter.

The excessive and continued rains of the autumn and winter of 1872 rendered it impossible to get in the seed, excepting on the small portion of drier land, and some that had been broken up early, so that about 70 acres intended for wheat was left until the spring, when the whole was sown.

I give first the results of the spring-sown wheat:—

Field No. 1. Browick red: sown the first week in March after seed clover. Manured and limed, to destroy the slugs, in the autumn. Produce, a little over $3\frac{1}{2}$ quarters per acre.

No. 2. Golden Drop: sown first week in March after oats. From a small portion thrashed, produce estimated at 3 quarters per acre.

No. 3. Sown the second week in March with Langham red, Browick,' and Rivett's. The produce of each kind not known, but the return from the whole field will be less per acre than from Nos. 1 and 2.

No. 4. Sown with Nursery wheat second week in April after beans. This field was too wet to bear the horses until the beginning of April, and then it hardened to such a degree that it had to be broken up with heavy implements. The crop did not come to perfection at all, and the small quantity produced will only be fit for feeding purposes.

No. 5. Sown with April bearded wheat the last week in April, on recently broken-up grass-land; fine dry seed-bed. Crop and quality good. Not thrashed. A small part of this field was sown with Nursery wheat at the same time, but this came to nothing.

The whole of the land was ploughed in the autumn or early in the winter, and each crop was hoed and weeded. The reaping-machine commenced with the autumn-sown wheats on the 11th August, and the spring-sown were from a week to ten days later.

The general results arrived at seem to be these:—The bearded spring wheat did well. The Nursery—considered by some a spring wheat—was a complete failure. This might arise in some part from being sown late; but the few ears of other autumn wheat in the crop were very superior to the Nursery.

Comparing the same varieties of wheat sown respectively in the autumn and spring, the comparison, as far as quality is concerned, is very much in favour of autumn-sown; the difference in value being from 4*s.* to 5*s.* per quarter at the same weight,—the difference in weight being about 2 lbs. per bushel.

As far as quantity is concerned, the comparison (circumstances being alike) is rather in favour of the spring-sown. For it must be borne in mind that the land sown in the autumn was just that which presented the best seed-bed (though not the better wheat soil); and here, even where the crop was upon the whole good, the general result was not more than from 3 to 4 quarters per acre.

Had the land left until the spring been sown in the autumn, over the greater part there would have been scarcely any crop. A small portion of the same character was sown in the autumn, and the constant wet, with the help of the slugs, prevented anything worth calling a plant appearing above the surface.

The most noticeable feature in my unfortunate experience of the year is, that Rivett's wheat, sown the 15th of March, produced a better crop than the remainder of the field, and the quality was superior—of the kind—to any of the spring-sown; being about equal to the average of autumn-sown.

I give one circumstance to show that not only does a season like the past produce bad crops, but that even the best are most injuriously affected. In 1870, the best wheat year I ever had, I found in the best crop of the season (Langham red) a remarkably fine ear, 100 corns from which I planted in the garden, each separately. The produce was again planted, after the rate of 1 peck per acre. And the return from this was drilled in November of last year 10 inches apart; a little more than a bushel per acre being sown on 4½ acres; a piece of clay, early broken-up land, in very good condition, being selected. At harvest the crop was equal in appearance to that of 1870, from which it was originally taken. But whilst the crop of 1870 produced 7 quarters per acre, that of last season produced but 4½ quarters per acre. The only circumstance, beyond the character of the season, to account for the discrepancy was that the crop of 1870 was grown upon rather the better wheat soil.

Supposing the land I was able to sow in the autumn of last year had been left until the spring, it could have been got in the latter end of February with a much better seed-bed than the breadth actually sown in the spring had, and though the quality might have suffered, I believe the produce would have been greater. The great deficiency to be found on examination in the best autumn-sown ear, was not nearly so apparent in the spring-sown.

There is, of course, always a risk to run as to whether wheat sown in the spring will ripen properly. This season, considering all circumstances, it did so very well. I may add that, as far as produce per acre is concerned, this is the worst wheat season I have had during the last 15 years.

Henry A. Bottle.

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5. Elford Park, near Tamworth.

(364 acres Grass, 280 Arable.)

Soil.—Principally strong loam on marl.

Rotation.—White straw and green crops alternately.

About 70 acres of autumn and 30 of spring wheat were sown in 1872–3. We take spring wheat in lieu of barley in consequence of the malt-tax; barley being apt to get lodged or stained by rain.

13½ acres were drilled on November 9th and 10th, 1872; 10½ were broadcasted November 11th; 2 acres were drilled November 11th; 26 acres in all being autumn-sown.

About 45 acres in all were left unsown in 1872, which had been intended for wheat. Altogether about 68 acres of wheat were spring-sown in 1873.

The sorts sown were Essex Rough Chaff white (Fig. 1), 36½ acres; Bedford (chalk), 32 acres; Talavera, 13 acres; Rivett's, 16 acres.

All the autumn wheat and some of the spring-sown was top-dressed with nitrate of soda, guano, and superphosphate of lime.

We began cutting oats on 6th August; wheat on the 13th; finishing harvest 23rd September.

The autumn of 1872 was too wet to get on the land. We drilled (very badly) on 9th and 10th November 13½ acres Essex wheat; and tried broadcasting 10½ acres on the 11th, but found it would not do. All this wheat did badly, although top-dressed with 1 cwt. of nitrate and 1 cwt. guano. We have threshed 10 acres, and find the yield only 20 bushels per acre.

Fig. 1.—*Essex Rough Chaff.*

Spring sown. Autumn sown.

On the 12th November another field was tried; could sow only 2 acres, wet coming on. This field was finished on 19th February, 1873, the seed, which was pickled, having been saved for the purpose. The 2 acres and the 6 acres were cut together on the 30th August; the autumn-sown being over ripe, and in appearance the better crop, the straw and ear being longer. All had been top-dressed. It was threshed 26th November, 1873, and yielded 29 bushels per acre.

The following are our Memoranda:—On 21st February, 1873, drilled Essex white wheat after beans. Top-dressed. Cut 2nd September. Poor crop in appearance.—22nd February, drilled 16 acres Rivett's after beans and vetches. This was the fullest crop we had. It was cut on the 17th September; ripe a week or ten days earlier, but weather bad. A part was thrashed, yielding 40 bushels per acre. — On 5th March drilled 13 acres of Talavera after clover eaten on by sheep with cake and corn. Bad crop: probable yield, 18 bushels.—On 24th March drilled 24 acres Bedford white after roots. Crop thin, but healthy: probable yield, 30 bushels per acre. This seed was brought from the chalk, and sown in the autumn of 1871, yielding 36 bushels per acre. It is a fine white variety, but I do not know its proper name.

As a general rule we find the Essex Rough Chaff white to yield best on this farm, though liable to mildew. Hunter's white and Victoria are good varieties, also the Browick red. Any of these sorts sown early in the spring on good land do well, and ripen about ten days later than autumn-sown.

On this farm I do not like sowing later than about the first ten days in November; but many of my neighbours, who have free-working soil, sow from October to March, whenever the land will work. Late sowing is more practised than it used to be. I prefer sowing strong land as early as possible, say from 10th October to 7th November, increasing quantity of seed from 6 pecks to 8; and in spring from beginning of February to middle of March, using 9 or 10 pecks of seed, and of Talavera 12 or 14 pecks.

Wheat is taken after beans, peas, vetches, clover (bastard fallowed), roots, and sometimes oats. Foldyard-manure is usually applied to the previous crops; and where crops look weak they are top-dressed. When wheat is foul with annuals it is hoed, and is always looked over for thistles and docks. A much larger breadth of wheat is sown in this neighbourhood than there would be if there were no malt-tax to hinder the sale of stained barley. Even reaping and tying the barley does not meet the difficulty and loss. If all strong land autumn-sown wheat yields no better than mine, and I know no reason why it should, there must have been a great deficiency and loss last year. Not only is the yield poor, but the weight is light.

G. A. May.

6. Burns Hall, Lea Down, Devon.

($323\frac{1}{2}$ acres Arable, and $187\frac{1}{2}$ Pasture.)

The Soil in the vale is principally clay, rather poor. The hilly part is light and stony—middling land for oats, barley, and turnips, but not of any use for wheat. The winters are very long, being close to Dartmoor. The cattle are taken into house about November, and are not able to turn to grass until May.

Rotation.—We generally plough lea for wheat, turning the grass under with skim points. After wheat we take turnips or mangolds, then wheat and seeds. The light land is ploughed out of lea for oats; then turnips are taken and folded with sheep. The land is then limed and barley and seeds are sown.

About 30 to 50 acres are generally sown in the autumn, this place being too wet and cold for spring sowing. We could not sow any wheat in the autumn of 1872; it being so very wet. 36 acres were sown in February, part of it being the second time of sowing.

The kind sown was red-straw white; the sample very poor, having suffered very wet weather in harvest.

The manure was lime, 30 or 40 bushels per acre. The corn was weeded by women in the spring.

We had a very wet and troublesome harvest beginning about the middle of August, and we had about 7 to 10 "bags" per acre, a bag being 2 bushels.

In this neighbourhood the produce will generally fall very far short of an average crop of wheat, and the samples will be very poor. All spring-sown wheats have failed, and they generally do in this part.

We find the best time for sowing wheat is September or October, that the plant may be well rooted before winter sets in. We sow about 2 bushels per acre, putting the seed as deeply in the ground as possible. I should think the average crop in this neighbourhood would be 15 "bags" per acre; but with early tillage, good management, and care, we often reach 20 bags per acre.

J. Horswell, Jun.

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7. Brinsop Court, Hereford.

(Arable Land, 280 acres; Pasture, 290 acres; Hop Land, 12 acres; and 250 acres of Coppice-wood—total, 832 acres.)

The Soil.—The general quality is a rather heavy loam, with some clay and some gravelly land or lighter loam.

Rotation.—Variable, but in general as follows:—Wheat, turnips, barley, seeds, wheat, beans, peas or vetches, then wheat again.

I sow all I can in autumn; but owing to the continual wet, it was impossible in 1872, except on the drier soils, to get any wheat in except on the clover lea; and, where the fields were wet, they were better left alone, as they were hardly dry enough to plough all the autumn.

47 acres out of 84 were sown in autumn, and 53 acres sown in the spring.

Biddle's wheat, the sort I sow most of, is, in my opinion, the best autumn wheat grown in the neighbourhood; it also does very well on good land sown up to February, and even later. It yields well, has nice straw, and, as a rule, stands the winter well, although I think on very cold, wet land a rougher wheat does better.

It is a great favourite wheat with millers, and they will give nearly as much for it as for white, indeed quite as much as for rough white.

Rough Chaff wheat, sown February 14th, was the best crop I grew; and I hope it will yield as much as 37 bushels to the acre. It is a good autumn wheat, and very good for early sowing in the spring.

Thick-set wheat I have only grown one year, and I cannot say more about it than that I like it, and have sown a good breadth this year.

These are the three sorts I have grown, and I have sent you two ears of each, with time of sowing and cutting. I have not thrashed more than about 100 bushels, so can only guess at the yield, but I consider it has been decidedly a bad year for wheat in this district.

There are several other good kinds of wheat grown. Creeping wheat does well; Browick's red is a good coarse wheat; and for sowing in March Velvet Chaff white comes well; but it is very long jointed and seldom yields much. April bearded wheat did very well this spring, but I would rather sow barley, as the yield is a great deal more and the straw much more valuable.

We began cutting wheat on the 13th of August. The winter Rough-chaff wheat, sown 14th of February, was quite fit to cut about the 17th of August, but the spring-sown Biddle's was not all cut until the 5th of September.

I do not think there was much wheat damaged by the rain, although we had a good deal about the middle of harvest, but the weather was cold.

I cannot give you the produce per acre, as I have not threshed, but probably this year the spring wheat will average as well as the winter wheat, owing to so much of the latter having perished from the continual wet. As a rule, autumn-sown wheat would yield from 15 to 20 per cent. more than spring-sown, having the same advantages as to land, &c.; but I have noticed that when we have had a very bad autumn sowing the spring wheat has generally done well.

D. Edwards.

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8. Long Sutton, Lincolnshire.

(483 acres: viz. 331 Arable and 152 Permanent Pasture.)

The Soil is an alluvial loam of medium quality and power.

The climate is equable, perhaps drier than in most parts of the kingdom, but being near the sea on the border of the Great Wash, the cold north-easters are very severe in the winter season; but, on the other hand, nice sea-breezes prevail in summer.

Rotation.—All regular rotations of cropping have been long abandoned, the aim being to produce the utmost yield which the land can bear, aided by liberal manurings and much artificial aid in foods to farm stock.

In the year 1872 the cropping stood as follows:—135 acres wheat, 22 acres oats, 85 acres potatoes, 35 clover, 22 mangolds, 23 turnips, 10 acres lucerne; besides gardens, yards, &c. In 1873 the cropping stood as follows:—105 acres wheat, 42 acres barley, 28 acres oats, 45 acres potatoes, 30 acres clover, 18 acres mangolds, 10 acres swedes, 21 acres turnips and cabbage, &c.

The difficulties of the wheat seeding-time were insurmountable in 1872; every effort was made and much patience exercised; but all was unfavourably, not to say woefully, got in; and the crops in consequence were very indifferent compared with average years, not probably equal to 3½ quarters per acre, and of inferior quality.

About 30 acres were left unsown until spring, and barley substituted instead, which has yielded well.

No wheat was spring-sown in 1873.

The kinds of wheat sown in 1872 were Golden Drop red, Velvet-chaffed white, and White-chaffed Thick-set yellow—all very productive kinds. One field of the Thick-set variety we have threshed. It yields $4\frac{5}{8}$ quarters per acre; the weight, $58\frac{1}{2}$ lbs. per bushel. Nearly the whole of the wheats were put in between the 25th November and Christmas, in preference to spring-sowing; but I have seen several samples at our markets from spring-sown crops which excel most of our autumn sowings. One in particular was sown as late as the 4th of March, and was of excellent quality. Many fields around me were spring-sown; and, from their appearance at harvest, they seemed superior to the average of the autumn-sown crops, nor were they much backwarder in harvesting. The unfortunate drawback we had just prior to harvest was in a serious attack of mildew. This unexpectedly reduced the yield and weight of grain, but the bulk of straw and fulness of crop were about a fair average. We have had more unfavourable seasons for wheat-sowing even than 1872. I remember one year in which we could not sow till February. It is true that many crops during that season were defective, some having too much straw, but upon the whole it was not a bad harvest in this district. I much prefer waiting for a spring-sowing to putting in the seed badly in autumn. In the past autumn, 1872, I should have thus waited, had not the weather and land become more favourable for seeding; the hazard then lying between a reasonable seed-time and a possibly protracted winter and late spring seeding. I believe many inferior soils would yield much better crops of wheat from spring-seeding than the autumn. Rich loams, and, indeed, most good wheat lands, are best to be sown in the autumn. However, no farmer need despair if he cannot sow then.

John Clarke.

9. Kinnersley Manor, Reigate.

(About 130 acres Arable, and 200 Grass.)

Soil.—Strong loam and clay.

Rotation of Cropping.—Wheat every other year alternately with beans, peas, clover, or tares.

As to the difficulties of the wheat seed-time in autumn 1872, I have known nothing like them before. There was scarcely a day without rain from October 18th to nearly the end of February.

The extent of land intended for wheat left unsown in 1873 was about 14 acres, which were then sown with wheat in spring 1873.

The kinds sown were Velvet or Rough Chaff white wheat and the April wheat (bearded), both yielding about 4 quarters to the acre; Velvet wheat weighing 61 lbs. to the bushel (autumn sown); the April wheat, sown late in March, weighing 61 lbs. also; while the spring (February) sown Velvet wheat weighed 60 lbs.

Thus 4 quarters would appear to be the measure of the season on this soil irrespective of sorts of wheat or the period of sowing; having reference to the finer kinds. Of the coarse kinds of wheat, I grew between 10 and 11 sacks: they had been sown early in October.

As to the treatment of the crop, whether winter or spring sown, I applied 1 cwt. nitrate of soda per acre to the autumn-sown wheats, and 2 cwt. guano to the acre was harrowed in with the spring seed. All the wheat was hoed.

We began to cut the autumn-sown wheat on the 4th August, and the spring-sown about the 18th. The weather was favourable to the end of harvest.

Speaking generally of the cultivation of wheat, I should say that the crop, as a rule, was governed nearly as much by the condition of land as by the season; and in highly-cultivated soils I think the largest and best crops are grown from sowing about two or three weeks before Christmas. When got in earlier there is always the danger of getting winter-proud.

Too vigorous growth in the winter months always with me means an indifferent crop at harvest; and, as a matter of fact, the fields which exhibit least promise all the winter turn out best. Knowing this, I now use nitrate of soda in preference to guano, taking care to apply it as late as it is safe to do so—well on in April.

As to rotations, and the wheat-growing power of the stronger soils, I am of opinion that, with exceptionally clean cultivation and deep ploughing, it is quite possible to grow wheat every year for an almost unlimited time. I have myself tried the experiment, and grew 5 quarters to the acre the last of seven wheat crops in succession.

J. C. Sherrard.

10. Milcote, Stratford-on-Avon.

(374 acres, of which 264 are Arable and 110 Permanent Pasture.)

The Soil.—About half is heavy clay, or wheat and bean land; the rest light gravel or turnip soil.

Rotation.—Variable. The six-course rotation is adopted.

I do not, as a rule, plant any spring wheat, unless it be a few acres instead of barley after the sheep.

The difficulties to be contended with in the seed-time of 1872 were the wet and tough nature of the land, rendering the use of a large drill impossible. All my wheat was planted consequently with a three-furrow drill.

But all the land intended for wheat was planted; although some of it was rather late. The extent of spring wheat was about 30 acres.

I only used one kind of wheat either in winter or spring, viz. Kentish Highback or Golden Drop. The yield in this case was 36 bushels per acre. I never manure for wheat, but generally hoe it once or twice as time serves.

There was very little difference between winter and spring-sown wheats as to period of maturity at harvest-time. The corn was harvested from the middle of August to the middle of September.

I have only threshed 18 acres of winter-sown wheat, which yielded 30 bushels, and 5 of spring, which yielded 36 bushels per acre.

John C. Adkins.

11. Vandyke Court, Pershore.

(350 acres—a fourth part Pasture and Meadow Land.)

Soil.—Part clay, part deep loam, part light sand, and part gravelly soil.

I usually plant about 100 acres of wheat, two-thirds in autumn and the remainder in the spring. Owing to the continued wet weather in the autumn of 1872 I only planted about 10 acres, most of which perished in the ground, so that I drilled across it in the spring. The second week in January, 1873, I commenced planting again, and in a very short time put in about 40 to 50 acres with the Improved Browick red wheat. The weather was remarkably fine and open afterwards; it soon germinated, and in a little time made its appearance above ground. From the time of its coming up till the time it was reaped no wheat could have gone on more satisfactorily. It averaged about

5 feet in the length of the straw, and I have sent you a sample of the ears. Upon threshing it I found it yielded about 33 bushels per acre, with little or no mildew about it.

As an experiment, I planted 10 acres of land the 5th of March, 1873, with Browick, Hallett's Golden Drop, and Square Headed wheat. All turned out well, with plenty of straw, and yielding about 27 bushels per acre; but it required dressing with sulphate of ammonia to whip it up. Here again there was little or no blight.

Between the early part of January and March I planted various other lots with the Buff Talavera and Wellingly white, but these did not do so well as the Improved Browick red wheat planted in January.

A good proportion of the wheat about here on the turnip soils is planted early in the spring, and for many years past it has answered very well. It is seldom down or mildewed, and generally ripens in about a week or nine days after the autumn-planted wheat.

I can only add that, throughout this district, the January-planted wheat was decidedly the best this season.

Henry Hudson.

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12. Aylesby Farm, near Great Grimsby.

(650 acres Arable; 270 Pasture.)

Soil.—Strong loam below the Lincolnshire Wolds.

Rotation.—Four-course shift.

The extent sown with wheat in ordinary years is 180 acres in autumn. Very seldom any in spring.

We had an unusually wet season, consequently bad seed-time; but none of the land intended for wheat was left unsown in 1872.

The extent sown with wheat in spring, 1873, amounted to 30 acres.

The kind sown was principally "Essex White." Quality good. Tolerably productive.

The autumn-sown wheat had received farmyard-manure on seeds. The spring-sown received 2 cwt. of Lawes' concentrated manure per acre. Not hoed.

We had a tolerably fine harvest. Began cutting autumn-sown wheat 12th August; spring-sown about 20th August. About 4½ quarters per acre.

Francis Sowerby.

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13. Send Barns, Woking Station.

(300 acres Arable, and 40 Meadow.)

The Soil is, most of it, heavy, on a clay subsoil.

The Rotation adopted is the four-course system.

Wheat is principally sown early in autumn; only occasionally is a piece sown in spring, after turnips, fed off with sheep.

About 15 acres of mangold ground were left unsown on account of wet in 1872; and about 20 acres were sown and failed in plant on account of the wet, and were ploughed up and replanted with barley or oats.

15 acres (mangold land) were planted in the spring with Talavera (or High-back Rough Chaff), which has yielded a very poor crop—the ear soft and spongy (not threshed yet)—about 3 sacks per acre, of very poor quality.

Almost any sorts sown in autumn are sown in spring; but Talavera for light lands, and Nursery for heavy lands, is generally preferred. The wheat crop is generally manured with about 10 loads of dung per acre, and horse-hoed once or twice.

On our kind, forward soils, we do not object to sow the ordinary wheats in the spring that we sow in the autumn; and they frequently do as well, and sometimes better, than winter-sown, and come very nearly as soon to harvest; but in unfavourable seasons they are much more likely to blight. Almost all sorts of wheat sown in the spring come up thick and grassy, and keep very close to the ground, and look very grassy for a long time before going off to spindle for the ear; but in the end of a favourable season the crop is generally satisfactory, both in quantity and quality. Red wheats sown in spring we consider much more likely to blight than white wheats.

We began cutting our autumn-sown wheats on the 24th July, and our spring-sown about the 24th August. Upon the whole, the crop was harvested in good condition; but it was very various, and the average produce was very poor; indeed, 2 to 4 sacks per acre under average.

EDW. HILDER.

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14. TIPTREE, KELVEDON.

(170 acres, Arable.)

Soil.—Two-thirds plastic clay; one-third cold sand, gravel, &c. A dry, cereal climate.

The extent sown with wheat in ordinary years is about 70 acres; always autumn sown, if possible.

The difficulties of the wheat seed-time in the autumn of 1872 caused about 17 acres to be sown in January and February.

The kinds sown were Nursery wheat, yielding 3 quarters; and Golden Drop, yielding 4 quarters per acre. The former after mangold and kohl rabi drawn off, the latter after turnips, following peas picked for London market; and turnips folded.

There was no blight on the spring-sown wheats, while the autumn-sown were all more or less blighted.

As a rule spring-sown wheat does not answer in Essex.

J. J. MECHI.

The above reports from clay soils give a graphic picture of the disastrous wheat seed-time for the crop of 1873. Very shortly epitomised, they furnish the following facts.—Mr. Randell, of Evesham, found Hallett's Pedigree Victoria Wheat to be a failure when sown in spring. The so-called "Lincoln Red" and "Golden Drop" varieties, neither of them spring wheats, answered much better, sown late in February.—Mr. Whitehead, of Ewell Farm, near Maidstone, found "Nursery" wheat to be a failure when sown in spring.—Mr. Bignall, of Loughton Farm, near Fenny Stratford, Bucks, found "Rivett's" wheat to answer fairly well, though sown in miserable condition so late as Feb. 22. "Golden Drop" was also found not altogether a failure, though sown very late.—Mr. Bottle's very interesting report from Pertenhall, Kimbolton, gives an experience of very late sowings of various sorts. "Browick Red" answered fairly well, though sown so late as the first week in March. "Golden Drop" proved hardly so productive. "Nursery" wheat sown in the second week of April yielded nothing. "April" wheat, sown the end of April, yielded a good crop of good quality. "Rivett's" wheat, sown the 15th of March, produced a very good crop.—Mr. May, of Elford Park, near Tamworth, found Rivett's, sown on the 22nd of February, the best crop of the year. The difference of spring-sown and autumn-sown wheat (Essex White) is represented by photographs of two ears. The engraving is one-half the natural size; and the woodcut on page 89, gives even a more favourable representation of the spring as compared with the autumn-sown crop, than the actual ears appear to do. The lesson here, as almost invariably throughout the reports, is, that the delay of seed-time beyond the usual autumn period is a misfortune.—Mr. Edwards, of Brinsop Court, Hereford, speaks well of Biddle's wheat, of which there are good accounts also from other farms. It yields well, even from a February sowing.—Mr. Clarke's report from the rich alluvial soils of South Lincolnshire, which is almost the only testimony in favour of spring sowings, scarcely describes a personal experience of them.—Mr. Sherrard, of Kinnersley Manor, Reigate, reports that the "Velvet-ear" wheat, sown in spring, was of somewhat inferior quality to that which had been sown in autumn.—Mr. J. C. Adkins, farming the rich, heavy soils near Stratford, found the "Golden Drop" or "Kentish High Back" wheat, whether sown in autumn or spring, yield satisfactorily: the actual threshings, indeed, had been rather in favour of the latter.—Mr. Hudson, farming near Pershore, sowed Hallett's Golden Drop and the Square-headed wheat, so late as March 5th; and they both turned out pretty well. The Browick Red wheat, planted in January, however, beat them all.—Mr. Hilder, of Woking, reporting generally, says that, as a rule, they do not object to sow the same ordinary wheats in spring that they sow in autumn, and they frequently do as well, and sometimes better, than when winter sown.

We are probably right in accepting this report as truly intimating that the experience of a single year is insufficient to determine practice; but it is plain that, upon the whole, the reports thus epitomised teach the superiority of the autum-sown varieties,—the failure of the Nursery wheat when sown in spring, although it, of all the winter wheats, has hitherto been supposed best to bear late sowing,—and the exceptional superiority of Rivett's wheat when sown so late as even February and March.

The failure of the spring-sown Nursery wheat last year, corroborates Mr. H. M. Jenkins' report of the French experience of the same variety, given in the 'Journal,' vol. viii., in his account of the "French Peasant-Farmers' Seed Fund.'

We now turn to the following

24 REPORTS FROM MEDIUM SOILS.

1. Honingham Thorpe, Norfolk.

(420 acres; only 40 of which are in Grass.)

Mixed soil; dry climate.

Four- and eight-course system of cropping.

No spring wheat usually sown, except a field of turnips has been too heavily manured and sheeped for barley.

A 14-acre field of early turnips was fed off with sheep, eating cake, in October and November, 1872. About the middle of November, 30 bushels of Spalding wheat were dressed with Down's Farmers' Friend ready for sowing. There was no chance of getting on the land to drill the wheat until early in February, when it was put in well. It was top-dressed with $\frac{3}{4}$ cwt. (6 st.) of nitrate of soda, 1 cwt. of superphosphate, and 2 cwts. of salt per acre in April. Some of the grain ripened prematurely from the great heat of July: and parts of the field were blighted. The yield is about 4 quarters per acre. The grain is small, and the sample pretty but light, weighing some 3 lbs. per bushel less than the autumn wheat grown from the same seed.

Another field of 14 acres of swedes was fed off with sheep, and in February it was sown with Nursery wheat. It received the same top-dressing as the other field. It was a poor crop of thin wheat, estimated at 28 or 30 bushels per acre. I have reason to believe this Nursery seed-wheat was sown in the autumn of 1871. I know the Spalding was, as it was grown upon this farm. I am this autumn (1873) sowing the Spalding wheat, which was drilled last February. I should never sow a really spring wheat in the autumn; but although I should prefer sowing spring wheat in the spring, I should never have any hesitation in sowing autumn wheat in the spring, if I had any difficulty in procuring any good spring varieties.

Both fields were horse-hoed and hand-weeded. One field was seeded down with sainfoin, the other with clover. The spring wheat was ready to cut 15 or 20 days after I began harvest with the autumn wheat. I consider the yield of the spring wheats to be from 4 to 8 bushels below the autumn wheats; but then the wheat sown in the autumn was grown on well-manured lea-ground, and had no top-dressing applied in the spring.

Clare Sewell Read.

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2. Riding Court, Datchet, near Windsor.

(300 acres: viz., 230 acres Arable; 70 Pasture and Meadow.)

Soil.—About two-thirds of the arable land is a nice friable loam, about 4 feet deep, with a gravelly subsoil; the remaining one-third is a very light loam, 18 inches deep, on very gravelly subsoil. The grass land is partly of the same kind, and partly alluvial soil. The climate is mild and dry, the farm being in the valley of the Thames.

Rotation.—The better portion of the arable land is farmed on a six-course system, viz.:—(1) Roots, *i.e.* mangel-wurzel and swedes; (2) oats or barley; (3) clover; (4) wheat; (5) beans, peas, or potatoes; (6) wheat.

The lighter part of the arable land is farmed on the four-course system, viz.:—(1) Italian rye-grass, trifolium, and tares, succeeded by turnips and rape (all the green crops are fed off by sheep with corn, cake, and clover chaff); (2) barley; (3) clover; (4) wheat. Thus two white-straw crops are not grown in succession.

About one-third of the land is sown with wheat in the autumn; none in the spring, as a rule. But the autumn of 1872 being very wet, and the seed-time bad, some of the seed-wheat perished, much came up very thin, and the plant was altogether deficient.

Only two acres, however, were sown in spring, this being where the autumn-sown had perished.

The seed sown was chiefly "Chidham," and "Rough Chaff" in the autumn. The two acres in the spring were drilled (14th February, 1873) with Chidham wheat, which was cut very green. Some ears and grains are enclosed. The yield is very bad, the spring wheat producing only 16 bushels, and the autumn wheat only 24 bushels per acre.

One-third of the land was manured for wheat; and two-thirds for the preceding crop, with London dung, stall-fed dung, and stable-dung, all of first-rate quality.

The harvest was early; I began reaping wheat 28th July, and finished 2nd August (labourers being very abundant). It was harvested well, is of exceedingly fine quality, and weighs 66 lbs. per bushel.

CHARLES S. CANTRELL.

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3. LYNCH FARM, MEDHURST.

(230 acres Arable, 230 acres permanent Pasture, 40 acres Hops, with some Wood-land, and a Sheep-down of 80 acres.)

The Soil varies very much. Near the down, which is the highest and most southern part of the farm, the soil is a light chalk, on a chalk subsoil. From this point it slopes towards the north, from near the highest point of the South-down range to the valley of the River Rother. Next is a belt of grey chalk covered with a grey chalk soil, then grey marl, and beds of the Upper Greensand, covered with a strong black clayey soil, very difficult to work, wet and stickey. Next comes the malm rock or rocks of the Upper Greensand, covered with a free working soil; this was very wet before draining; in fine dry summers productive, in wet ones the reverse. Then comes a soil made up of a mixture of malm with the Gault, on the side joining the malm, and below this Gault, mixed with a drift of chalk and chalk flints, very wet sticky land, difficult to till. Next to this is the Lower Gault clay (yellow), partially covered with a tender loam, varying in thickness from a few inches to one or two feet, very wet, and difficult to drain.

The Climate is mild and wet, nearly 40 inches of rain annually (a gauge is kept on the farm). Wet is the great drawback on this land. Naturally a retentive soil, with a northern aspect, it suffers from an excess of wet; hence in very dry years the corn is good, but the reverse in wet.

The Rotation is irregular; it has been found very difficult to adhere to one. The cropping is governed by circumstances.

From 60 to 80 acres of wheat are sown annually, as a rule in autumn. Some April wheat has been sown at times by the present occupier since 1856, once as late as the 23rd May, on the malm land, which grew a fair crop. This was quite an exception, it was only done to finish a field.

The autumn of 1872 was very wet; and only 20 acres were sown. Part of a field was then sown with wheat (the Fenton); the remainder of this field, and parts of two others, were sown in the spring of 1873, in April, with the bearded April wheat, which is expected to yield, from the appearance, a better crop than the autumn sown (none yet threshed).

About 25 acres were thus left unsown with wheat in 1872–3, and about 30 acres were sown with April wheat in the spring of 1873.

I know only of one sort of spring wheat, the bearded April wheat. I should not sow any other sort after the first week in March; other varieties may be sown up to the end of February, or as late as the first week in March, after turnips fed off with sheep, or on well-tilled land with plenty of good manure in it, or Peruvian guano; as I consider wheat sown so late requires a manure that will act quickly, such as sheep manure or guano. The varieties which I have seen succeed best when sown after Christmas are Chidham, Morton's Red Straw, Nursery, and Talavera. But I would not sow either of these after the first week in March, and then only on well-tilled, well-manured soil. I have seen and heard of several complete failures of Nursery wheat sown in spring; one, not three miles from here, never came to harvest. Some years ago, a farmer bought at Guildford Market what ought to have been April wheat, but, from some mistake, Nursery wheat was sent instead, and the whole, nearly 30 acres, was a complete failure. The seeds of April and Nursery wheat are sometimes so nearly alike, that they cannot be distinguished from each other; hence great care is required in buying of strangers.

Winter wheat on this farm is sown on fallow-land, clover lea, after beans, or peas, and on land after tares fed by sheep. The wheat sown on land once ploughed after clover is the most productive, if not thinned by slugs, which it is very apt to be, especially in damp autumns after a cold wet summer. The manure mostly used is good farmyard. Peruvian guano is considerably used and much liked; occasionally shoddy, also woollen rags. Peruvian guano and nitrate of soda are used as a top-dressing when required. Most of the corn is drilled on this farm, and the wheat is hoed, if the weather permits, in the spring.

Spring wheat (April wheat) is the last grain crop sown in the spring, being sown in preference to barley as late as the middle of May, after the last fed swedes.

Harvest commences here from the last week of July till the middle of August with the winter wheats, closely followed by the April wheat. The produce of this year's crop has not been ascertained.

I think there are very few of the ordinary winter wheats that will bear sowing so late as the first week in March; they are very apt to blight, and grow a poor crop of bad, thin wheat. There are localities and particular soils where they succeed, but it is the exception, not the rule. If wheat sowing cannot be finished by the middle of February, it is advisable to wait for a good season in March, or even in April, and sow the bearded April wheat. I have grown April wheat at different times, beginning in 1848, up to the present. I drill most of my wheat about 10 inches apart, and prefer doing so on land that has been ploughed some little time—here termed stale land. If ploughed in fine weather, all lea-ground is best ploughed some time before sowing for fallow-land. I find two tines with the harrows better than one, the wheat always comes up better and more even.

James Eames.

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4. Whitfield Farm, Falfield, Gloucestershire.

(528 acres, 344 of which are in permanent Pasture.)

The Soil varies from a rather weak sand to a stiff clay, but the greater part is a good and productive soil. The climate is variable, but favourable, on the whole, to the growth and cultivation of all agricultural crops. The land is farmed on the four-field course:—that is, (1) roots; (2) part barley, part oats, and part wheat, sown down with mixed clover and rye-grass seeds; (3) clover mown for hay; (4) wheat. The extent sown with wheat in the autumn is about 45 acres, and in the spring about 10 acres after roots fed off with sheep.

We never had a finer seed-time than the autumn of 1872. The wheat was planted on a clover-lea that had been ploughed up for some six weeks before it was wanted, and, in consequence, the land had become firm and mellow. And about the middle of October, our usual time of sowing autumn wheat, we had just the right quantity of rain to make the land work well; and, everything being ready, the drill went to work, and the seed went into the ground in first-rate condition, and came up a fine, even, healthy plant, which looked well all the winter, but suffered somewhat from the ravages of the wire-worm before the land became dry enough in February to admit of its being pressed down with a heavy roller. After that had been done the crops went on well. Our spring wheat—10 acres—was sown early in the month of February 1873, and that month being dry, with light frosts at night, the land worked well, and the seed came up as well as I could desire, and, I believe, produced quite as good a crop as that sown in the autumn; but, as a rule, I get the best results from autumn-sown wheat.

Fig. 2.—*Biddle's Imperial Wheat.*

The kinds of wheat we generally sow in the autumn are Hallett's Pedigree, Hunter's, a white wheat with long, stiff straw, hardy, and very productive (and much liked by the millers), and Biddle's Imperial (Fig. 2), a first-class red wheat, rather a dwarf variety, but yielding well, and a good miller's wheat.

For spring sowing I prefer Hunter's White or Red Nursery, but either of the varieties I have named will answer equally well for either winter or spring culture, provided the sowing takes place not later than the month of February. After that time April wheat, or barley, I think, will be safer.

The cultivation in spring consists of hand-hoeing, and afterwards harrowing in dry weather, to kill the weeds cut off by the hoe, and afterwards rolling, to make all smooth for the reaping-machine.

Our harvest commenced the 10th of August, the weather being warm, with brilliant sunshine, which enabled us to finish the harvest quickly, the whole being secured in fine condition.

We have not yet commenced threshing wheat, so that I cannot say for a certainty how it will yield; but, from the cold sunless summer, I am pretty clear the yield will be found under an average.

John Cobban.

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5. Sutton, Elton, Nottinghamshire.

(120 acres of Arable and 80 acres Grass.)

Soil.—I have in my arable land limestone, clay, red marl, and about 25 acres of black or moor land. I work it on the six-course system (except the black land, where I grow mangolds every fourth year), viz. five crops and a fallow, which I find the most profitable, having at one time tried continuous cropping, doing away with fallow. I abandoned it, as I find I can grow more on an average of years by dead fallowing every sixth year, and I have very much decreased my labour account. I found it impossible to keep down annuals, which our land is subject to, without a great amount of hoeing. My system now is, dead fallow, barley, seeds (red clover), wheat, beans, and wheat. As we find clover does not flourish on our clays, when taken every course, the next course is fallow, barley or wheat, peas, wheat, beans and tares, and wheat. If the land is smashed up dry by steam or otherwise by the latter end of May or beginning of June, so as to get the largest amount of surface exposed to the atmosphere and kept as rough as possible, so that it may be thoroughly aerated, I find it leaves it much more friable and porous through the next winter; and I have no difficulty in growing barley, good as to quantity and fair as to quality. It is also far more certain than sowing with wheat, as, through the lightness of the soil, the frost lifts the plant, and frequently the greater portion loses root, or it grows too florid with an excess of straw, and goes down before the grain is matured, considerably lessening the yield, which is often very flinty and light in quality. If intended for wheat, I find it best not to plough it again after beginning of August. Being more solid, the wheat flourishes far better, but I find barley answers better on the average. I apply on my fallow crop, whether wheat or barley, about 4 cwt. of Proctor and Ryland's prepared manure, or 2½ cwt. of Lawes' concentrated, with about 3 cwt. of salt mixed, sown broadcast after the drill, and harrowed in with the seed; and from both of these I have had good results. Many in our neighbourhood apply about 12 loads of manure per acre: I never do, as I find it is much better to manure for the pulse and green crops, which obviates one great difficulty, too much redundancy of straw; and I think in a dead fallow the atmosphere enriches the soil to that extent that, having artificial manure, it is far better to apply your manure for your seeds or pulse crops. I top-dress my clovers with about 12 loads of manure after harvest; and mow them generally twice. We find by mowing twice we get a far better crop of wheat than by grazing them. The leaf being left the roots expand more considerably and form food for the succeeding wheat crop.

Once ploughing for wheat is far better than twice, if after beans or peas. If ploughed once, a drag run through it leaves it far more solid and adhesive. Dragging leaves it in a nice clot, which the frost pulverises, and the soil is thus embedded down to the roots. I have grown my best crops of wheat when the land has been left in that state; but we can only practise it when, through the weather, the soil has become well dried through.

We always hand-hoe all our wheat if labourers can be obtained. Some years ago I horse-hoed all my corn, but I feel certain I injured my wheat, as it cut the fibres, and caused it to drop and become storm-broken, thus producing a lot of underling small ends, which not only decreased the yield, but made it of poor quality.

I apply 12 loads of manure per acre to both beans and peas, which encourages the growth of straw, adds considerably to the yield, and helps to smother those annuals which, if not checked, are so detrimental to the succeeding wheat crop; and I think I may say no one can cultivate wheat to perfection if he neglects the preceding crop. The crop of wheat being the sheet-anchor of clay-land, I look on the others as preparatory.

I generally grow 50 acres of wheat every year, more or less. I got in all my wheat last year; but, through the great excess of rain, only about half the wheat on our clays could be got in in the autumn: but the weather being so fine in February and March, I think the greater part was got in at length. The spring-sown wheat, however, yields very indifferently, and although the autumn-sown was injured by the excessive wet and much eaten with the slugs, it yields much the best, all the later spring-sown wheats being very much mildewed. Some of my neighbours on the banks of the Trent, a district of fine loam and very early, grow 6 quarters per acre of fine white wheat, put in as late as March. Essex white is the favourite variety, being short-strawed and coming to maturity very quickly. There was a large breadth of land put in with the bearded April wheat sown in March; and a considerable quantity of our turnip lands are grown with this wheat every year, as it may be put in as late as the 14th of April, and sometimes good yields are had, but it is very uncertain. It is seldom more than a week later at harvest than the autumn-sown. I sell the bulk of my wheat for seed. I seldom grow my own seed two years together on my own farm. I get it sometimes from the north of Scotland, and sometimes from off the chalk and the south. If many of my brother farmers only knew the value of selected seed and the great advantage of seed from a distance, they would practise it more. The straw is brighter and stronger, and the grain of finer quality. Last year I grew a new white-chaffed variety from Mr. Scholey, called Square-headed (Fig. 3), which, for

Fig. 3.—*Square-headed Wheat.*

Fig. 4.—*Collard's Red Wheat.*

Fig. 5.—*Hallett's Pedigree Wheat.*

prolificness, strength of straw, and quality of grain, surpassed all others. I had three friends come over before harvest to inspect it growing, two having taken some years ago the 30*l*. prize given by the Duke of Rutland for the best cultivated land in our district, and they said they never saw such wheat growing in their lives. This wheat is especially adapted for deep soils in a high state of cultivation, where it is liable to lodge. Its characteristics are uncommon stiffness of straw of medium length, and fine, bold, thick-set heads; and, being a wheat that tillers little, it will, where the land is deep and fertile, stand with the ears nearly touching each other. It grows a bright golden straw, and requires thick seeding, being rather short-strawed, and not tillering. I sowed one piece in February; it was only a few days after the autumn-sown, and a very fair crop.

Collard's red, from Mr. Collard, Isle of Thanet, is an excellent wheat, and, since I introduced it into Notts, it has been one of the wheats most cultivated here (Fig. 4). It is a red-chaffed wheat, very hardy, growing a long, strong straw, fine long head of excellent quality, and holding its own against most others.

Banham's Browick red is a very hardy wheat, but not much cultivated, on account of its being open-clefted and rather coarse in quality; it grows a long, stiff straw, does not lodge, and answers admirably where land is stiff and liable to bake after excessive wet; it is very prolific. It is greatly cultivated in Bedfordshire.

Hallett's Pedigree Golden Drop. I have cultivated Major Hallett's latest selection of red wheat three years. It is a wonderful wheat to tiller; grows a strong medium straw; and, although the head is rather thinly tedded (Fig. 5), it is very prolific, growing plump grain. The millers with us object to it on account of its dampness, which makes it difficult to break. It is of good quality, and I think seldom makes more than 1*s.* per quarter less than other kinds of red, and is becoming greatly cultivated with us, being hardy and very prolific.

Eldred's Prolific White-chaffed variety is the largest cultivated of any in our district, and approaches the nearest to Scholey's Square-head I have seen. It is especially adapted to low lands, or where the land grows too much straw. It grows a strong, bright straw, like reed, is of very good quality, and grows a thick long head. It is an early variety, and will do sown as late as the end of February.

These are the wheats I cultivated last year. They were all very good for the unpropitious season. I have said nothing that is new to any practical farmer. It is the province of every tiller of the soil to watch and humour his land, and experience will soon teach him the best time of seeding and cultivation. In our district a seed-time about the third week in October to the third week in November suits our land best.

I tried Major Hallett's system as recommended by him with some of his own wheat; sowing half the field about the 1st of October and the other half the first week in November. That put in the 1st October I drilled at the rate of 4 to 5 pecks per acre. It tillered wonderfully, the ears were of great length, and the straw was 3 to 4 inches longer; but the straw was speckled and unhealthy, and when threshed, although there was a much greater bulk of straw, it yielded considerably less than that put in in November at the rate of 8 pecks per acre. The straw of this was shorter and brighter, the flags all dropped off, and when we carted it, to use my men's own expression, it was as slippery as glass. The other retained a lot of its flag, which showed an unhealthy state; it was sown on a low mixed soil, and excellent wheat-land. I have no doubt early sowing may answer on chalk or high heath lands, but it does not answer on ours. Our clays are of a good description, with a fair depth of soil. The two last seasons the oldest and most practical men we have assure me have been the worst they ever knew. This year the crop will be fully one quarter per acre below the average; and I should say 3 quarters per acre is the utmost that the crop of 1873 will yield.

From the experience of last year, clay-land, as a rule, is not adapted for spring sowing. I grew one field of April bearded wheat, sown the first week in April; but, although a beautiful crop to look at, when thrashed it yielded 3 quarters per acre, on dead fallow top-dressed with special wheat manure from Proctor and Ryland. I have grown many varieties of wheat, but those specified I think equal to any I have had. Some of Mr. Hope's Fenton wheat, from the Fenton Barns farm, Haddington, through its shortness of straw did not answer with me; but some of my friends, on good land, had good yields of it. It is of excellent quality. Several in our neighbourhood are growing Rivett's, but I think they will find it too coarse for the miller, and unsaleable if wheat is low in price.

W. S. Amwell.

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6. Honnington Grange, Newport, Salop.

(468 acres, of which 160 are permanent Grass and 296 Arable.)

Climate medium between the dry west coast and moist flat coast climates.

Soil very variable. Most of the farm free dry loam, but there are some pieces of very stiff clay, as also of light sand, and black moor soil—this last being in permanent pasture.

The Rotation of Cropping generally adopted is the four-course—turnips, barley or peas, wheat or oats, one year clover or mixed seeds, then wheat.

The extent sown with wheat in ordinary years is about 55 acres sown in autumn, and about 25 in spring.

The difficulties of the wheat seed-time in the autumn of 1872 were very great, owing to the wet autumn; the clay-land was much trodden, and the seed perished in places, necessitating resowing in spring.

The extent of land intended for wheat left unsown in 1872 was 24 acres of clover-root. The extent sown with wheat in spring, 1873, was 63 acres, inclusive of what had been left over from autumn.

The kinds sown were Hardcastle white wheat, sown on 32 acres in the autumn of 1872, and also on 14 acres spring of 1873; and Essex Rough Chaff white sown on 24 acres in spring. Pedigree Hunter's white was sown on 6 acres in spring, and Talavera was sown on 19 acres in spring.

The Hardcastle and Essex Rough Chaff appear to be the most productive of the four kinds named. The Hunter's was probably sown too late to give it a fair trial. Talavera is very uncertain as to yield on this land, though the quality is good.

Ten acres sown with Hardcastle wheat in autumn had been dunged during the previous winter, and had been intended for root-crop, but, owing to the wet summer, a naked fallow had to be made. In the spring the plant was over most of the field healthy and vigorous, but a "knuckle fallen" crop resulted. The rest of the autumn-sown wheat was on clover-root, dunged; a good deal of clover remaining uneaten was ploughed in also. Snails were very destructive to the young plant, which remained very weak through the winter, and in stiff wet patches perished. Owing to the wet, sunless character of the season, there was a good deal of mildew on the autumn-sown wheats, and unequal ripening causing much delay in harvest—one part of a field being ready for cutting long before the rest; and in these cases the spring-sown wheat was cut first. A rough, unequal sample resulted.

The bulkiest crop was obtained from 24 acres of clover-root (unmanured), ploughed before Christmas, and left till February 14th, when part was sown with Hardcastle, and part with Essex Rough Chaff. A good deal of uneaten clover was ploughed in, and this having decomposed forced on the crop. Want of sun and dry weather, however, prevented the ear from filling well.

It does not appear likely to be very productive of grain of good quality, but it has not been tested by threshing yet.

These remarks apply to both varieties of wheat sown. No hoeing and no top-dressing were done this year. The following are my memoranda of harvest time:—

Ten acres of Hardcastle, sown after summer fallow (strong land), sown November 2nd and 4th, cut August 19th and 21st.—Ten acres of Hardcastle, sown on manured clover-root, November 1st and 2nd, cut in patches, as it ripened, August 15th, 21st, and 22nd. Patches of this field were re-sown with Talavera April 3rd; not cut till September 20th, and even then not altogether ripe. — Twelve acres of Hardcastle, sown on manured clover-root, November 9th and 10th. Cut in patches, as it ripened, August 23rd and 27th.—Fourteen acres Hardcastle and 10 acres Essex Rough Chaff, sown February 14th, 15th, and 17th, were cut August 29th, 30th, and September 1st, 2nd, and 3rd.—Fourteen acres of Essex Rough Chaff, sown February 18th to 20th, after turnips eaten by sheep, was cut August 23rd and 26th.—Nineteen acres Talavera, sown on light land (mucked) after mangolds, was cut August 27th to September 2nd.—Six acres Hunter's white (Pedigree) (Fig. 6), sown on turnip land March 13th, was cut September 3rd.

Fig. 6.—*Hunter's (Pedigree) Wheat.*

The harvest of 1873 was a remarkably tedious one, especially as to barley with much clover in it. The rainfall was, as measured by the gauge, by no means so great as it has often been at the same season, but few days passed without some rain. The low temperature checked sprouting.

The best *quality of wheat* was grown this season after turnips and mangolds; very little mildew in this case; whereas there was a good deal of mildew in the cases of all the wheats sown on clover-roots, both in autumn and spring.

R. W. Ralph.

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7. Eastoft Grange, Goole, Yorkshire.

(400 acres, chiefly Arable.)

Soil.—Warp-land. This land, with several thousands of acres in this district, has been warped by the warping sluice and canal of the late Mr. Ralph Creyke, of Rawcliffe Hall, in this county.

The Rotation is the three-course system:—(1) potatoes; (2) wheat, (3) about one-half of mixed seeds for depasturing, and red clover for mowing for winter food, and the remainder divided amongst beans (principally the winter variety), oats, barley, flax, mangolds, and turnips, all of which, with the exception of the white crops, experience proves to be favourable for the succeeding crop—potatoes—the first of the next triennial course.

All wheat is autumn-sown, except in very wet seasons.

The difficulties of the wheat seed-time of 1872 were, in consequence of the excessive rains, almost insurmountable; and on undrained land necessitated the ploughing up of large breadths and re-sowing in the spring.

The extent of land left unsown until the spring, in this neighbourhood, might be put down at one-quarter of the acreage intended to be sown; and much that was sown was destroyed, and had to be ploughed and patched up with wheat and spring cereals, as will be stated below.

About one-half of the land left unsown with wheat in the autumn was sown with wheat in the spring of 1873, and in most cases autumn wheats, the "Scotch Brown" and the variety called the "Square-headed"—the latter, a very productive sort, as you will see by the letters I have sent you—being the kinds most used.

There was a little April wheat—the Bearded Red—sown in this neighbourhood last spring; but I hear from a friend, who has tried it well, that it seldom yields more than from 18 to 24 bushels per acre.

The kinds of wheat most sown on the various soils of this district are Scotch Brown, Woolly-eared *alias* Velvet-chaff, *alias* Rough-chaff White, Golden Drop, Browick Red, and the Square-headed wheat. (See Fig. 3, page 102.)

Scotch Brown is a long-strawed wheat; quality of grain very similar to the Fenton. It is much liked by some occupiers of peaty land; and some strong-land farmers like it because on such land it rarely gets laid, except after through-fallows, and it grows of rather better quality than the general run of reds. The quality of the Scotch Brown is very similar indeed to the "Fenton," but it is longer in the straw than Mr. Hope's wheat, and does not, on our land, stand up or yield nearly so well.

Woolly-eared (Velvet-chaff or Rough-chaff) White is grown by some on account of its being prolific and of good quality; but I discontinued growing it because of its being unable either to keep erect or yield anything like the Square-headed.

The Golden Drop Wheat was very popular about a quarter of a century ago, but has been little heard of for many years, until the last three or four seasons among a few persons, who have got some of Major Hallett's Selected; but not having grown it myself, I cannot say more than that the samples of it I have seen are of nice quality for red wheat; but I have not heard of more than the average yield of red wheats.

Spalding Red flourished about the same time as the last-named kind; but it, like the Golden Drop, had to succumb to its more popular descendant, the Browick Red.

Browick Red. For ten of the past fifteen years, no other wheat has held so high a position with the wheat-growing community of this district, or has been so largely cultivated, as the Browick.

For the last five years the cultivation of the Browick Red has gradually decreased; and although the Square-headed was unknown save in the village where it was discovered, until 1868, yet there was last season, within a radius of seven to ten miles from this centre, as much of this variety grown as of nearly every other variety put together. I have grown it side by side with several sorts in 1870. I had the pleasure of seeing it beat the lot, and yield $9\frac{1}{2}$ quarters per statute acre. This year I tried it against the Browick Red, and, although the latter produced the greatest bulk of straw, the Square-headed won the trial by 664 lbs., or 10 [? 11] bushels 4 lbs. per acre.

I sent you a few of a number of Reports I have received from gentlemen who got Square-headed seed of me last autumn. [Mr. Scholey adds the names of some of his neighbours who have reaped large yields—Mr. Belton having reaped 8 quarters per acre throughout a field of 60 acres; Mr. Pindar, 9 quarters over a field of 20 acres; Mr. Ross, $9\frac{3}{8}$ quarters round the farm; and Mr. Brownlow, $10\frac{1}{2}$ quarters.]

Fenton wheat is a variety well deserving the attention of growers, and I intend giving it further trials.

We manure heavily for potatoes with farmyard and bought dung, with a liberal quantity of guano and other artificial manures. For succeeding crops we top-dress as may be required. We like to harrow our wheat in the spring of the year, as labour here is both scarce and dear, and cannot be obtained in sufficient quantity to hoe the whole of the cereals.

In conclusion, I will beg to say that what I have written to you on this subject, and especially with respect to the yields spoken of, is more for your own private information than for publication; nevertheless, if you wish to make favourable mention of the wheat, or publish an ear, I could not object. These extremely large yields, as I need not tell you, are only to be had on well-farmed land, and in really good wheat seasons.

C. Scholey.

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8. Witcombe Court, Gloucester.

(135 acres Arable; 60 Pasture.)

Soil.—Loam, sand, gravel, and clay.

Wheat has been grown every other year for the last forty years; about 50 acres in autumn and from 12 to 15 in spring.

The difficulties of the wheat seed-time in the autumn of 1872 were very great. I only planted 25 acres, replanting a portion again in spring, for the seed had perished in the ground.

About 30 acres of land intended for wheat were thus left unsown in 1872, and the extent sown with wheat in the spring of 1873 was 43 acres.

The kinds sown were Rough Chaff and Talavera.

Some portion of the crop, when required, was dressed with nitrate of soda, 1 cwt. to the acre.

Finished harvest on the 5th of September.

Anthony Bubb.

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9. Brineton House Farm, Shiffnal, Salop.

(About 200 acres Arable and 72 Pasture.)

Soil very variable, the greater portion a mixed loam, with marly subsoil, wet and cold, but mostly drained.

Rotation.—The five-course system—turnips, wheat, clover, wheat, and barley.

The strong land clover leas and the mangel land generally get sown in the autumn, about 40 to 50 acres. The light land clover leas, with the turnip land, from 30 to 40 acres, are sown in the spring.

The seed-time in the autumn of 1872 was very wet in this district. I did manage to plant two 16-acre fields, but one (the earliest) I had to resow nearly all over in the spring. The other did not come away well, but tillered well, and made a capital crop.

I planted 46 acres with spring wheat, besides the 16 which were re-sown.

In the autumn I sowed Browick Red, Golden Drop Red, and Essex Rough Chaff White; and in spring Hallett's Pedigree, Victoria White, and Talavera. Browick is a rather coarse wheat, but a good yielder, and suited to our strongest soils. Golden Drop is a good miller's wheat and capital yielder. Both are close-set in the ear. The Essex Rough Chaff White is a very thick-set wheat, with velvety chaff, a bad harvester in an awkward time, as it is so prone to grow, and the seasons are generally too late for it in this district. But it is a capital yielder; of good quality in a favourable season. Hunter's White and Victoria White are both very useful wheats, of splendid quality and much sought after for seed in this district for spring sowing. Talavera is sown here upon land fed off with sheep, when too late for other kinds.

We commence sowing winter wheat when we can, about the last week in October, and like to finish about the middle of November; spring wheat, from middle of February until the end of March.

The clover leas are well dunged. The turnip land is top-dressed with a mixture of guano, superphosphate, and nitrate of soda.

This is rather a late district. Last harvest the cutting of winter wheat was not general before the 25th of August; spring wheat a week or nine days later; a good fair yield of both, with good quality.

THOMAS S. LEE.

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10. EASTROP AND WICKSTED, BERKSHIRE.

(300 acres Arable; 400 Pasture.)

Soil various; half being sheep land, including brash and sandy loam, the rest strong loam on clay. Part lies high, part low, adjoining the River Cole.

Rotation—four-course; 100 acres of wheat are generally sown in winter, except an occasional failing after swedes fed off.

Fortunately all was got in, in 1872, in good season, before winter set in, so that I had no spring wheat in 1873.

The wheat was sown after mangolds, vetches, beans, and clover. Land is manured for beans, mangold wurzel, and on clover lea where the soil is light. All is hoed, but the wet weather was much against this operation. Annual weeds were very strong, and injured the corn a good deal. It is believed the yield will be much below an average. Harvest both early and late was pretty good, but a few weeks in the middle were very wet. It lasted a long time, from first and second week in August till late in September.

On a farm adjoining this, nearly all strong land, only about 10 acres out of 120 were sown in autumn, the land not being ready till the rains set in. All the land was sown late in spring, weather throughout unfavourable—the result is a very inferior crop, though better than was at one time expected. I did not begin to cut till the corn of the neighbourhood was in the stackyard. This turned out favourable as it happened, the weather having much improved. My experience of winter wheats, sown after January, is that they are generally later than spring wheat and than autumn-sown wheat; but a great deal depends on the season, as I have had excellent crops from winter wheats sown in spring, when the land has been in good condition, with plenty of sunshine later on. I believe the late spring was exceptionally unfavourable; and the results are thus more unsatisfactory than would have been the case had the weather been more propitious.

E. W. MOORE.

11.—FROCESTER COURT, STONEHOUSE, GLOUCESTER.

(130 acres Arable; 350 Permanent Pasture.)

The soil is clay and loam.

The Rotation adopted is wheat alternately with roots, and pulse or clover in intermediate years.

The usual extent of wheat sown is 45 acres, all down in autumn in favourable seasons.

The difficulties of the seed-time in the autumn of 1872 were so great from constant rain that only half was got in by the end of December. Ultimately all was sown, but it was not finished until March, 1873.

The kinds sown were the Frocester Bearded (Fig. 7), planted with the hoe in November, which produced 40 bushels an acre, of very good quality, after peas.

Biddle's Imperial, sown broadcast in February, yielded 38 bushels an acre of good quality, after beans.

Talavera, planted with the hoe in March, light crop and bad quality (12 bushels an acre), after a heavy crop of white turnips.

The usual treatment of the wheat crops includes harrowing, rolling, and hoeing in spring. No artificial manures are used, farmyard-dung being liberally applied to preceding crop.

The harvest-time was the second week in August, in unfavourable weather, but the wheat was not much injured with the exception of the Talavera, which was badly sprouted.

Frocester Bearded and Biddle's Imperial I have found good sorts for spring sowing, being less liable to blight than most winter varieties. I prefer planting all wheat in the autumn, when possible; for although the spring-sown last season in many cases produced a better crop than the autumn, it was in consequence of the unfavourable state of the land at the time of sowing the latter.

H. Scott Hayward.

Fig. 7.—*Frocester Bearded Wheat.*

12. Riddings Hill, Farnsfield, Notts.

(77 acres Arable and 45 acres Permanent Grass.)

Soil.—Fine loam, friable, and of great depth; red in colour; a most productive soil; all well drained where required.

I have no particular rotation of cropping; but I crop the land hard.

About 20 acres of wheat sown in autumn is the annual average. I never sowed any in spring before this year.

I think I might have sown some of the land in the autumn of 1872 with wheat, if I had begun earlier; but it was a late and wet harvest; and directly after harvest, having had about a week's fine weather, I took the opportunity to autumn cultivate the land intended for cropping in 1873, and I succeeded in doing that tolerably well, and also had all manure out of yards and spread it on the land intended for tares in 1873. But after that work was completed, we had constant rain almost every twenty-four hours—either in day-time or at night. The land was completely saturated with wet, and from that time I never had the opportunity of sowing a grain of wheat.

About 20 acres were sown in spring. I sowed "Fenton wheat" of good quality, and the most productive wheat I know. I have had the seed direct from Mr. George Hope, of Fenton-Barns, for the last sixteen years, from time to time, as I required a change of seed. The April wheat is of medium quality, and not a good yielding variety. The "Fenton wheat" was sown 19th to 22nd of February. It went in tolerably well, and all came up well on 3rd of April. Sowed "April wheat" 31st March and 23rd April.

Part of the land intended to be sown with wheat in the autumn of 1872 was a clover stubble; I gave it a dressing of lime, 2 tons per acre, before it was ploughed and pressed ready for wheat. A part was bean stubble, manured in the autumn of 1871, with 15 loads per acre of manure for the beans, which had been dibbled in the spring of 1872; and another part was in swede turnips, and for this crop 18 loads of manure and 5 cwts. of fine bone-dust had been applied; the thistles and annual weeds were hoed out.

The spring-sown wheat, particularly the Fenton wheat, grew well, and flowered out at a propitious time; the ears filled well. We commenced cutting it on 27th August, and the April wheat at the same time.

I have not threshed out any grain yet, but I estimate the yield of the Fenton wheat at about 4 quarters per acre; but the April wheat will be a bad yielding crop.

I consider that the spring-sown wheat did very well.

Charles Doncaster.

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13. Amcott's Grange, Doncaster.

(190 acres Arable.)

My experience of spring wheats sown last year was not very favourable, and our soil does not suit them generally; in fact, it is only in extraordinary seasons that we ever sow any.

My farm is about 190 acres of arable land, without permanent pasturage; it is all warp by the side of the River Trent.

Our *Rotation of Cropping* is wheat every third year, generally after potatoes, and sown in November if possible. In 1872 I only got about 30 acres sown, instead of 60, which is about my usual quantity. In the spring of 1873 I had about 20 acres sown in the spring, 14 acres of which were sown with a wheat known here as Square-head, and 6 with Buff Talavera (our April wheat). The Square-head was sown in February and the Talavera in the first week in March. The Talavera we harvested the last week in August, and the Square-head about a week later. As to their yield I cannot speak with certainty, as I have not threshed either of them; but I have no doubt the Square-head will yield at least one-third more than the Talavera, judging from the weight in the sheaf.

The Square-head I should highly recommend for early spring sowing on rich soils, but not on inferior, as it is a wheat that grows but little straw on good land, but very stiff, rarely getting down, and it generally pleases in threshing.

On this soil spring corn generally grows weak in the straw and coarse in the grain, so that we avoid it as much as we can.

F. Knapton.

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14. New Park Farm, the New Forest.

(269 acres; 161 Arable, 100 Pasture.)

Soil.—Decomposed leaf mould upon gravel.

The Rotation of Cropping generally adopted is as follows:—Two years Italian ryegrass, fed constantly with sheep, once mown each year, then Chidham wheat, then barley, with Italian ryegrass sown upon it when well up. The Italian ryegrass is irrigated with farmyard-liquid after mowing.

The extent sown with wheat in ordinary years is about 45 acres.

The difficulties of the wheat seed-time in the autumn of 1872 were very great indeed from continuous rain; not one field was finished with winter wheat.

The extent of land intended for wheat left unsown in 1872 amounted to 16 acres, which were sown in April with bearded wheat, besides 12 acres intended for spring wheat.

Chidham white wheat was sown in the autumn, and bearded April wheat in the spring. We dress with soot and nitrate of soda early in the spring.

Harvest began the first week in August for the winter wheat, the second week for the April; both were excellent in quality and quantity, and were harvested in capital condition. None threshed at present. If the nine ricks were put end to end they would measure 95 yards, off 58 acres of land in the New Forest.

I have sent you two ears of my Chidham wheat, the autumn-sown, and two ears of the bearded, sown in April; the straw of both is first-rate and about five feet long, which is the average length of the crops. Every one that saw the wheat standing and those that have seen the ricks express themselves surprised at the produce.

W. Dickinson.

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15. Nursling Farm, near Southampton.

(400 acres of Arable, 100 acres of Water Meadow.)

Soil.—Deep loam, on a gravel. Climate warm, and early to harvest.

Rotation.—The four-field system of cropping, and in some instances three-field.

I sow about 100 acres of land to wheat on an average.

We had a most difficult seed-time in the autumn of 1872; many fields could not be sown till late in December; and then the land was wet and unkind, a deal of the seed perishing. The crop was thin, weak in the straw, and much blighted, with the exception of that sown in October.

Twenty acres were sown in January and early in February, after swedes eaten off with sheep consuming cake and corn. This is often done on farms in this locality, where many sheep are fattened, as barley gets much laid if sown after swedes.

White Trump wheat and Red Nursery were sown. The White Trump, drilled in October, was fit to cut by the 4th August, was thrashed in September, and yielded 34 bushels per acre, weighing 65 lbs. per bushel, realizing 17*l.* 10*s.* per load of 10 sacks. The same sown in an adjoining field (the land being in a high state of cultivation) the latter end of December, produced only 4 sacks per acre, weighing only 61 lbs. per bushel.

Red Nursery was sown January 19th after swedes, sheep having eaten cake and corn. Small ears, but thickly planted; crop not threshed, but computed at 24 bushels per acre.

The spring-sown wheat in our warm climate is not more than ten to twelve days later at harvest than the autumn-sown. Spring-sown wheat is not hoed in this locality.

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16. Patton Farm, Much Wenlock.

(503 acres; 400 acres of which are on the Ludlow rock formation, at an average elevation of 700 feet.)

Soil.—A rich loam, but much affected by the absorbent nature of the substratum, so that only in very dry and sunny summers can a first-class crop of wheat be obtained: 225 acres of this portion of the farm are arable, and 175 permanent pasture.

Rotation.—The cultivation is on a five-course, seeds remaining two years. The usual quantity of autumn wheat was sown, but a great portion perished, and one-third of an average crop was the result. This was supplemented by a field being sown in the spring after turnips, which, however, proved a complete failure, and was ploughed up again.

The other portion of the farm is on the Old Red Sandstone formation, at an average elevation of 500 feet: 30 acres of this pasture is arable, the remaining 73 permanent pasture; the soil a strong loam; rotation four-course. The portion for wheat being fallow, could not be sown in the autumn. It was sown in the spring with bearded wheat, which produced about two-thirds of an average. The usual area of wheat sown is from 50 to 60 acres, and it is invariably sown in the autumn, spring-sown wheat being unsatisfactory. I write this for my son, who is now the tenant here. I retired from farming five years ago, but I must say that, after 40 years' experience, the autumn of 1872 was the most disastrous for wheat culture I ever witnessed.

My son also occupies a small farm of his own adjoining (120 acres), also on the Old Red Sandstone—80 arable, 40 pasture; rotation four-course; soil a strong loam. The portion for wheat could not be sown in the autumn, but was sown in the spring with autumn wheat, and a most miserable crop (9 bushels to the acre) was the result. The farm is called Weston Farm, and has an average elevation of 600 feet.

Evan Davies.

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17. Dorchester.

The Rotation of Cropping is generally a four-course system, viz., wheat, turnips, barley, and clover on light soils; but on strong land winter vetches frequently take the place of turnips.

Without naming any particular farm, I think it right to say that in this county of Dorset a great portion of the cultivated land is on a chalk subsoil, and therefore much the greater portion of it was sown as usual with wheat in the autumn; but in all the valleys of the county less than one-half was sown in the autumn, the remainder being sown in the spring with Nursery wheat and April wheat.

The Nursery wheat sown in February gave a better return than the April wheat, which was sown a month or two later; but the produce of each of these wheats was only from one-half to two-thirds of the quantity usually grown from wheat sown in the autumn.

The treatment of the crop was the same for that sown in the spring as the winter-sown wheat. The spring-sown wheat came to harvest about a fortnight later than the autumn-sown, and as the weather had then become bad, the former wheats were much deteriorated in quality.

As a rule, spring-sown wheats are not very productive in this county, and it is quite evident that barley will make a better pecuniary return than wheat, if not sown in well-cultivated land in the autumn. Ordinary winter wheats, when sown in the spring in this county, will not answer.

R. Damen.

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18. Osmington Farm, near Weymouth.

(About 800 acres: 340 Arable, and 460 Meadow and Pasture.)

The Soil varies. Some of the arable is very strong clay, some strong loam with clay subsoil, some flint with chalk subsoil.

The climate is mild, adjoining the sea-coast facing Weymouth Bay.

The System of Cropping on the strong arable lands is as follows:—Wheat is taken after vetches fed off with sheep (followed by a summer fallow). If the land is clean the wheat is sown down to grass and clover, which generally remain two years—the first year cut for hay, the second year fed with sheep. Then follows a dressing of farmyard-manure, and summer fallow again for wheat. Sometimes a crop of beans is taken after wheat; then vetches and summer fallow prepare for wheat again. The lighter soils are farmed on the 4-field system:—turnips, barley, grass, and wheat.

The quantity of wheat sown per year on an average is about 100 acres; about 70 in autumn, and 30 in spring.

The autumn of 1872 was the worst season for strong lands that I have known since 1852. I was able to sow only about 18 acres of wheat early in November, although the land was ridged up ready for sowing; but, after the rain set in there was no cessation, and I could not venture on the land until about the 14th of February, when I was fortunate enough to sow about 60 acres of Red Nursery wheat, and on the 27th of March I sowed about 20 acres of Red Chaff April wheat, from seed purchased of Messrs. Raynbird and Co., of Basingstoke.

The sort of wheat sown in autumn was Red Lammas, bought of Messrs. Raynbird, which I think is a good productive sort. It has a good ear, and grows stiff in the straw, and, although such a bad season, it produced 42 bushels per acre.

The Red Nursery sown about the 14th February did not yield well, only about 22 bushels per acre. I have grown the same sort on the same lands many times, and grown more than 10 sacks per acre; but the straw this year was thin and short, with small ears.

The Red Chaff April wheat sown on the 27th March yielded very well, rather over 37 bushels per acre. I began cutting it the same day as the wheat sown on November 13th, the straw was thick on the land, and very bright, and the weight of the wheat was 64 lbs. per bushel.

The autumn wheat was after clover—the second growth fed off with sheep and a dressing of farmyard-manure. The Nursery wheat was after vetches fed off with sheep, which had 1 lb. of cake per day each, half cotton-cake, half linseed, and then a summer fallow; and some was after clover with a dressing of farmyard-manure. The April wheat was after turnips fed off with sheep, each having 1 lb. of cake per day, half cotton, half linseed.

The harvest of 1873 was quite a fortnight later in this district than the average of seasons: it became general about the 11th of August. I have many times sown Nursery wheat the first week in March, and begun cutting it the first week in August, and it has yielded more than 10 sacks per acre; but this year it has yielded only about half the quantity, although sown much earlier. Many farms in this neighbourhood will not average more than 4 sacks per acre. It has been the worst season for strong land farms since 1860. The quality of the wheat is very good; but there is not enough of it. Some of the very late sown wheats were not worth cutting, being affected with rust. I think the Red Chaff April wheat is the best sort to sow late in the spring. I have sown the White Chaff April wheat, but it is much more liable to blight. I have always found the Red Chaff to answer well if sown on good land.

I should not recommend, as a rule, to sow winter wheat in spring. The best sort to depend on I have always found the Nursery, but this last year a neighbour of mine has sown some Golden Drop the same day as some Nursery—the latter part of January—and its yield was 6 bushels per acre more, and the weight 2 lbs. per bushel more than the Nursery. Seasons will beat every person's judgment.

W. Chilcott.

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19. Anick Grange, Hexham.

(320 acres under Tillage: Old Grass, 88; Rough Pasture, 56.)

Soil dry; known as turnip and barley soil, but the stronger portions grow fair wheat in favourable seasons.

Rotation.—One and two years seeds; oats; potatoes, mangolds, and white turnips; wheat; swedes; barley or wheat sown out with grass seeds.

Fig. 8.—*Shirreff's White Wheat.*

No strictly autumn wheat is sown, the earliest being that after potatoes. All the rest is after turnips, and seldom above 30 to 35 acres are sown previous to the new year.

The difficulties on this farm in 1872 were chiefly in getting swedes off the land.

Eighty acres were sown with wheat in January, February, and the first week of March. The sorts sown were Shirreff's (Fig. 8), a beautiful wheat,* requiring better soil than I have—on good deep loams it yields well, I believe; with me it did not—"Hunter's," my favourite—and a little Talavera where the sheep finished in spring.

None of my wheat was either manured (except by the sheep previous to sowing) or hoed.

We had slow, tedious harvest. Commenced cutting August 11th, finished cutting September 12th. Corn was all saved in good condition, but it was all done in catches, owing to heavy rains, accompanied, however, by high, cold, and dry winds. I have not threshed sufficient to know productiveness. Hunter's wheat, no doubt, gives more quarters per acre than either of the others.

Thomas Dods.

* The Bearded white wheat here mentioned and depicted was introduced by Mr. Patrick Shirreff of Haddington, a veteran plant improver, whose labours in the work of selecting, cultivating, and hybridising wheats—long acknowledged by his brother farmers in Scotland—have been described in his little volume entitled 'Improvement of the Cereals,' &c. Printed for private circulation by Messrs. Blackwood and Sons, Edinburgh and London, 1873. I add here a note received from Mr. Shirreff, to whom I had communicated the plan of this report, in which it will be seen that he imagines a much more elaborate and ambitious scheme than any that had been projected. The

20. Mungos' Walls Farm, Dunse, N.B.

(Excluding margins of streams, steep banks, and fences, I can plough 487 acres, but I have some 24 acres of that in pasture, sown off by myself 17 years ago, and 40 acres more have been just laid down, to lie during the currency of a new lease.)

Soil of all sorts; much of it strong loam, naturally full of springs, but pretty fairly drained by stone and tiles of all dates up to the present time. Such soil must be carefully handled in broken weather ("masterly inaction"). Of light, free soil, we have just enough to make us wish for more. Our climate includes occasional spells of three wet days from N.N.E.

Rotation.—Oats, turnips and potatoes, wheat and barley; grass lying mostly two years.

The area of wheat, following only roots, depends on the autumn being more or less favourable for the removal of these crops. I generally aim at 40 acres—too much of it sown in spring (last season *all*)—but that is precarious, and must be given up in favour of barley.

Last winter being our second wet one, and following a whole year of rain, our land was in an extraordinarily bad state, turning up in solid furrows; but was sown in late spring, having been previously somewhat mellowed by frosts.

We sowed no wheat until after New Year's Day, 1873: Golden Creeping wheat was a very unequal crop; a rough sample, sown January 3rd on land too soft after rain. Nursery red, a small crop, fine quality; sown February 15th on land old ploughed and mellow. "Hunter's," small crop, middling quality, sown March 13th, on lumpy clay, partially mellowed.

Not having threshed any quantity, I cannot give you the produce; but it is easy to see the crop must be very small—3½ quarters perhaps. Last year it was under 3 quarters, of very inferior stuff. But neither of these years can be taken as a criterion either of my land or of these varieties of wheat.

I neither directly manure nor hoe my wheat-crop. The harvest was late and showery, but not destructive.

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ideas of so experienced a man on this subject deserve attention, and they are therefore placed on record here:—

Haddington, 19th November, 1873.

"You ask my aid in this matter, but unfortunately I have little worth contributing this year; the crops on my experimental plot having been rendered almost useless by slugs and by the manure condition of the soil. The task to which you have committed yourself is of great importance, and it would require perhaps a busy lifetime to work it out. I trust, however, you will be able to make a proper beginning, and others in time will work the problem. If I rightly understand your object it is to trace the effects of the time of sowing, the thickness of seeding, and the temperature during the period of growth on the different kinds of soils and varieties of wheat, as well as on different subsoils and exposures on which the land inclines. It is sometimes difficult to distinguish the effects of insects inhabiting the air and those inhabiting the earth from simple climatic effects. There is certainly such a thing as disease in the wheat plant, and it is frequently partial in its attacks. But do not let my enumeration of difficulties frighten you. The weather is seldom alike in two successive seasons, or even in two adjoining counties, in the same year. But the credit of overcoming the obstacles will be the greater.

"I am not aware of anything very remarkable in the wheat-crop of this county last season. Our autumn and winter proved wet, but early it was dry. Ultimately a good deal of land was seeded with wheat in spring, which ripened unusually slowly, proving here a pretty good crop, the seed being the winter varieties in common use.

"Patrick Shirreff."

Perhaps we ought to give more attention than we do to the selection of winter and spring-grown wheats for winter and spring-sowing respectively.

Of the three varieties mentioned, Hunter's is, perhaps, the one that may not be so well known in the south, and might have been worthy of representation in your report; but, judging from recollection of what I used to have, I very much doubt if we have the real old sort in cultivation now. It was a rare sort for bad harvest weather, and a favourite with millers for its "strength," but I gave it up years ago for its tendency to lodge on rich land, and now I fear an impostor has assumed the name.

I have been very unfortunate in my attempts to get seed-corn from the Midland Counties of England—a farrago of all manner of seeds comes with it.

James Thomson.

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21. Lambieletham, St. Andrew's.

(316 acres, all Arable.)

Soil.—Soft top, with clay subsoil. Climate late; 350 feet above the sea.

The Rotation of Cropping generally adopted is the six-course.

All my wheat is sown in autumn if possible, but two-thirds of it intended for wheat were left unsown in 1872; and of this, about 22 acres were sown with wheat in spring, 1873.

Seventeen acres were sown with Fenton on 20th February, and five with Bearded wheat on 4th April. Fenton wheat I have sown for a number of years; it yields well. Shirreff's Bearded wheat I have only sown this year; it was late in being sown, but looked well when growing; none is threshed yet.

Two hundredweight of Peruvian guano were sown per acre with all at the time of sowing.

The winter wheat was cut on 6th and 8th September, the spring on 26th and 27th. I have only thrashed a small ouantity of winter sown; it is yielding well.

John Morton.

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22. Edington Mains, Berwickshire.

(100 acres Arable, and 140 Pasture.)

The Soil is generally strong loam, on the Lower Carboniferous formation, with an average elevation of about 250 feet. Of the arable land, not more than 500 acres are adapted for growing wheat.

The ordinary Scotch five-course is followed, viz., two years seeds, oats, turnips, and wheat or barley.

An endeavour is always made to sow from 30 to 60 acres of wheat; that is, as much as can be overtaken before the end of the year. If the minimum quantity just stated has been got in, more is sown in spring; but barley is then a much safer crop. On this farm spring-sown wheat is so liable to mildew and other disasters, that it is only resorted to in exceptional circumstances.

The difficulties of our wheat seed-time in 1872 were so great, that of a portion of a field, extending to about 10 acres, which had been bare-fallowed, only about 4 acres were sown with wheat in October, when the excessive rain debarred all further progress until February. Another piece of 10 acres, of freer soil, had in like manner about 4 acres sown in autumn, after the removal of a turnip-crop, and the remainder had to remain unsown till February.

Seed had been provided for sowing 30 acres in autumn, of which only 18 were put in.

When a favourable opportunity occurred early in February, the balance of the above quantity was sown, and as much more as brought the whole extent sown at that time up to about 12 acres.

The kind sown in autumn was Fenton, and in spring the Northumberland Red. In the case of the field of 10 acres, after turnips, partly sown in autumn, the remainder was sown in spring with Fenton, to avoid the inconvenience of having two sorts in so small a piece. But for this it would have been avoided, as Fenton is especially liable to mildew when spring-sown. For autumn-sowing it is the most productive sort I have yet tried. Its stiffness of straw adapts it peculiarly for growthy soils in high condition. The Northumberland Red was introduced on Tweedside by the Messrs. Culley towards the end of last autumn, and has since maintained its place, both for late-autumn and early-spring sowing, for which it is specially adapted. In my own experience this year it ripened simultaneously with the Fenton, and had a brighter colour. It is a tall-strawed sort, somewhat long and open in the ear, with a longish grain. In favourable seasons it produces a bright sample, and is well liked by millers. During the past twenty years it has been less grown than formerly, and it has become difficult to get it genuine. With a recurrence of unfavourable seasons it invariably comes to the front again.

My patch of bare fallow was manured with farmyard-dung in July, and got a seed-furrow immediately before sowing. The other land had been well-manured for swedes with about 15 cart-loads per acre of dung, 2 cwt. each of bone-meal and bone-ash superphosphate, and 1 cwt. of Peruvian guano. The land was steam-ploughed in February and the wheat was sown broadcast by machine from day to day as the ploughing proceeded, at the rate of very nearly 3 bushels per acre, and harrowed in. It got no after-treatment save a single turn of the harrows and rolling in April, when the clover and grass seeds were sown.

My wheat was all reaped in the first week of September, the autumn and spring sowings having ripened simultaneously. Although harvest work was often interrupted by rain, the drought was so good that the harvest, as a whole, was a short one, and the crops were secured with slight damage save the loss of colour. The 10-acre piece of Fenton wheat, partly sown in autumn and partly in spring, has yielded exactly 30 bushels per acre, weighing 63 lbs. per bushel. The red wheat is the same weight per bushel, but a better sample, with the promise of a better yield by from 4 to 6 bushels per acre.

Owing to the character of the seasons and the comparatively good price of barley, there has of recent years been less wheat sown on the best class of turnip-soils in Berwickshire than used to be the case. On such soils our experience is that November sowings of wheat prosper best. Forty years ago a shrewd old ploughman used often to say to me, "Our wheat does best, Sir, when the braird's nae langer than elshin-irons afore winter"—elshin being the Scotch name for the shoemaker's awl. My own experience since has quite confirmed the accuracy of old John's observation.

John Wilson.

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23. Ballydoyle, Mallow, Co. Cork.

(500 statute acres, of which 10 are in Permanent Pasture.)

The Soil is a calcareous loam, and lies about 200 feet above the sea-level. One portion of the farm is worked on the five-course shift, the remainder is left under grass for eight or ten years before being brought under the plough, when it is cropped first with oats, then green crops, and again laid down with wheat. The breadth under wheat is generally about 40 acres, which formerly was all sown in the autumn; but, owing to the incessant rains of the autumn months of 1872, Mr. Lavers postponed sowing until early spring, and he then sowed 45 acres. The varieties sown were the Red Buff (Fig. 9) and a compact form of White Essex (Fig. 10). The former came from Devonshire, and the latter from Scotland. The Red Buff yielded fully 20 stones to the acre more than the White Essex, and Mr. Lavers intends to sow it alone this spring. Although its skin is pale red, the millers class it with the white wheats. The grain is short and plump; the straw is short and stiff, and the plant tillers remarkably well. The head is short and thick, but well-filled, and the chaff is velvety (Fig. 10), and in appearance like the variety known here as Stettin.

Fig. 9.
Red Buff Wheat.

Fig. 10.
White Essex Wheat.

Both varieties were sown after turnips, manured with farmyard-dung and Norrington and Co.'s superphosphate. The land was principally broadcasted, though a portion was drilled. The wireworm was never so troublesome in the district, and at one time it threatened to destroy the entire crop; and Mr. Lavers thinks that, were it not for turning a large flock of sheep on it, it would have been completely ruined; as it was, the plants were decimated. The spring-sown wheat ripened in three or four days after the autumn-sown in this neighbourhood, and the harvest-time was quite as propitious. The Red Buff yielded close on 160 stone per acre, while the Essex gave but 140 stone per acre. On the whole, Mr. Lavers, while he is in favour of sowing wheat in the autumn, if the weather is favourable, would advise postponing until spring much of the wheat which, through the inclemency of the weather, is often puddled in in autumn or early winter; and he considers that for this purpose, in such a district as the one he lives in, the Red Buff is the best variety to sow.

James Byrne.

24. Woodford, Armagh.

(A small Farm.)

I usually sow a few acres, and, up to 1869, always in autumn. In 1869 I sowed a portion in February, and found the yield, both as to quality and quantity, so much superior, that for the past three seasons I have sown all in spring. In the present season of 1873 I sowed my usual quantity on the 26th, 27th, and 28th February, of the Browick Red; it came away with a good vigorous plant, and I have sold the produce, fully 19½ cwts. to the acre. The soil is a good loam, with a stiffish blue clay bottom. A near neighbour sowed about 8 days later, say 3rd or 4th March; his did better than mine, as he had above 22½ cwts. to the statute acre. I know a great many here who have sown the Bearded April wheat, but, without exception, the crop has been short of straw and very deficient in yield, in many cases not exceeeding 10 to 11 cwts. In fact the feeling here is strongly in favour of spring sowing, and of sowing the ordinary winter wheats, in preference to the spring wheat, and, from the experience of past seasons, although this season has been the most favourable we have had here for autumn-wheat sowing, many of our best farmers here are deferring the sowing of their wheat till spring.

As to the time of harvesting there is never more than 8 or 10 days between the autumn and the spring sown.

My own farm is about 100 acres: 50 in permanent meadow and grass, the remaining 50 farmed on the ordinary four-course rotation; but, being anxious to winter as much stock as possible, oats are principally grown.

Robert A. Boyd.

These reports from Medium Soils do not differ materially from those received from heavier and more difficult farms. Mr. Clare Sewell Read, M.P., though declaring that he would not object to sowing autumn wheat in spring, nevertheless reports that the yield of his spring-sown wheats was from 4 to 8 bushels per acre less than their yield when sown in autumn. Spalding wheat, prepared for seed in November, but not sown till February, was partly blighted. "Nursery" wheat sown in February was a poor, thin crop.—Mr. Cantrell, farming near Datchet, found "Chidham" wheat sown in spring yield very badly—8 bushels an acre less than the same sort sown in autumn, which produced only 3 qrs. per acre.—Mr. Eames, of Lynch Farm, Medhurst, knows only of one true spring wheat, the bearded so called "April" wheat: other sorts, however, may be sown up till the end of February; in particular, "Chidham," the "Red Straw White," "Nursery," and "Talavera," and they are named in the order of the earliness in which they should be sown; but none of them should be sown after the first week of March, nor so late as that except on well-tilled land.—Mr. Cobban, of Whitfield Farm, Gloucestershire, believes that Hunter's White or Red Nursery wheat will do equally for winter or spring sowing, provided the latter be not later than the month of February.—Mr. Amwell's very interesting report on wheats is an instructive record rather of his experience generally of varieties, some of which are very confidently introduced as worthy of extensive adoption, than of the special fitness of any of them for late or early sowings. The "Square-headed" wheat figured, both front view and in profile (Fig. 3, p. 102), in particular appears to have a fairly proved character for very remarkable productiveness.—From Mr. Ralph's elaborate report of his experience (Honnington Grange, Newport, Salop) of last year's seed-time, I gather that the crop varied not so much according to the time when it was sown, or the variety which was selected, as according to the condition of the land. There was a good deal of mildew in the case of all the wheats sown on clover roots (dunged) both in autumn and in spring.—Mr. Scholey of Eastoft Grange, Goole, to whom the credit of introducing the "Square-head" variety of wheat is due, gives a very interesting comparative account of a number of varieties, and specifies the extraordinary yields which have been obtained on the rich alluvial soils in his neighbourhood.—Mr. Knapton, of Amcott's Grange, Doncaster, recommends the "Square-head" wheat for early spring sowing. Sown in February it yielded about one-third more than Talavera sown in March.—Some few reports are added from Scottish and Irish farms, without, however, adding materially to the lessons to be gathered from those which have preceded them.

The following reports from the light-land farms to which the circular inquiry was directed, as might be expected, relate fewer difficulties and present therefore less distinctive guidance by the experiences of 1873 which they describe.

12 REPORTS FROM LIGHT SOILS.

1. Bedfont, Hounslow, Middlesex.

(560 acres Arable; 40 acres Pasture.)

Soil.—Gravelly loam, very various.

The Rotation of *Cropping* generally adopted is the six-course: one-third wheat, one-third oats and barley, one-third pulse and roots and clover.

Two-thirds of the wheat-land is, in ordinary years, sown in autumn; one-third in spring.

In the autumn of 1872 we could not sow all the clover lea on account of wet, and 90 acres of land intended for wheat were left unsown in 1872.

Our sorts were the Burmah, a stiff-strawed productive wheat of fair quality (Fig. 12), came originally from Burmah about 1862; Nursery, a red spring wheat, very common; and Rough Chaff Talavera, a new sort, of prime quality and productive (Fig. 11).

As to the treatment of the crop: manure is usually applied to the preceding crop, and it is mostly hoed in spring.

As to the character and date of harvest—both winter-sown and spring-sown wheats were bad alike, except that the spring-sown was very much more blighted.

Of nine fields of Burmah wheat seven were sown in November. They were respectively:—A thin crop, but very bright; a fair upstanding crop; one very much blighted and root fallen; a poor thin crop and much root fallen; a fair crop, but somewhat blighted; a fair upstanding crop, and promised a much better result; one was sown in February and was very short in straw and much blighted; one in February and March was the heaviest and best crop of any. A field of Rough Chaff Talavera, sown in March, was a middling crop, and rather blighted and smutty; and Nursery wheat sown in March on two fields was a very poor blighted crop, and very short in the straw and very much blighted—never, indeed, was yellow, but passed from green to brown.

You are very welcome to my experience, but I very much fear that your labours will be futile as to any practical results; these being, in my humble opinion, so entirely dependent on seasons.

It has always been the practice on this farm to sow wheat from October to March. In 36 years, therefore, I have had some experience, and, having constantly seen such contradictory results, I now sow when convenient, as well as I know how, and trust to Providence for the reaping.

The proportion usually sown in the autumn is about two-thirds; last autumn I was able to get in only about half. I have not known such a wet season since 1860, when I had to leave 30 acres of clover lea, and it was not sown till the 1st February, but it produced the best crop of that year — 40½ bushels per acre. Not so, however, this year, as 27 acres in the adjoining field, under precisely the same conditions, will not, I expect, produce 16 bushels per acre. So much for seasons. Not having thrashed much, I cannot give you actual results, excepting as to two small pieces. I send you two ears of the Burmah wheat, and two ears of the Rough Chaff Talavera; the former you will find is 5 set, which is very rare this year. I, however, found much of it thus, and I have one ear grown in 1870 which is 6 set, and contains 97 grains. The latter I have also a very high opinion of, but this is the first crop I have grown of it, and not under advantageous circumstances. On the whole I think it was a most unfavourable year for spring-sown wheats; the sodden state of the ground, followed by a dry cold spring, could have but one effect on the wheat crop generally, and that a very bad one. Threshing, I hear all round, has proved so very disappointing, that I dare not give an estimate of my unthreshed corn, but feel certain the result will be very unsatisfactory.

F. Sherborn.

Fig. 11.—*Rough Chaff Talavera.*

Fig. 12.—*Burmah.*

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2. Woodcote, near Carshalton, Surrey.

(640 acres, Arable.)

Soil.—A light sandy loam on chalk.

Rotation.—Hitherto we have had no particular rotation, having been guided by circumstances; at present we adopt the four- and six-course systems.

135 to 150 acres of wheat were autumn-sown, from beginning of November to middle or end of January.

Excessive and continual wet prevented us from getting in the usual quantity, and even on this light soil the tramp of the horses' feet formed pans in which water stood all winter, rotting the young germ; the consequence was a deficiency of plant from the commencement, resulting in one of the shortest crops ever grown.

About 43 acres were left unsown till spring.

Talavera was sown in the beginning of February; it came away strong and well, with an unusual crop of straw for this land, but was very deficient in yield. Nursery was sown in the middle of February and beginning of March; a nice thick crop, but it did not yield well. Bearded April wheat was sown in the middle of March; it gave a great crop of straw, and yielded well compared to the other sorts, but then only reached 4 quarters per acre—of splendid quality and weight, however.

All got from 3 to 5 cwts. per acre of a strong ammoniacal corn manure we specially prepared, well harrowed in, and applied in two doses.

Began cutting August 4th with two of Burgess and Key's reapers, two horses in each. We cut 250 acres of corn in 8 days in fine style, and had harvest gone on in the same way it would have been the best and cheapest ever known. Carting commenced on the 18th, and we finished on 17th September, and yet had not a sprouted sheaf. Spring wheats were ripe simultaneously with autumn-sown.

I am sorry I cannot send you any heads. I thought the sooner a bad crop was out of sight, the sooner it would be out of mind, and made short work of it. Produce over 154 acres, 387 quarters, or 20 bushels per acre.

James Arnot.

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3. Pendeford, Wolverhampton.

(540 acres, of which 390 are Arable.)

Soil.—A light loam on red sandstone.

The Rotation adopted is generally the 4-course.

60 acres of wheat are generally sown in autumn, 40 in spring, but last year half the land intended for autumn wheat was left unsown until spring.

65 acres of spring wheat were got in, 30 of which had been intended for autumn sowing.

Corner's white wheat was sown in November; crop good, 5 quarters 2 bushels per acre. Hallett's Victoria was sown in November; quality good, crop not equal to Corner's white by 12 bushels per acre. Taunton Dean sown in February; crop good, quality fair. The three crops above mentioned were sown on clover lea manured the July previously. Talavera was sown first week in March; crop good, quality very fine, sown after turnips. Taunton Dean sown in February; previous crop mangolds. Red Bearded wheat (or April) sown after roots, crop and quality both good, but apparently not equal in yield to Taunton Dean or Talavera; previous crop swedes. The mangolds were manured with town manure—with 4 cwts. of superphosphate applied at the time of sowing; all the crop was drawn off: the swedes with farmyard-manure, and other turnips with superphosphate, two-thirds of the roots were eaten on the land where superphosphate was applied, and one-half the swedes was drawn off where manure was used.

Harvest began on 16th of August for autumn-sown and 21st of August for spring-sown. I have given you the result of yield in one instance. I have not threshed more. My estimate of the crop is from 4½ quarters per acre of the winter-sown, and of the spring-sown 2 to 3 bushels per acre less on the average. I may remark that on this farm, the spring-sown wheat has been equal to the winter in quality and quantity. Our land is so apt to lose plant in the winter.

I usually sow one of my root fields with wheat, and do not seed it down, but manure it in the winter and take a second white straw crop to secure a plot of red clover, which I usually succeed in getting.

R. H. Masfen.

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4. Delamere Lodge Farm, Northwich, Cheshire.

(770 acres Arable: 600 acres Rough Wood-land; 14 acres Permanent Pasture.)

Soil.—Poor, thin, black and sandy, from 4 to 9 inches in depth, with grey sand as subsoil, or, still worse, what is locally known as "Fox bench," namely, *Oxide of Iron;* thickness varying from 1 to 4 inches, and, until broken up by steam power, impervious to water.

Climate good; but, as a rule, it gives us late harvests.

Rotation of Cropping.—On this farm no regular rotation has been adopted. The great aim is to grow as much wheat as possible, and, so long as the land is clean, we do not hesitate to take wheat after wheat, or wheat after oats. When we do this we always fold our feeding sheep on the stubble, consuming a large quantity of decorticated cotton cake, with either second-crop clover or turnips, as the case may be, carted on to the stubble; of course keeping the land ploughed close after the sheep.

240 acres of spring wheat are generally sown. No wheat was sown in autumn of 1872, as, from previous experience, we found that the winter frosts invariably make it an uncertain crop.

222 acres were sown with wheat in the spring of 1873.

Hallett's Pedigree and Hunter's White were the sorts grown. The former was first bought from Captain Hallett, 6 years ago, at 7 guineas per quarter, and has been used on the farm ever since with unvaried success. The plan I adopt is to exchange seed with a heavy-land farmer who sows it in the autumn and returns what I want to seed my land.

The land is kept in the highest state of cultivation by maintaining from 2000 to 3000 sheep, 120 to 150 head of cattle, and some 200 pigs.

The 222 acres of wheat average 37½ bushels per statute acre. Our great aim is to put this seed in on land in good heart, and with as solid a seed-bed as we can give it, not ploughing more than 5 inches in depth.

Simeon Leather.

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5. Bradford Abbas, Sherborne, Dorset.

(350 acres Arable; 50 acres Permanent Pasture.)

Soil.—Inferior Oolite—brash and sand of that rock; mostly light. Climate mild but moist. "The land of the mist."

The Rotation of Cropping generally adopted is the four-course system.

From 70 to 80 acres of wheat are generally sown in autumn, and seldom any in spring.

We had few difficulties at wheat seed-time in the autumn of 1872. On our light land in 1872 none.

90 acres of winter wheat, and 10 acres of spring wheat, were sown; the latter instead of barley.

White Essex or White Hoar, and Golden Drop, were sown in autumn; both good for this farm. Rivett's wheat sown in spring was poor.

All the winter wheat was sown before Christmas; Rivett's in March.

Winter wheat harvest commenced July 28th.

Of the three wheats used on the farm the yield per acre was—of Essex White, 9 sacks, 64 lbs. per bushel; of the Golden Drop, 8 sacks; of the Rivett's, 6 sacks, 59 lbs. per bushel.

The spring wheat was cut at the end of August.

The usual spring wheats do not fetch a good price. Such winter wheats as Nursery and Talavera may be sown after Christmas, but their yield is not usually good.

Spring wheat did not pay here on a good barley farm; and this year our winter wheat has been better than usual.

James Buckman.

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6. Kingscote, Wotton-under-Edge, Gloucestershire.

(360 acres Pasture; 400 acres Arable.)

Soil.—The Kingscote Home Farm is a light brash on the Oolite formation.

The Rotation of Cropping generally adopted is the five-field system—two years seeds.

One fifth of the wheat is generally sown with wheat in spring; namely, 20 acres where mangolds and swedes are got off.

We had no difficulties at wheat seed-time in the autumn of 1872.

Of wheats sown here, the Red Lammas, and Browick Red and Rough Chaff mixed, the latter was the most productive. The former is very suitable to our soil and climate. As a rule the sample was good.

The wheat was all put in with drill, 2 bushels per acre, horse-hoed, harrowed and rolled in the spring. No manure.

F. Burnett.

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7. Eglwysnunydd, Glamorganshire.

(Arable 141 acres; Pasture, 278.)

[This was the Prize-farm in 1872].

Soil.—The arable land is moderately light, and situated midway between the sea and the Margam mountains, 1129 feet high; the rainfall is, therefore, great, but the climate is mild.

Rotation.—The five-course is generally followed, and the wheat is planted after roots.

About 30 acres are nearly always sown in spring; and, not only on this farm, but within a radius of four miles, fully 90 per cent. is spring-sown.

Only one field in the parish was sown in the autumn of 1872.

Thirty acres were sown in spring on this farm.

The following sorts have been grown in this neighbourhood:—

Name.	Quality.	Productiveness.	Straw, and Remarks.
Chidham White.	Grain short and plump, weighing 62 lbs. per bushel.	Not very productive; the head short.	Grows rather long and weak. This kind is given up.
Shirreff'sBearded.	Very similar to Chidham; grain has a pearly appearance. 62lbs. per bushel.	Head short, and sheds very much if left too ripe.	Weak, especially just below the ear. Not sown since 1871.

Name.	Quality.	Productiveness.	Straw, and Remarks.
Rough Chaff White.	Good; weighing 61 lbs. per bush.; the grain longer than the two former. Very bad in wet seasons.	Head short and woolly. Yields on some occasions very well, and is much sown in this neighbourhood.	Very short and pretty stiff. Not sown on this farm since 1872.
Hallett's Victoria White.	Excellent grain; plump, and weighing 62 lbs.	Ears longer than any of the former, and yields well.	Long and moderately stiff.
Nursery Red.	Good; 62 lbs. per bushel.	Head short, and does not yield very well.	Short and weak. Not sown here since 1872.
Biddell's Imperial Red.	Good; weighing 62 lbs. Plump, and not very red.	Ears moderately long, and yields very fairly.	Stiff, but not as long as Victoria.
Giant Red.	Coarse; 60 lbs.	Head long.	Long and coarse.

As the wheat crop is taken after roots, it does not often require mowing or manuring, but is always harrowed and rolled in April.

The harvest this year was very late and wet. There is usually a difference of ten to fourteen days between the cutting of the autumn- and spring-sown wheats. The yield is considered bad this year, but I cannot give an opinion of my own, as I have only thrashed a very small quantity.

W. S. Powell.

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8. Rectory Farm, Weston Turville, Tring.

(220 acres, Arable; Permanent Pasture, 140.)

Soil.—Deep gravel.

Rotation.—Four-course.

About 60 acres are generally sown with wheat—50 in autumn, 10 in spring. All were in 1872 grown during the autumn. The sorts sown were Rough Chaff and Golden Drop, mixed; Rough Chaff and Uxbridge White, separate. The first named are the most productive, but the white wheats are of the best quality.

Date of sowing, October 25th to November 10th; sometimes as late as December. Clover leas are manured at Michaelmas; hoeing in the spring is always found advantageous.

Harvest commenced between 8th and 10th of August, 1872; got in with much difficulty, in consequence of precarious season.

Winter wheat averaged 4½ to 5 quarters.

The sorts above referred to make the top price, Chidham only excepted.

I do not recommend winter wheat being sown after the early part of December. It is after that better to plant spring wheat.

I made a trial last season by sowing two lands between other autumn wheat in January. The result was I had the wheat blighted and not half so good as that which had been early sown.

Some neighbours sow the Cone wheat, which gives larger yield, but is of inferior quality, and in straw and chaff nearly worthless.

M. J. P. Parrott.

9. The Agricultural Colony, Charnwood Forest, Leicestershire.

The farm of the Agricultural Colony and Reformatory School is situated on the Charnwood Forest hills, at an elevation of 700 feet above the sea-level. The soil is a light loam, lying upon porphyritic rock. When well farmed and fairly supplied with manure, good crops of cereals may be produced. Of root crops mangels will in ordinary seasons yield the most satisfactory results, while the common white turnip is invariably exceeded in produce by swedes. The disafforesting of the hills has had a considerable influence upon the rainfall of the district, and the portions of uncultivated land on the forest now carry a vegetation altogether different from that of twenty years ago.

The Systems of Rotation adopted on the farm under notice have been generally the five-course, with two years grass; and the ordinary Norfolk four-course, which preceded the five-course for the purpose of getting the land into condition by more frequent manuring.

Wheat and barley almost invariably follow the green crop, but an occasional deviation takes place when wheat is sown upon oat-stubble which has been dressed with farmyard-manure.

Until 1873 the sowing of spring wheat had not been attempted upon a large scale; but the difficulties of the seed-time of 1872, and the almost total failure of a large breadth of winter-sown wheat, decided our sowing a considerable extent of spring wheat. The autumn and winter of 1872 will long be remembered by the farmers of this district, especially such of them as had not the good fortune to have prepared for an early seed-time. The alternations of rains and frosts were most discouraging. During the months of October and November there were forty-one days upon which rain fell, and the quantity amounted to nearly eight and a half inches.

The extent of land intended to be sown with wheat was nearly fifty acres. Of this about nineteen acres were sown in a very indifferent manner, and with considerable difficulty. The most successful system of sowing was by broadcasting immediately after the ploughing; but if a few days of dry weather permitted, the drill was used. The varieties sown were Hallett's Red Pedigree, Golden Drop, Larney's Stiff Straw, and Rivett's. As to the comparative hardiness or adaptability of these varieties for a wet untoward season I cannot say much, as I believe where failures occurred the ploughing-up the winter-sown lands for spring corn was necessitated by condition of soil and bad seed-time rather than by differences in the hardiness of the varieties named.

The yield of winter-sown wheats of 1872 on this farm has been very much in excess of our expectations, and I believe the general yield of the district, though variable, is better than was anticipated.

The Golden Drop was sown on November 9th: preceding crop mangels; land limed ($2\frac{1}{2}$ tons per acre); three pecks of seed per acre, drilled at 8 inches between rows; land fairly dry. Looked well during winter, and yielded almost 32 bushels per acre.

Hallett's Pedigree was sown November 16th on oat-stubble, to which 15 loads per acre of good farmyard-manure had been applied; six pecks of seed per acre drilled 8 inches between the rows; land dry; top-dressed with $1\frac{1}{4}$ cwt. of nitrate of soda and $1\frac{1}{2}$ cwt. salt per acre in spring. It looked very well during winter; yielded quite 32 bushels per acre.

Rivett's, sown November 16th exactly as the preceding. Looked miserable during winter, but yielded 40 bushels per acre.

Larney's Stiff Straw, a Norfolk red wheat, was sown on December 14th. The preceding crop was mangels; $2\frac{1}{2}$ tons lime applied per acre; the seed was sown broad-cast, two bushels per acre, top-dressed with nitrate of soda $1\frac{1}{4}$ cwt., and salt $1\frac{1}{2}$ cwt. per acre, in the spring. Part of this crop was ploughed up and re-sown in spring; the remainder looked very badly during winter, but recovered in spring. The produce is estimated at 28 bushels per acre.

Of the spring-sown wheats, about five acres were on land upon which the winter-sown wheat had failed. The whole of the land had been ploughed for winter wheat, and such as was not sown remained in furrow all winter. A very good seed-time was taken advantage of in February and March. The varieties sown were Chidham, Nursery, Talavera, and April wheat.

Fig. 13.—*April Wheat.*

Fig. 14.—*Talavera Wheat.*

Fig. 15.—*Nursery Wheat.*

The Chidham, ordinarily sown in winter in this district, is occasionally used for spring sowing. Our experience of it as a spring wheat is on the whole favourable. It is a good miller's wheat, yields fairly, but on "soft" soils it becomes laid. This year it was sown (about two bushels per acre) February 22nd, on land which had grown a crop of potatoes. The produce is not yet threshed, but the yield will be about 30 bushels per acre.

Talavera was sown (two bushels per acre) March 21st, after potatoes. The plant was thick upon the ground, grew vigorously, stood well, and yielded 28 bushels per acre. I should say earlier sowing would have produced better results. The quality of the produce was good.

Nursery wheat was sown and treated exactly like the Talavera. This plant did not seem so vigorous, and did not promise as good a yield. It stood well, and yielded almost as much as the Talavera.

April wheat is little grown in this district. It is sometimes used for sowing amongst such winter-sown wheats as fall off or appear thin and delicate in spring. It is frequently attacked by smut, and farmers look out for a "bolder" wheat. The winter of 1872 and early spring of 1873, being so bad for wheat-sowing, caused greater attention to wheats which were supposed to be better adapted to a very late seed-time; and April wheat was so much inquired for, that its price rose quite fifty per cent.

Having well dressed our seed with Down's Farmers' Friend, it was sown on the turnip and mangel break on March 28th and 29th at the rate of two bushels per acre. The soil was in good condition at seed-time. The plant at first was very weak, but it grew rapidly, and the straw got to a good length and stood well. The crop is not yet threshed, but there is promise of quite 32 bushels per acre.

The wheat first ready for cutting was the Golden Drop; next came the Chidham and April wheat, followed by Hallett's Pedigree, Larney's Stiff Straw, Rivett's, and, last of all, Nursery and Talavera.

Our wheat harvest commenced August 25th, and the carrying was finished September 27th. It was the most protracted harvest time which we have had for years, and although there was not a great amount of rain to account for this, the humidity of the atmosphere, as evidenced by the wet and dry bulb thermometers, was very considerable in this district.

As regards the advisability of sowing what are recognized as winter wheats in spring, rather than the varieties of spring wheat, I am decidedly of opinion that if a good seed-time occurs in early spring, some varieties of winter wheats will yield a better return, both as regards quantity and quality, than the spring wheats; but when we are precluded from sowing before the middle of March, I prefer the spring varieties, and amongst these the April wheat has few superiors.

T. Carroll.

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10. Stancombe, Kingsbridge, Devon.

(217 acres, of which 165 are Arable.)

Soil is light loam on slate—warm and moist.

Rotation.—Wheat, green crop, wheat or barley, green crop, followed by barley with seeds.

Occasionally wheat or oats first, then two green crops to thoroughly prepare the ground for barley, when the seeds are to remain in grass longer than usual.

The wheat season begins in November, and continues until the middle of February. All wheat is winter sown in this neighbourhood.

All the fields that were ready to be sown before the 20th of November were got in well; after that there was great difficulty, and some being put in very wet, came very thin at harvest.

Much wheat was sown later than usual, and this was detrimental to the crop of such a season as 1872. Late-sown wheat generally will not bear artificial manure, except on our best wheat land and on high land near the sea.

Essex wheat was sown 11th November. Red Dantzic wheat was sown 15th November; Nursery on 16th November. I like the Essex wheat, and have kept by it five years. The Red Dantzic is a hardy red wheat, and bears a bad harvest better than most sorts, yielding usually a good crop. Nursery yellow wheat is of fine quality, and generally productive, tillering much in spring. It is dangerous to manure late-sown wheat, as it produces straw and not grain. Hoeing, which was generally practised some years ago, is now given up on our very light land. Harvest commenced August 10th. After the first week it was very wet. Much grain was lost; sprouted and stained.

I am farming my own property, and shall lay out more on pasture and get it in condition; and I do not grow more corn than is necessary for the straw to keep my stock. You will gather from my replies that I am farming my land easily and inexpensively, leaving my second-rate arable land in grass as long as it will produce grass to pay the bare yearly rent value. By this means I hope to much increase its productiveness when broken up, and to get good clover once in nine or ten years. Our pastures, meadows, and orchards, are worth more than double the uplands.

John F. Cornish.

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11. Barford Farm, Salisbury Plain.

(About 600 acres Arable: 150 acres Down Pasture; 90 acres Water Meadow and Pasture.)

Soil.—Principally light land on chalk subsoil, with a portion of bottom land, partly clay and partly sand.

Rotation—generally four-field course, viz.:—(1) wheat; (2) barley or oats; (3) partly grass and partly vetches; (4) partly old field and partly roots, with a portion down to sainfoin.

From 130 to 150 acres of wheat are generally sown in the autumn. Twenty-six acres were last year left unsown owing to weather, and this was sown in spring.

Nursery, and Morton's prolific and Lammas wheat mixed, were sown from November 6th to December 3rd, 1872. The quality proved very good; quantity per acre on the hill land about 22 bushels, which is below an average; low land 32 bushels, or an average.

Nursery wheat, sown January 16th, 1873, on the hill lands, yielded about 22 bushels per acre—quality very good. Nursery wheat, sown February 15th, on the low land clay, yielded about 33 bushels per acre—quality middling, a little pinched. This was a very good field of wheat; it was struck with the blight about a week before it was full; it was not cut before it was dead ripe, August 23rd. I should think the blight injured the crop to the extent of from 6 to 8 bushels per acre.

We began cutting the autumn-sown wheat on August 6th, carted from August 12th to the 19th. We began cutting the spring wheat on the 19th, and carted from the 26th to the 29th, in the midst of very stormy weather: could have carried it earlier and well, but preferred carting barley when the weather permitted.

About half of this farm has suffered from blight in the years 1866–1872, reducing the yield from 6 to 8 bushels per acre per year; but it did but very little injury to the autumn-sown wheat this year.

Jas. Cornlees.

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12. Bulbridge and Ugford, Salisbury.

(955 acres: 750 Arable; 106 Water Meadow, 70 Pasture, and the remainder Orchard and Homesteads.)

Soil.—A thin chalk, with deeper soil towards the meadows.

The Rotations of Cropping generally adopted are the four- and five-field systems. The extent sown with wheat in ordinary years is about 150 acres, about 20 acres of which are sown in the spring.

The difficulties of the wheat seed-time in the autumn of 1872 were not felt so much on this soil as in most localities.

About 30 acres intended for wheat were left unsown in 1872, and this was the extent sown with wheat in spring, 1873.

I generally sow Browick and White Taunton mixed, as I have found them answer best in the average of years.

I sow about half after lea, and half after turnips, rape, or cabbages. I never hoe unless to destroy annual weeds. Hoeing does not benefit the crop on this thin calcareous soil.

I began harvest the first week in August, and the wheat was saved without rain. The crop is of good quality, but it yields badly.

Nursery is the wheat that is generally sown in the spring. I sometimes sow Talavera. The last two years it mattered not what I sowed, it was all sadly blighted; and, although the crop was very promising till within a few days of its being ripe, in about forty-eight hours the straw became speckled, and some of it almost black; the result was only "chickens' food," with a fine crop of straw which was almost rotten.

The winter varieties, if sown in the spring, are attended with the same results if it be a blighty season.

I have reaped some good crops of Scotch wheat sown as late as the first week of April. This wheat scarcely ever blights, and is the safest to sow late in the spring.

JAMES RAWLENCE.

Epitomising these light-land reports in the same manner as those from heavy and medium soils, we find Mr. Sherborn, of Hounslow, looking back over 36 years' experience, distrusting the lessons of a single season. He has always sown "Nursery," "Burmah," and "Talavera" wheats from October to March. He has constantly seen contradictory results and now sows just when he can, accepting the result.—Mr. Arnot, of Carshalton, found "Nursery" wheat sown in February and March "a nice thick crop, but yielding unsatisfactorily." "Bearded April," which was sown the middle of March, was a great crop of straw, and yielded well compared with the other sorts; but these only reached 4 qrs. per acre—of splendid quality and weight however.—Mr. Masfen, of Pendeford, Wolverhampton, reports a satisfactory yield from sowings of all dates, the spring-sown sorts yielding less than the autumn-sown by not more than 2 or 3 bushels per acre.—Mr. Leather, sowing upwards of 200 acres of wheat in spring at Delamere Lodge, Northwich, gives a high character to Hallett's "Pedigree" wheat.—Mr. Buckman, farming near Sherborne, reports his autumn-sown "Nursery" wheat as yielding 9 sacks per acre and weighing 64 lbs. per bushel; the "Golden Drop," also sown in autumn, as yielding 8 sacks per acre, and Rivett's wheat, sown in March, yielding 6 sacks per acre, weighing only 59 lbs. per bushel.—Mr. W. S. Powell, farming at Eglwysnunydd, Glamorganshire, describes seven varieties of wheat, of which he has retained only two, Hallett's "Victoria" white, and Biddle's "Imperial" white.—Mr. Carroll, of the Reformatory Farm, Charnwood Forest, Leicestershire, enumerates several sorts. "Chidham," "Talavera," "Nursery," and "April" wheat are all described as spring wheats; and he declares himself confident of the advisability of sowing what are recognised as winter wheats in early spring, rather than any of the acknowledged spring sorts, certain that if a good seed-time occurs in early spring, some varieties of winter wheats will yield a better return, both as regards quantity and quality, than the spring wheats. When, however, he is precluded from sowing before the middle of March, he prefers the spring varieties, and among these the "April" wheat has few superiors.—Mr. Cornlees, of Barford Farm, on Salisbury Plain, gives a good account of spring-sown "Nursery" wheat.—Mr. Rawlence, of Bulbridge Farm, near Salisbury, describes an experience in which the difficulties of the wheat seed-time of last year have had very little place. The constant liability to mildew of which he complains, irrespective of sort or season, seems to be due rather to the condition of the soil, than to kinds of wheat or times of sowing.

Of course it is not in the reports from the lighter soils, but in those from heavy-land farms that there is any chance of useful information on the policy or impolicy of spring-sowing wheat under the special circumstances of 1872-3. But even here I fear that, on the whole, Mr. Sherborn's judgment, after 36 years' experience, will be very generally accepted. Whatever be the lessons of any particular year, farmers will begin wheat-sowing in October, or in milder climates in November, and get through it as quickly as the condition of the soil and of the weather will permit them. If all can be sown before winter, so much the better; but if not, the work will be continued as opportunity offers, so long as the soil is fit, with the certainty, however, that the later sown crops will be less productive than the earlier; with the probability, moreover,—on which this report is altogether silent,—that it may generally prove more profitable to sow barley in place of wheat after the month of February.

I must not forget, in this final comment on the reports here published, to call attention to the great advantages of preparedness and promptitude at seed-time, as being especially illustrated by the subsequent fortunes of the wheat crop in a difficult season. The report on page 100 is from Lord Ducie's Home Farm at Whitfield, Gloucestershire, which I know to be as liable as any of its class to suffer during excessive rains; but Mr. Cobban, who manages it—alone of all who have been good enough to relate in these pages their experience of such land last year—was able to declare—"We never had a finer seed-time than the autumn of 1872." His clover lea had been all ploughed up in August; and the earlier rains of that long season of wet weather beginning in October, from which so many others suffered, were just sufficient to make his land fit for drilling.

The several reports here collected will probably be found useful in bringing some new varieties of wheat into notice, and in calling attention to unsuspected features in the character of old sorts. "Nursery" wheat will not be so much trusted on wet, clay soils for even early spring sowing as it has been hitherto. Rivett's, on the other hand, will probably be more trusted than it has been. And the very strong testimony to Mr. Scholey's "Square-head" will probably secure for it extended use next year.

III.—*On the Composition of Waters of Land-Drainage.* By Dr. AUGUSTUS VOELCKER, F.R.S., F.C.S., Consulting Chemist to the Royal Agricultural Society.

THE examinations of drainage-waters, made by Professor Way and other chemists, have brought to light results which have an important bearing on the question of the exhaustion of cultivated soils, or the loss of nitrogen experienced from the growth of cereal crops, and on other agricultural problems. The composition and physical properties of the land from which drainage-water is derived have, as might be expected, a direct influence upon the composition of the water which percolates through it; hence the analyses of drainage-waters are also of interest in connection with the influence of the sources of water-supply upon the quality and fitness of the water for drinking and general domestic purposes. It is generally believed that drainage-waters from highly manured fields, or from land in a high agricultural condition, are very much contaminated with organic and saline impurities, and that they are either decidedly unwholesome or of a quality which renders their use for drinking purposes undesirable. We shall see how far this opinion is borne out by the results of my recent inquiry into the composition of drainage-waters. During the last ten or twelve years many samples of well-waters and waters of land-drainage have been sent to me with a view of ascertaining whether in the particular instances they were fit for domestic use. There are good and bad well-waters; and in not a few instances, I have found waters of land-drainage purer and of a better quality than the samples of well-waters which have been sent to me for comparative examination.

The results of water analyses have in many instances proved useful to householders anxious to ascertain whether the water in daily use for drinking and domestic purposes was wholesome, and whether it was good or bad for washing or cooking purposes. Such water-analyses, however, are not of much general interest, and not calculated to afford data for discussing and solving important practical questions which present themselves to intelligent agriculturists, and which are of special interest to the scientific inquirer into the *rationale* of particular agricultural practices.

It is not, therefore, necessary for me to allude to the numerous analyses of waters of land-drainage which have been made by myself and other chemists, mainly with the view of ascertaining the fitness of the water for drinking and household purposes.

The object of the present contribution to the 'Journal' of the Society is mainly to give an account of the results of no less than seventy complete analyses of land-drainage water having an accurately recorded agricultural history. This investigation has occupied me more or less for a period of three years; and as the results obtained are of considerable importance in a practical point of view, I am anxious to record them in detail, even at the risk of trying somewhat the patience of the reader.

The seventy samples of water which, as just mentioned, have an accurately recorded history, were kindly supplied to me by Mr. Lawes of Rothamsted. I feel much indebted to that gentleman and to Dr. Gilbert for sending me from time to time drainage-water from various plots of the experimental field at Rothamsted, which for more than twenty-five years has borne wheat from year to year in succession, thus giving me the opportunity to investigate the question of land-drainage, by supplying me with a series of drainage-waters which I could not possibly have obtained anywhere else under such favourable circumstances, inasmuch as an accurate account has been kept for more than twenty-five years of the kind and quantities of manure which each experimental plot of the wheat-field has received from year to year. A full record of the agricultural history of the experimental wheat-field will be found in Messrs. Lawes and Gilbert's classical report "On the Continuous Growth of Wheat for Twenty Years in Succession." *

The Broadbalk field, Rothamsted, is divided into a number of plots, each experimental plot occupying the space of two-thirds of an acre. It had grown wheat from year to year since 1844, and the different plots had been variously treated as regards manure.

By opening holes at the end of each drain, passing right through the middle of each experimental plot, the opportunity was given to collect separately the drainage from thirteen different plots.

These plots were treated as regards manure as follows:—

Plot 2.—Farmyard-manure every year, 14 tons.

Plots 3 and 4.—Unmanured every year.

Plot 5.—Since 1858, 200 lbs. sulphate of potash, 100 lbs. sulphate of soda, and 100 lbs. sulphate of magnesia; for crop of

* 'Journal of the Royal Agricultural Society,' vol. xxv. pp. 93 & 449.

1857-58 and previously, 300 lbs., 200 lbs., and 100 lbs. respectively, and 200 lbs. bone-ash, and 150 lbs. sulphuric acid (spec. grav. 1·7).

Plot 6.—The same mineral manures as Plot 5, and 200 lbs. of ammoniacal salts (equal parts of sulphate and muriate of ammonia of commerce), containing 41 lbs. of nitrogen.

Plot 7.—The same mineral manures as on Plot 5, and 400 lbs. of ammoniacal salts, containing 82 lbs. of nitrogen.

Plot 8.—The same mineral manures as on Plot 5, and 600 lbs. of ammoniacal salts (containing 123 lbs. of nitrogen).

Plot 9.—The same mineral manures as on Plot 5, and 550 lbs. nitrate of soda (containing 82 lbs. of nitrogen).

Plot 10.—Without mineral manure, and 400 lbs. ammonia-salts (containing 82 lbs. of nitrogen).

Plot 11.—Superphosphate (200 lbs. of bone-ash, and 150 lbs. sulphuric acid, and 400 lbs. ammoniacal salts).

Plot 12.—Superphosphate, and 366½ lbs. sulphate of soda, and 400 lbs. ammoniacal salts.

Plot 13.—Superphosphate, and 200 lbs. sulphate of potash, and 400 lbs. of ammonia-salts.

Plot. 14.—Superphosphate, and 280 lbs. sulphate of magnesia, and 400 lbs. ammonia-salts.

Plot 15.—Mixed alkalies, and 200 lbs. bone-ash, and muriatic instead of sulphuric acid, and 400 lbs. sulphate of ammonia one-half of the plot, and the other half used alkalies and superphosphate, and 300 lbs. sulphate of ammonia, and 500 lbs. of rape-cake.

Plot 16.—Mineral manures and 800 lbs. ammonia-salts 1852-64. Unmanured 1865 and since.

The drainage-waters, it will be seen, were collected from plots of the same field upon which wheat had been grown from year to year since 1844. These plots as regards manure were very differently treated.

From Plot 2 we have the land-drainage of the portion of field which had been manured every year with about 14 tons of farm-yard-manure.

Plots 3 and 4 had been left unmanured for a great number of years.

Plot 16 had been highly manured both with mineral and ammoniacal manure previous to 1865, and left unmanured since that year.

On Plots 5-9 a fixed quantity of a mixed mineral manure with variable quantities of ammonia-salts and nitrogen in the form of nitrate of soda had been applied, and

On Plots 10-14 a fixed quantity of ammonia-salts with different kinds of mineral manures were used.

The first series of drainage-waters was collected on the 6th December, 1866, at a full flow of the drains.

From 2 to 3 gallons of each sample of water were received for examination and submitted to careful analyses, which yielded the results incorporated in Table I. (pp. 136, 137), showing the constituents in the drainage-water in grains per gallon.

A careful perusal of the results of these analyses will bring to view a number of important and interesting particulars to which attention may be usefully directed.

1. In the first place it will be seen that the total amount of solid constituents in a gallon of the several waters of land-drainage varies greatly with the quantities and kinds of manure which the different plots had received.

The drainage from the continuously unmanured plots, Nos. 3 and 4, contained only 21 grains per gallon in round numbers, whilst the plots highly manured both with mineral and ammoniacal manures furnished drainage-waters containing from 48 to 56 grains of solid matter per gallon. Thus the drainage from Plot 14 contained nearly three times as much solid constituents as that from the unmanured Plots 3 and 4.

2. The influence of the application of mineral and ammoniacal manures previous to 1865, after which Plot 16 was left unmanured, is still perceptible in the drainage from that plot, but only in a slight degree; it contained 23 grains of solid matter per gallon, whilst the continuously unmanured Plots 3 and 4 gave only 21 grains.

3. The application of ammonia-salts to the land increased the proportion of mineral constituents in the drainage-water; and, as a rule, more mineral matter was found in the drainage from plots which had received a heavier dressing of ammonia-salts than those manured with more moderate quantities.

Thus the drainage from the unmanured Plots 3 and 4 contained 21 grains of solid constituents per gallon; Plot 5, manured with mineral manures without ammonia-salts, 26·85 grains; Plot 6, manured with the same mineral manures as Plot 5, with the addition of 200 lbs. of ammonia-salts, gave 37·1 grains; and Plot 7, treated like Plot 5, and the addition of 400 lbs of ammonia-salts, furnished land-drainage containing 48½ grains of solid constituents per gallon.

4. By comparing the proportions of lime in the several drainage-waters, it will be seen that in the samples from plots dressed with ammonia-salts it is much larger than in the drainage from the unmanured plots, and from the plots upon which no ammoniacal salts were applied.

The actual amounts of lime in the different samples varied from 8½ grains per gallon to 26 grains in round numbers.

TABLE I.—FIRST SERIES. DRAINAGE-

COMPOSITION OF DRAINAGE-WATER FROM PLOTS

Broadbalk Field, Rothamsted; Wheat

Manures stated in Quantities per Acre; Constituents

PER GALLON.	Farmyard Manure every Year.	Unmanured every Year.	SUPERPHOSPHATE AND SULPHATE OF POTASH, SODA, AND MAGNESIA. Without Ammoniacal Salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plot 2.	Plots 3 & 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
Organic matter and loss on heating ..	1·41	·85	1·11	1·55	2·75	1·01	1·61
Oxide of iron and traces of phosphoric acid	·15	·40	·39	·21	1·50	·20	·30
Lime	11·06	8·59	10·41	13·44	17·61	18·70	9·38
Magnesia	·32	·34	·39	·75	·84	·82	·43
Chlorine	1·37	1·16	·95	1·69	2·54	3·59	·74
Sulphuric acid.. ..	8·24	3·91	6·31	7.48	9·82	8·51	4·13
Nitric acid	5·28	1·75	2·37	3·59	5·86	6·93	1·91
Alkalies and carbonic acid	5·52	3·35	4·02	6·34	5·74	7·89	5·65
Soluble Silica	4·40	·80	·90	2·05	1·99	1·10	1·25
Total residue per gallon (dried at 260° Fahr.) ..	37·75	21·15	26·85	37·10	48·65	48·75	25·40
Ammonia, per gallon	·023	·018	·018	·020	·006	·040	·046

According to the preceding analytical results, the composition of the drainage-water from the

An imperial gallon contains:—							
Organic and volatile matter	1·41	·85	1·11	1·55	2·75	1·01	1·61
Oxide of iron ..	·15	·40	·39	·21	1·50	·20	·30
Carbonate of lime	4·59	8·82	8·50	11·32	13·75	16·34	9·82
Sulphate of lime ..	14·01	6·65	10·73	12·72	16·69	14·47	7·02
Nitrate of lime ..	8·01	2·66	3·60	5·45	8·90	10·52	2·90
Carbonate of magnesia	·67	·71	·82	1·57	1·76	1·72	·90
Chloride of sodium	2·26	1·91	1·56	2·78	4·18	5·63	1·36
Soluble silica ..	4·40	·80	·90	2·05	1·99	1·10	1·25
	35·50	22·80	27·41	37·65	51·52	50·99	25·16
Ammonia	·023	·018	·018	·020	·006	·040	·046

Waters collected December 6th, 1866.

differently manured, collected December 6th, 1866.

every year, commencing 1844.

in Drainage-Waters in Grains per Gallon.

400 lbs. Ammonia-salts (82 lbs. of Nitrogen).					Mineral Manure, as 800 lbs. Ammonia-salts, 1852-1864. Unmanured 1865, and since.	Per Gallon.
Without Mineral Manure.	With Superphosphate of Lime.	With Superphosphate and Sulphate of Soda.	With Superphosphate and Sulphate of Potash.	With Superphosphate and Sulphate of Magnesia.		
Plot 10.	Plot 11.	Plot 12.	Plot 13.	Plot 14.	Plot 16.	
1·10	1·25	1·35	2·25	2·05	·75	Organic matter and loss on heating
·35	·30	·35	·45	·40	·25	Oxide of iron and traces of phosphoric acid
13·10	14·33	18·05	20·21	26·28	9·26	Lime.
·67	·54	·50	·74	1·06	·43	Magnesia.
3·07	2·86	2·86	3·49	3·59	·53	Chlorine.
3·84	4·80	10·09	9·40	9·75	1·71	Sulphuric acid.
11·82	6·11	7·06	7·55	8·07	2·43	Nitric acid.
	5·01	8·60	7·25	9·21	6·69	Alkalies and carbonic acid.
2·90	·35	·49	·61	·60	1·15	Soluble silica.
36·85	35·55	49·35	51·95	56·01	23 20	Total residue per gallon (dried at 260° Fahr.).
not determined	·040	·028	·028	·020	·010	Ammonia, per gallon.

different plots may be represented as follows :—

						An imperial gallon contains :—
1·10	1·25	1·35	2·25	2·05	·75	Organic and volatile matter.
·35	·30	·35	·45	·40	·25	Oxide of iron.
18·61	13·93	13·09	17·41	18·35	12·12	Carbonate of lime.
6·53	8·16	17·15	15·98	16·57	2·91	Sulphate of lime.
not determined	9·28	10·72	11·43	12·25	3·70	Nitrate of lime.
1·31	1·13	1·05	1·55	2·22	·90	Carbonate of magnesia.
5·06	4·71	4·71	5·75	5·91	·87	Chloride of sodium.
2·90	·35	·49	·61	·60	1·15	Soluble silica.
35·86	39·11	48·91	55·43	58·35	22·65	
not determined	·040	·028	·028	·020	·010	Ammonia.

5. A glance at the combined results of the several analyses shows that much of the lime in the drainage passes away in the form of nitrate of lime.

6. All the drainage-waters from the plots to which chlorides had been applied contained considerably more chlorine in the form of chlorides than the drainage from plots upon which no chlorides had been used.

Thus the drainage from unmanured Plots 3 and 4 contained in round numbers 1 grain of chlorine, and that from Plot 5, not dressed with manures containing chlorides, yielded about the same quantity of chlorine, whilst the drainage from Plot 6, to which a mixture of 200 lbs. of sulphate and chloride of ammonia in equal proportions had been applied, contained 1·69 grains of chlorine; that of Plot 7, dressed with 400 lbs. of mixed ammonia-salts, gave 2·54 grains of chlorine; and that of Plot 8, manured with 600 lbs. of mixed ammonia salts, yielded 3·59 grains of chlorine.

7. The same remark applies to sulphuric acid. The plots manured with sulphates yielded drainage richer in sulphates than those to which no sulphuric acid, in the shape of readily soluble sulphates, had been applied.

Professor Way has shown that soils have not the power of absorbing and retaining the acid elements of chlorides and sulphates, and these results fully confirm his observations.

8. It is remarkable that the quantity of soluble silica in the drainage from Plot 2, continuously manured with farmyard-manure, contains nearly 4½ grains of soluble silica, which evidently is derived from the rotten straw in the dung, it being well known that straw abounds in silica.

9. Special attention is directed to the exceedingly small quantities of ammonia which were found in all the thirteen samples of waters.

Although some of the plots had been annually manured with large quantities of ammonia salts, and Plot 2 with farmyard-manure—containing nitrogen both in the form of ammoniacal salts and of decomposing nitrogenous organic matter, which readily gives rise to the formation of ammonia—all the drainage-waters contained, practically speaking, mere traces of ammonia. The drainage from the highly-manured plots, it will be seen, hardly contained more ammonia than that from the unmanured portions of the same field.

Professor Way has determined the amount of ammonia in rain-water in a series of samples, supplied to him by Mr. Lawes, representing the whole rainfall at Rothamsted of each month in the year 1855. The following table shows the amount in grains of ammonia and of nitric acid in an imperial gallon of the rain of different months:

TABLE *showing the amount of Ammonia and Nitric Acid in Rain-Water, 1855, in Grains per Imperial Gallon (Professor Way).*

	Ammonia.	Nitric Acid.
January	·092	·017
February	·104	·042
March	·086	·021
April	·123	·035
May	·080	·035
June	·135	·080
July	·061	·017
August	·080	·060
September	·095	·021
October	·061	·036
November	·054	·018
December	·067	·017

The mean quantity for the whole year is 0·86 grains in a gallon, or about 1·228 parts in a million of water according to Professor Way; and Mr. Lawes and Dr. Gilbert found, in their experiments in 1853 and 1854, on an average, as nearly as possible 1 part of ammonia in a million of rain.

On comparing the amount of ammonia in rain-water with the proportions which I found in the preceding drainage-waters it will be seen that the latter, without exception, contain less ammonia than rain. It follows from these observations that the ammonia in rain, as well as that contained in ammoniacal manures, and that produced during the decomposition of nitrogenous fertilising matters, is either absorbed by the soil, or that it is probably oxydised and converted into nitric acid. I may state here at once that I have examined drainage-water collected at all times of the year, and never found more than mere traces of ammonia in them, whereas the proportion of nitric acid in waters from land-drainage is nearly always more considerable than in rain-water, and, at times, very large indeed.

10. This leads to the consideration of the remarkable occurrence of nitric acid, or, more correctly speaking, nitrates in the drainage-water from land upon which nitrates have never been applied.

From the preceding calculated results it will be seen that the drainage from all the plots contained more or less nitric acid, and that even that from the plot upon which no manure whatever had been used for 25 years, contained an appreciable amount of nitric acid.

It is interesting to notice that the continuously unmanured Plots 3 and 5 furnished drainage-water poorer in nitric acid than any of the other plots, and that the influence of the application of ammoniacal salts to Plot 16 before 1865 is still perceptible in the slightly larger proportion of nitric acid which was found in the drainage of Plot 16.

All soils under cultivation contain vegetable matters in the shape of decaying roots and other remains of previous crops, and it is to the gradual decay and oxydation of the nitrogen contained in these vegetable matters that the presence of nitric acid in the drainage from the unmanured plots must be ascribed.

Farmyard-manure does not contain nitrates, nevertheless the drainage-water from Plot 2, manured with farmyard-manure, contained 5·28 grains of nitric acid per gallon, or about three times as much as the drainage from the adjoining unmanured plots.

It appears thus that a portion of the nitrogen contained in farmyard-manure passes into the drains in the shape of nitrates, and, this being the case, it appears to me better policy to manure moderately for each crop than to apply a heavy dressing of dung to one crop in a rotation and none to the succeeding crops; for it is plain that the loss in nitrogenous fertilizing elements by drainage will be greater if a large quantity of dung is applied at once to the land and left for a succession of crops than if each crop is manured in turn. In the former case a large mass of dung is exposed to the oxydising influence of the air and the solvent action of the rain at periods of the year when active growth practically is at a standstill, and rain falls more copiously than during the spring months and periods of active growth. A larger amount of nitrates under these circumstances passes into the drains than is likely to be the case if every crop is manured with more moderate dressings of dung, when each crop will receive a fresh supply of nitrogenous constituents that will afford nitrates at a time of the year when the crop can appropriate them and be benefited thereby. In other words, greater chance is given to the rain to wash out the nitrates more effectually when only one crop of a rotation is heavily dunged than is the case if farmyard-manure in more moderate quantities is applied to more than one crop.

11. Although large quantities of ammonia-salts had been applied to some of the plots, the drainage-water from these, and indeed from all the plots, contained merely traces of ammonia.

It will be noticed, however, that the drainage-waters from all the plots dressed with ammonia-salts were found to contain nitric acid in notable proportions; and, further, that from those plots which had been manured with the larger quantities of ammonia-salts the drainage was richer in nitric acid than the waters from the plots manured with a smaller quantity of ammonia-salts.

Thus whilst the drainage from the unmanured Plots, Nos. 3 and 4, contained only 1·75 grains of nitric acid, that from Plot 6, manured with 200 lbs. of ammonia-salts per acre, contained 3·59 grains of nitric acid; the adjoining Plot, No. 7, to which 400 lbs. of ammonia-salts had been applied, 5·86 grains; and the next Plot, No. 8, manured with 600 lbs. ammonia-salts, contained 6·93, or nearly 7 grains of nitric acid per gallon.

It appears from these experiments that salts of ammonia in contact with soil permeated by air suffer decomposition, and that the ammonia is gradually oxydised into nitric acid, which makes its appearance in land-drainage in combination with lime, and likewise, as we shall see further on, with magnesia. The oxydation of ammonia proceeds slowly but steadily; hence the ammonia-salts which had been applied early in spring gave rise to the formation of nitric acid, a considerable proportion of which continued in the soil for some months, as the drainage-waters collected in December contained more nitric acid the larger the proportion of ammonia-salts which had been applied to the plots in spring.

It may be inferred from these observations that, in all probability, nitric acid, and not ammonia, is the source from which plants derive their nitrogen as far as their supply is dependent upon the nitrogenous constituents of the soil.

12. It is a well-established fact that soils have not the power to retain either soda or nitric acid, and that, in consequence, the beneficial effects which usually result from the application of top-dressings with nitrate of soda to cereal crops in propitious seasons, are lost in a great measure when nitrate of soda is applied to the land early in spring, and continuous wet weather sets in.

The drainage from Plot 9, manured in spring every year with 550 lbs. of nitrate of soda per acre, presents a striking illustration of the effect of rain on soils top-dressed with nitrate of soda. The drainage-water taken in December from this plot contained only 1·91 of nitric acid, or scarcely more than that from the continuously unmanured portions of the same field, which shows plainly that soils have not the power of retaining nitric acid for any length of time.

On Plot 7, 400 lbs. of ammonia-salts, containing the same amount of nitrogen which is present in 550 lbs. of nitrate of soda, had been applied. The drainage from that plot contained in December 5·86 grains of nitric acid, or about 3 times as much as that from Plot 9 top-dressed with nitrate of soda. Whilst the nitric acid from the latter plot was removed in the course of the season, the ammonia-salts on Plot 7 appear to have become gradually oxydised and changed into nitrates. The land on Plot 7 contained, in consequence, considerable quantities of nitrates at a period of the year when the nitrate of soda applied to Plot 9 had drained away to a much greater extent.

We may learn from this comparison that whilst nitrate of soda is more energetic and rapid in its action than ammonia-salts, it is more liable to be washed out of the land than the latter; and that, in wet seasons, there is greater risk of losing the benefits of a top-dressing of nitrate of soda than is the case when sulphate of ammonia, guano, or other ammoniacal fertilizers are employed for cereal crops.

With regard to the distribution of rain, and the general character of the season in 1866, it may be observed that January, and the first half of February, were unusually warm, though in January there was a heavy fall of snow, which, however, rapidly thawed, and the whole period was very wet. March on the whole was cold and dry. The beginning of April was cold and rather wet. May was unusually cold, and there was a deficiency of rain. June was changeable, and during this month a considerable excess of rain fell. The beginning of July was cold and wet; then followed a week of hot and dry weather, but from about the middle of the month to nearly the end of September the weather was generally cold, with a good deal of rain and wind in August, and an almost continuous and excessive fall in September. October, however, was drier than usual. A good deal of rain fell about the middle of November and beginning of December, causing a full flow of the drains at the time when the samples of drainage-waters were collected.

Second Series of Drainage-Water Experiments.

The second series of drainage-waters (Table II.) was collected on the 21st of May, 1867. All the drains except that of Plot 2, manured every year with about 14 tons of farmyard-manure, were freely running at the time of collection. Hardly any water passed through the drain on Plot 2 at that time, and a sufficient quantity for the purpose of analysis could not be obtained.

In the first series of analyses neither potash nor soda were determined separately, nor was an attempt made to weigh the traces of phosphoric acid, which the qualitative examination has shown to exist in water of land-drainage.

In the second series of analyses both potash and soda were separately determined in all the samples, as well as the amount of carbonic acid combined with basic constituents; and in three instances the traces of phosphoric acid detected in the water were likewise determined by the delicate molybdate of ammonia process.

None of the samples contained more than merely faint traces of ammonia. It was not, therefore, considered necessary to determine the amount.

The results of the several analyses are incorporated in Table II. (pp. 144, 145).

By comparing the preceding analytical results with each other, and with the analyses of the drainage-waters collected on the 6th December, 1866, many points of interest are brought out, to some of which I shall now direct attention.

1. The total amount of fixed solid constituents varies from $16\frac{1}{2}$ to $32\frac{1}{2}$ grains per gallon in the several samples. It is smallest in the drainage from the continuously unmanured Plots, No. 3 and 4, which contained, in round numbers, only $16\frac{1}{2}$ grains per gallon of solid matter in solution.

On Plot 16 the influence of the application of mixed mineral and ammoniacal manures previous to 1865 is still perceptible in the larger amount of soluble constituents which passed from the land into the drainage, for it will be seen that the drainage from Plot 16 contained 21·41 grains of solid matter per gallon, whereas the drainage-water from the continuously unmanured Plots contained only 16·65 grains.

On comparing the relative amounts of solid constituents in the drainage from Plots 5, 6, 7, and 8, it will be seen that rain falling upon land which has been manured with mineral manures only, dissolves less mineral matter than from land upon which both mineral and ammoniacal fertilizing matters have been used. Thus the drainage from Plot 5, manured with superphosphate and sulphates of potash, soda, and magnesia, and without ammoniacal salts, contained 20·25 grains of solid matter per gallon, whilst the samples from the adjoining Plots 6, 7, and 8, treated like Plot 5 as regards mineral manures, with the addition of 200 lbs., 400 lbs., and 600 lbs. of ammonia-salts respectively, yielded 23·15 grains, 25·10 and 31·35 grains of soluble matter, the largest dressing of ammonia-salts causing the largest amount of mineral matters to appear in the drainage.

The solvent action of ammonia-salts upon the mineral constituents of the soil is likewise clearly traceable on Plots 11, 12, 13, and 14.

On Plot 5, which had been manured from year to year with mineral fertilizing matters without ammonia, the drainage contained 20·25 grains of solid constituents, composed almost entirely of mineral matter. The addition of ammonia-salts to the mineral manures used on Plots 11, 12, 13, and 14, had the effect of largely increasing the total amount of mineral constituents in the drainage from them.

At the same time it will be seen that ammonia-salts in a great measure cease to abstract soluble mineral matters from the land when they are applied to it for a great number of years. Thus the drainage from Plot 10, dressed every year with 400 lbs.

TABLE II.—SECOND SERIES. DRAINAGE-

COMPOSITION OF DRAINAGE-WATER FROM PLOTS

Broadbalk Field, Rothamsted; Wheat

Manures stated in Quantities per Acre; Constituents

PER GALLON.	Unmanured every Year.	SUPERPHOSPHATE AND SULPHATE OF POTASH, SODA, AND MAGNESIA. Without Ammoniacal-salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plots 3 & 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
Organic matter	·45	·35	·65	·99	1·20	·79
Oxide of iron	·153	·375	·247	·45	·29	·30
Phosphoric acid	·047	·025	·153			
Lime	7·50	8·62	9·66	10·24	13·02	8·56
Magnesia	·39	·32	·39	·50	·48	·52
Potash	·16	·38	·28	·40	·19	·15
Soda	·35	·86	1·10	·88	1·01	3·80
Chlorine	·42	·54	·82	·98	1·16	·53
Sulphuric acid	·61	2·26	2·68	3·25	4·43	1·63
Nitric acid	·14	·16	·24	·21	·74	2·12
Carbonic acid	5·83	5·85	6·44	6·65	8·38	8·16
Soluble silica	·60	·51	·49	·55	·45	·45
Total residue per gallon (dried at 260° Fahr.) ..	16·65	20·25	23·15	25·10	31·35	27·01

By uniting the acid with the basic constituents into the saline compounds which may be

An imperial gallon contains:—						
Chloride of sodium	·66	·89	1·35	1·61	1·91	·87
Carbonate of soda	..	·20	·66	..	..	3·64
Chloride of potassium ..	·25	..	..	..	..	..
Carbonate of potash	..	·55	·41	·58	·28	·22
Nitrate of lime	·21	·24	·36	·32	1·12	..
Nitrate of soda	..	..	..	..	..	3·33
Sulphate of lime	1·04	3·84	4·55	5·52	7·53	2·77
Carbonate of lime	12·50	12·43	13·68	14·03	17·04	13·25
Chloride of calcium	..	..	..	..	..	..
Oxide of iron	·153	·375	·247	·45	·29	·30
Phosphoric acid..	·047	·025	·153			
Carbonate of magnesia ..	·82	·67	·54	1·05	·91	1·09
Soluble silica	·60	·51	·49	·55	·45	·45
Organic matter and difference	·37	·52	·71	·99	1·82	1·09
	16·65	20·25	23·15	25·10	31·35	27·01

WATERS COLLECTED MAY 21ST, 1867.

DIFFERENTLY MANURED, COLLECTED MAY 21ST, 1867.

every year, commencing 1844.

in Drainage-Waters in Grains per Gallon.

400 lbs. AMMONIA-SALTS (82 lbs. NITROGEN).					Mineral Manure, and 800 lbs. Ammonia-salts, 1852–1864. Unmanured 1865, and since.	PER GALLON.
Without Mineral Manure.	With Superphosphate of Lime.	With Superphosphate and Sulphate of Soda.	With Superphosphate and Sulphate of Potash.	With Superphosphate and Sulphate of Magnesia.		
Plot 10.	**Plot 11.**	**Plot 12.**	**Plot 13.**	**Plot 14.**	**Plot 16.**	
1·65	2·10	·75	1·27	1·35	·61	Organic matter.
·29	·31	·40	·41	·30	·31	Oxide of iron. Phosphoric acid.
8·87	11·36	11·48	14·16	14·22	10·33	Lime.
·49	·59	·50	·51	·64	·43	Magnesia.
·27	·08	·14	·24	·16	·04	Potash.
·86	·63	1·60	·53	·47	·12	Soda.
1·21	·95	·92	1·08	1·09	·42	Chlorine.
1·92	2·74	4·32	4·13	4·31	1·06	Sulphuric acid.
·11	·14	·29	·25	·32	·28	Nitric acid.
5·64	7·49	8·95	8·78	9·53	7·21	Carbonic acid.
·60	·51	·60	·69	·21	·60	Soluble silica.
21·91	26·90	29·95	32·05	32·60	21·41	Total residue per gallon (dried at 260° Fahr.)

assumed to occur in the waters, their composition may be represented as follows:—

Plot 10.	Plot 11.	Plot 12.	Plot 13.	Plot 14.	Plot 16.	An imperial gallon contains:—
1·60	1·17	1·51	·86	·89	·23	Chloride of sodium.
..	..	1·38	..	..	..	Carbonate of soda.
·42	·13	..	·38	·25	·06	Chloride of potassium.
..	..	·21	..	..	..	Carbonate of potash.
·17	·21	·44	·37	·49	·42	Nitrate of lime.
..	..	..	..	..	..	Nitrate of soda.
3·26	4·66	7·34	6·02	7·33	1·80	Sulphate of lime.
13·34	16·48	14·84	19·30	19·09	16·53	Carbonate of lime.
..	·28	..	·67	·67	·39	Chloride of calcium.
·29	·31	·40	·41	·30	·31	Oxide of iron. Phosphoric acid.
1·03	1·24	1·05	1·07	1·34	·90	Carbonate of magnesia.
·60	·51	·60	·69	·21	·60	Soluble silica.
1·20	1·91	2·18	2·28	2·03	·17	Organic matter and difference.
21·91	26·90	29·95	32·05	32·60	21·41	

of ammonia-salts alone, contained much less solid matter per gallon than that from the adjoining plots, which received saline mineral manures in addition to the ammoniacal dressing.

2. The drainage from all the Plots contained less solid matter than the samples collected in December of the preceding year. This appears to indicate that at a period of the year when vegetation makes a vigorous start, the soluble saline soil constituents are taken up by the plant and utilized in promoting its growth; whilst at a time of the year when vegetation is at a standstill the soluble constituents pass more copiously into the drains.

3. With the exception of the drainage from Plot 9, where nitrate of soda was used, all the other samples collected in May, 1867, contained only minute quantities of nitric acid, whilst all the samples collected in December of the preceding year contained more nitric acid, and some of them in considerable quantity.

It would appear, therefore, that during the active growth of wheat, nitric acid, which is applied to the land in the shape of nitrate of soda, or which is gradually produced by oxydation of ammoniacal top-dressings, is consumed by the wheat-crop in considerable quantities, and employed, together with the needful soluble mineral constituents of the soil, in the development of the plant.

4. In the December drainage-waters, the proportion of nitric acid was largest in the samples from those plots upon which the largest quantities of ammonia-salts were used, whilst the drainage from Plot 9, dressed in spring with 550 lbs. of nitrate of soda, contained scarcely more nitric acid than that from the unmanured portions of the same field. In the drainage from Plot 9 collected in May, on the other hand, the amount of nitric acid was considerable, being from 10 to 15 times as great as that in the drainage from most of the Plots manured with ammonia-salts.

On Plot 9 it thus appears that there was more nitrate of soda at the command of the crop than it could utilize, and consequently an appreciable quantity passed into the drains; whilst in the case of the plots dressed with ammonia-salts not much more nitric acid was produced at the time by oxydation from the ammonia-salts than could be at once consumed and utilized by the growing crop.

The differences in the relative proportions of nitric acid in the December and the May drainages, from the plots manured with nitrate of soda and ammonia-salts respectively, are very instructive, and full of practical interest. The small quantities of nitric acid, or rather nitrates, in the drainage from land highly manured in spring with ammonia-salts, and the much larger amount in the drainage from land top-dressed with nitrate of soda, explain in a great measure the more powerful effect of the latter on vegetation. During the active spring growth of cereal crops dressed with nitrate of soda it appears that a considerable excess of soluble nitrogenous food circulates in the land, whilst no such excess is found in it at that period when the crop is manured with ammonia-salts instead of nitrate of soda. For this reason the effect of nitrate of soda upon a crop of wheat is seen almost directly after a good shower of rain has washed a top-dressing of nitrate of soda into the soil, and its growth is much more rapid than it is when the crop is manured in spring with ammoniacal fertilizers.

5. All the drainage-waters collected in May contained but little potash, and as, upon most of the plots, considerable quantities of sulphate of potash had been used, I found in these analyses a full confirmation of the well-known fact that the soil has the power of absorbing and retaining potash.

6. On the other hand, the proportion of soda in the drainage, it will be seen, is larger on the plots which were dressed with nitrate or with sulphate of soda. Thus, whilst the drainage of the unmanured Plots 3 and 4 contained only ·35 of soda, that from Plot 9 (nitrate of soda) contained 3·80 grains, and the drainage from Plot 12 (sulphate of soda) 1·60, or considerably more than all the other samples. Whereas the variations in the proportions of potash in the different samples were but slight, and the actual amounts of potash small, the variations in the relative proportions of soda in the different samples were great, and the actual quantities considerable, in the drainage from the plots manured with soda-salts, thus showing a marked difference in the retentive powers of soils for potash and soda.

7. In three instances the amount of phosphoric acid was determined. The quantity of phosphoric acid in drainage-water, it will be seen, amounts to mere fractions of a grain per gallon, showing that soils have the power of absorbing and retaining soluble phosphoric acid, which has been applied to them in the shape of superphosphate or other readily soluble phosphates.

I may observe, that as the quantity of phosphoric acid in waters of land-drainage is very minute, it was necessary to evaporate to dryness as much as half a gallon of water for each determination. The phosphoric acid was determined in the residue by the molybdate of ammonia process, and weighed as phosphate of magnesia.

8. The proportions of lime and sulphuric acid, it will be seen, were much greater in some samples than in others; as a rule, the greater the proportion of lime, the more sulphuric acid occurred in the water at the same time.

The larger proportion of sulphate of lime in some of the samples is, no doubt, due to the sulphate of ammonia with which some of the plots were manured every year, for it is well known that when a solution of sulphate of ammonia is filtered through a soil containing carbonate of lime, the sulphate is decomposed; and whilst the ammonia is retained in the soil the sulphuric acid contained in the sulphate of ammonia passes away in combination with lime.

As regards the distribution of rain between December 6th, 1866, and May 21st, 1867, it may be stated that a good deal of rain fell in December. In January we had heavy falls of snow, alternating with rapid thaws, warm weather, heavy gales, and a good deal of rain. A large amount of rain fell in the beginning of February, and a moderate quantity during the remainder of the month. A good deal of snow fell in March. April and the beginning of May were unsettled, and there was rather more than the average fall of rain.

Third Series of Drainage-Water Experiments.

During the summer months little or no water passes from the land into the drains, nor could sufficient be collected from all the Experimental Plots on Mr. Lawes's Broadbalk wheat field to enable me to make a full and strictly comparative series of analyses.

In January, 1868, all the drains at Rothamsted began to flow, and on the 13th of that month Dr. Gilbert kindly collected for me samples from 14 different plots, which, like the previous samples, were submitted to careful and full analyses, when the results shown in Table III. (pp. 150, 151) were obtained.

The preceding analyses suggest the following observations:—

1. The total amount of solid constituents in the drainage-waters from the different Plots of the Experimental Wheat-field varied from 18·11 grains to 57·55 grains in the imperial gallon. The drainage from the highly manured plots in some instances contained 3 times as much saline matters as that from the continuously unmanured Plots 3 and 4. On Plot 16, highly manured with mineral and ammoniacal manures previous to 1865, and since that year left unmanured, the drainage contained somewhat more solid constituents than on the continuously manured plots, but less than on the remainder of the experimental plots.

2. The drainage-water from all the plots of the same field contained merely traces of ammonia, although ammonia-salts had been applied to several plots in large quantities.

3. Appreciable quantities of nitric acid occurred in all the samples, even in those from the unmanured Plots 3 and 4.

The question arises, whence is the nitric acid in the latter case derived? The proportion of ammonia in rain-water is too small to give much support to the theory that the nitric acid in the drainage from the unmanured plots of the field is derived from the ammonia of the rain. In contact with the soil the ammonia of the rain will, no doubt, be absorbed and become oxydised into nitric acid; but probably only a fraction of the nitric acid which was actually found in the drainage is due to atmospheric ammonia, and much more is likely to have resulted from the gradual decomposition or decay of the roots and other vegetable remains left in the soil by the wheat crop.

4. More nitric acid was found in the drainage from the plots to which ammoniacal-salts were applied in large proportions than in the drainage from the plots on which they were used more sparingly. Thus the drainage water from Plot 6, manured with 200 lbs. of salts of ammonia, contained 4·60 grains of nitric acid; that from Plot 7, manured with 400 lbs. ammonia-salts, 7·59, and that from Plot 8, manured with 600 lbs. ammonia-salts, 8·38 grains of nitric acid per gallon.

On Plot 15 the drainage contained as much as 12·55 grains of nitric acid, showing how large a proportion of the most valuable fertilizing matter may be lost by drainage.

5. It will be seen that the drainage from Plot 9, manured in the preceding spring with nitrate of soda, contained much less nitric acid than that from Plot 7, upon which the same quantity of nitrogen was used in the shape of ammonia-salts. In the latter 7·59 grains of nitric acid per gallon were found, whilst the drainage from the nitrate of soda plot contained only 3·23 grains. The portion of the field which in spring had been manured with ammonia-salts, it thus appears, contained a larger proportion of nitrates than the plot top-dressed in spring with nitrate of soda, showing that the nitrogen of the manure had been removed to a greater extent by the rainfall during the autumn from the nitrate of soda plot than from the plot upon which the same quantity of nitrogen was employed by the shape of ammonia-salts.

6. The proportion of lime in the different samples varied considerably. Whilst the drainage from the unmanured Plots, 3 and 4, contained only 7·14 grains of lime, that from some of the manured plots contained from 16 to 19 grains. With an increasing proportion of nitric acid in the drainage that of lime also increased, showing that nitric acid passed off as nitrate of lime.

7. More magnesia was found in the water from the plots to which sulphate of magnesia had been applied than where no magnesia-salts were employed as manuring agents.

TABLE III.—THIRD SERIES. DRAINAGE-

COMPOSITION OF DRAINAGE-WATER FROM PLOTS

Broakbalk Field, Rothamsted; Wheat

Manures stated in Quantities per Acre; Constituents

PER GALLON.	Farmyard Manure.	Unmanured every Year.	SUPERPHOSPHATE AND SULPHATE OF POTASH, SODA, AND MAGNESIA. Without Ammoniacal-salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plot 2.	Plots 3 & 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
Organic matter ..	2·25	1·95	1·60	1·65	2·60	4·05	1·20
Oxide of iron	·21	·35	·15	·15	·25	·30	·35
Phosphoric acid ..	..	..	..	..	..	..	..
Lime	9·57	7·14	10·61	12·57	16·49	17·31	7·61
Magnesia	·36	·32	·46	·64	·54	·56	·27
Potash	·38	·17	·72	·60	·13	·27	·12
Soda	·96	·41	1·04	·72	1·06	1·01	2·94
Chlorine	1·53	1·02	1·17	2·56	1·97	4·38	1·31
Sulphuric acid	6·62	1·75	7·76	8·37	9·21	8·35	3·98
Nitric acid	3·39	1·80	2·50	4·60	7·59	8·38	3·23
Soluble silica	·60	·30	·45	·55	·20	·70	·60
Carbonic acid	3·03	2·90	1·89	4·32	4·51	5·14	3·24
Total solid matter per gallon (dried at 260° Fahr.) ..	28·90	18·11	28·35	36·75	44·55	50·45	24·85
Ammonia	·0045	·0125	·0136	·014	·0056	·0056	·0128

Combining the acid with the basic constituents the composition of the several waters may be

Chloride of sodium	1·80	·76	1·95	1·35	1·98	1·91	2·16
Nitrate of soda ..	..	..	..	..	..	..	4·93
Chloride of potassium	·61	·32	..	·95	·21	·42	..
Carbonate of potash	..	..	1·13	..	..	..	..
Chloride of calcium	·23	·59	..	2·02	1·04	4·72	..
Nitrate of lime ..	5·15	2·73	3·80	6·99	11·52	12·73	..
Sulphate of lime ..	11·25	2·97	13·19	14·23	15·66	14·19	6·77
Carbonate of lime	5·48	8·41	6·93	6·41	9·98	8·46	8·61
Nitrate of potash ..	..	..	..	..	..	..	·26
Carbonate of magnesia	·76	·67	·97	1·34	1·13	1·18	..
Nitrate of magnesia	..	..	..	..	..	..	·96
Oxide of iron ..	·21	·35	·15	·15	·25	·30	·35
Phosphoric acid ..	..	..	..	..	..	..	..
Soluble silica ..	·60	·30	·45	·55	·20	·70	·60
Organic matter and difference	2·81	1·01	excess ·22	2·76	2·58	5·84	·21
	28·90	18·11	28·35	36·75	44·55	50·45	24·85

Waters collected January 13th, 1868.

differently manured, collected January 13th, 1868.

every year, commencing 1844.

in Drainage-Waters in Grains per Gallon.

400 lbs. Ammonia-salts (82 lbs. of Nitrogen).					Bone-ash and Muriatic-acid and Sulphate of Ammonia.	Mineral Manure, and 800 lbs. Ammonia-salts, 1852–1864. Unmanured 1865, and since.	Per Gallon.
Without Mineral Manure.	With Super-phosphate of Lime.	With Superphos-phate and Sulphate of Soda.	With Superphos-phate and Sulphate of Potash.	With Superphos-phate and Sulphate of Magnesia.			
Plot 10.	**Plot 11.**	**Plot 12.**	**Plot 13.**	**Plot 14.**	**Plot 15.**	**Plot 16.**	
2·80	3·50	3·44	4·80	5·40	5·25	2·15	Organic matter.
·20	·15	·15	·20	·26	·26	·11	Oxide of iron.
·14	·18	·15	·10	·09	·14	·09	Phosphoric acid.
14·62	14·11	16·43	17·22	18·92	19·20	7·86	Lime.
·54	·56	·41	·58	1·13	·89	·41	Magnesia.
·14	·06	·26	·41	·05	·65	·26	Potash.
·52	·63	2·41	·56	·57	1·27	·29	Soda.
3·21	3·58	4·02	4·09	4·24	2·56	1·24	Chlorine.
4·15	5·08	9·54	7·59	9·34	12·01	1·78	Sulphuric acid.
6·84	7·77	8·13	9·46	10·19	12·55	3·65	Nitric acid.
·45	·30	·20	·35	·25	·30	·25	Soluble silica.
1·24	2·13	·96	1·69	2·97	2·47	2·67	Carbonic acid.
34·85	38·05	46·10	47·05	53·41	57·55	20·76	Total solid matter per gallon (dried at 260° Fahr.)
·0068	·006	·0045	·0091	·005	·0184	·008	Ammonia.
represented as follows:—							
·96	1·19	4·55	1·04	1·07	2·39	·53	Chloride of sodium.
..	..	..	..	..	..	..	Nitrate of soda.
·23	·10	·42	·65	·08	1·03	·42	Chloride of potassium.
..	..	..	..	..	..	..	Carbonate of potash.
3·94	4·39	1·65	4·92	5·55	·97	1·13	Chloride of calcium.
10·39	11·80	12·35	14·37	15·47	19·06	5·54	Nitrate of lime.
7·05	8·64	16·42	12·90	15·88	20·42	3·23	Sulphate of lime.
11·04	7·69	8·05	8·07	7·68	6·77	7·41	Carbonate of lime.
..	..	..	..	..	..	..	Nitrate of potash
1·13	1·18	·86	1·22	2·37	1·87	·86	Carbonate of magnesia.
...	..	..	..	..	..	..	Nitrate of magnesia.
·20	·15	·15	·20	·26	·26	·11	Oxide of iron.
·14	·18	·15	·10	·09	·14	·09	Phosphoric acid.
·45	·30	·20	·35	·25	·30	·25	Soluble silica.
excess ·68	2·43	1·30	3·23	4·71	4·34	1·19	Organic matter and difference.
34·85	38·05	46·10	47·05	53·41	57·55	20·76	

8. The preceding analyses also afford abundant evidence of the marked difference in the relative power of soils to absorb potash and soda.

Without exception all the drainage-waters contained but little potash, and in all cases more soda than potash. It will be noticed that the drainage from Plot 9, manured with nitrate of soda, contained 2·94 grains of soda, and that from Plot 12, upon which sulphate of soda was used, 2·41 grains, or very much more than the drainage from the plots upon which soda-salts formed no considerable part of the manuring mixtures used.

9. The drainage-waters in which phosphoric acid was determined contained only small, but appreciable, quantities of phosphoric acid. No great loss in phosphoric acid thus takes place by drainage if land is highly manured with soluble phosphatic manures, for the soluble phosphate of the manure is rapidly fixed by almost every kind of soil, and rendered insoluble to an extent which prevents the rain passing through the land from removing it to any great extent.

During the summer months of 1867 little or no rain passed through the drains. Comparatively little rain fell in October, and unusually little in November. In December there was a full amount of rain.

Fourth Series of Drainage-Water Analyses.

The next collection of drainage-waters (Table IV.) was made on the 21st of April 1868, when Dr. Gilbert again sent me twelve samples for examination. Unfortunately the drain from the plot manured annually with farmyard-manure did not run at the time the other samples were collected, nor could a sample be obtained from that plot in sufficient quantity for an exhaustive examination at any later period of the year. In all the samples the proportions of potash and soda were determined separately, and also, with one exception, the minute quantities of phosphoric acid which the different samples contained.

The ammonia was also determined quantitatively in several samples of this series; some samples, however, contained merely faint traces, and others no ammonia whatever.

The results of analyses are given in detail in Table IV., (pp. 154, 155).

A glance at the analytical results contained in this Table will bring to view some points of interest.

1. In the drainage-waters from the majority of the experimental plots, the total amount of solid matter varied much less than in the preceding series. Excepting the drainage from the nitrate

of soda plot, which contained as much as 47·85 grains of solid matter per gallon, the amount varied from 14·15 to 29·65 grains in the unmanured and the highly manured plots, whilst the drainage from the latter collected in the month of January contained from 47 to 57½ grains. This seems to indicate that the soluble matters of the soil are taken up by the wheat-plant in spring, and that the loss which the soil sustains in fertilizing matter by drainage is not nearly so great during the active growth of a crop as during the autumn and winter months when no crop is on the ground.

2. The composition of the drainage-waters collected on the 21st of April 1868 was very similar to that of the drainage-waters collected on the 21st of May 1867.

3. Practically speaking potash was not removed to any extent from any of the experimental plots in the drainage.

4. In the drainage-water from the plots manured with sulphate of soda, more soda was found than in the drainage from the plots upon which no sulphate of soda had been employed as a manure.

5. More magnesia likewise occurred in the water from the plot manured with sulphate of magnesia than from other parts of the same field.

6. All the drainage-waters from the plots to which superphosphate and chlorides had been applied contained more phosphoric acid and more chlorine than the unmanured plots; the amount of phosphoric acid which passed into the drains, however, was but small in every case.

7. In some of the samples the amount of soluble silica was considerable. For instance, the drainage from Plot 6 contained 5·10 grains of soluble silica, and that from Plot 13, 5·20 grains. Both samples were perfectly clear, they having been filtered through fine filtering-paper before they were submitted to analysis. Moreover, in both samples the proportion of soluble silica was determined twice with closely agreeing results, as I feared some mistake might have occurred in the first determination. There is, therefore, no doubt about the correctness of the silica determination, but I am at a loss to understand why some of the drainage-waters contained but little soluble silica and others, comparatively speaking, a large amount.

8. With the exception of the drainage from Plot 9, all the samples contained comparatively little nitric acid.

On the whole, however, there was more nitric acid present in the April collections than in the samples collected in May 1867.

9. Particular attention is directed to the large proportion of nitric acid in the drainage from Plot 9, which was manured in spring with 550 lbs. of nitrate of soda.

TABLE IV.—FOURTH SERIES. DRAINAGE-
COMPOSITION OF DRAINAGE-WATER FROM PLOTS
Broadbalk Field, Rothamsted; Wheat
Manures stated in Quantities per Acre; Constituents

PER GALLON.	Unmanured every Year.	Superphosphate and Sulphate of Potash, Soda, and Magnesia. Without Ammoniacal-salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plots 3 & 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
Organic matter ..	1·50	1·45	2·40	2·60	2·90	4·01
Oxide of iron	·25	·30	·20	·45	·15	·35
Phosphoric acid ..	·04	·102	·063	·064	·012	
Lime	5·96	6·66	6·04	8·01	7·16	10·75
Magnesia	·47	·46	·54	·56	1·06	·69
Potash	·07	·20	·21	·18	·13	·43
Soda	·67	·78	·75	·49	·31	6·57
Chlorine	·58	·65	·73	1·16	1·38	1·02
Sulphuric acid.. ..	·79	2·62	2·43	3·33	4·09	1·67
Nitric acid	·23	·37	·51	1·21	1·63	15·74
Carbonic acid	3·24	3·91	3·83	2·80	3·38	5·77
Soluble silica	·35	1·35	5·10	2·80	4·60	·85
Total solid residue per gallon (dried at 260° Fahr.) ..	14·15	18·852	22·803	23·654	26·802	47·85
Ammonia	faint trace	none	traces	·007	....	none

According to the preceding analytical data, the composition of the different drainage-waters

Chloride of sodium	·95	1·07	1·20	·92	·58	1·68
Carbonate of soda	·29	·37	·20	..	..	..
Chloride of potassium	..	..	..	·29	·21	..
Carbonate of potash	·10	·29	·31	..	..	..
Sulphate of lime ..	1·34	4·45	4·13	5·66	6·95	2·84
Chloride of calcium	..	..	..	·92	1·41	..
Nitrate of lime ..	·35	·51	·77	1·84	2·48	5·33
Nitrate of potash ..	..	..	..	..	..	·90
Carbonate of lime	9·44	8·28	7·28	8·37	4·89	13·86
Nitrate of soda ..	..	..	..	..	..	15·48
Carbonate of magnesia	·99	·97	1·13	1·18	2·23	..
Nitrate of magnesia	..	..	..	..	..	2·55
Phosphoric acid ..	·04	·102	·063	·064	·012	·35
Oxide of iron ..	·25	·30	·20	·45	·15	
Soluble silica ..	·35	1·35	5·10	2·80	4·60	·85
Organic matter and difference	·05	1·16	2·42	1·16	3·29	4·01
	14·15	18·852	22·803	23·654	26·802	47·85

Vaters collected April 21st, 1868.

ifferently manured, collected April 21st, 1868.

very year, commencing 1844.

ı Drainage-Waters in Grains per Gallon.

400 lbs. Ammonia-salts (82 lbs. of Nitrogen).					Bone-ash, Muriatic-Acid, and Sulphate of Ammonia.	Mineral Manure, 1800 lbs. Ammonia-salts, 1852–1864. Unmanured 1865, and since.	Per Gallon.
Without Mineral Manure.	With Superphosphate of Lime.	With Superphosphate and Sulphate of Soda.	With Superphosphate and Sulphate of Potash.	With Superphosphate and Sulphate of Magnesia.			
Plot 10.	**Plot 11.**	**Plot 12.**	**Plot 13.**	**Plot 14.**	**Plot 15.**	**Plot 16.**	
3·10	2·20	2·20	3·45	5·10	2·80	2·15	Organic matter.
·25	·25	·20	·15	·35	·30	·30	Oxide of iron.
·063	·051	·025	·051	·051	·075	·038	Phosphoric acid.
7·78	8·20	9·68	7·02	11·01	10·22	7·18	Lime.
·52	·46	·50	1·11	·70	·47	·39	Magnesia.
·06	·10	·20	·13	·10	·22	·29	Potash.
·41	·28	1·18	·30	·37	·71	·60	Soda.
1·24	1·24	·51	1·46	1·60	·87	1·02	Chlorine.
2·71	2·69	2·78	3·70	4·67	5·67	1·85	Sulphuric acid.
2·74	2·06	·47	1·52	1·82	2·05	1·59	Nitric acid.
3·18	2·57	7·56	3·66	3·23	3·87	3·01	Carbonic acid.
·60	·80	1·60	5·20	·65	·65	·25	Soluble silica.
22·653	20·901	26·905	27·751	29·651	27·905	18·668	Total solid residue per gallon (dried at 260° Fahr.).
·008	none	·043	·011	none	none	·005	Ammonia.
may be represented as follows:—							
·76	·96	·59	·58	·68	1·17	1·14	Chloride of sodium.
..	..	Sulphate of soda. 1·99	..	..	·15	..	Carbonate of soda.
·09	·15	·32	·21	·15	·34	·46	Chloride of potassium.
..	..	..	..	..	..	..	Carbonate of potash.
4·61	3·57	2·44	6·29	7·94	9·64	3·14	Sulphate of lime.
1·16	·65	..	1·57	1·75	..	·17	Chloride of calcium.
4·34	3·13	·71	2·31	2·76	3·12	2·41	Nitrate of lime.
..	..	..	..	..	..	..	Nitrate of potash.
6·59	9·16	15·11	5·11	10·57	9·25	8·78	Carbonate of lime.
..	..	..	..	..	..	..	Nitrate of soda.
1·09	·96	1·05	2·33	1·47	·99	·82	Carbonate of magnesia.
..	..	..	..	..	..	..	Nitrate of magnesia.
·063	·051	·025	·051	·051	·075	·038	Phosphoric acid.
·25	·25	·20	·15	·35	·30	·30	Oxide of iron.
·60	·80	1·60	5·30	·65	·65	·25	Soluble silica.
3·10	1·221	2·87	3·85	3·28	2·22	1·16	Organic matters and difference.
22·653	20·901	26·905	27·751	29·651	27·905	18·668	

This sample it will be seen contained no less than 15·74 grains of nitric acid per gallon. It will further be noticed that the nitric acid passed into the drains partly in combination with soda, and partly with lime, magnesia, and potash.

The combined results of the analysis of the water from Plot 9 show that there was in a gallon 15·48 grains of nitrate of soda, ·90 nitrate of potash, 2·55 grains of nitrate of magnesia, and 5·33 grains of nitrate of lime. In percolating through the soil, nitrate of soda, it appears, suffers decomposition, and gives rise to several compounds of nitric acid with bases; and it passes off not simply as nitrate of soda, for the amount of soda which was found in the drainage was not sufficient to bind the nitric acid, a portion of which entered in union with other bases, and passed into the drains as nitrate of lime and magnesia.

We learn from these experiments that in a wet spring the loss of nitrogen by drainage is unquestionably very great when the wheat crop is top-dressed with nitrate of soda; and that the loss of nitrogen in wet seasons is much more considerable in the case of nitrate of soda than when ammoniacal salts are employed as top-dressings for wheat.

Fifth Series of Drainage-Water Analyses.

The last series of analyses was made with samples collected December 29, 1869, at Rothamsted, at an enormous flow of the drains.

In October there was a deficiency of rain, and in November hardly any rain fell. In December, on the other hand, we had a very great excess of rainfall.

Notwithstanding the heavy and continuous rains which fell in December, and which caused the pipe-drains from all the other drains to run freely, little or no water passed through the drain-pipe from the plot usually manured with farmyard-manure, and consequently no analysis of the drainage from that plot could be made in December 1869. Dr. Gilbert informs me that whilst the pipe-drains from every one of the other plots in the experimental wheat-field run freely, perhaps four or five times or more annually, the drain from the dunged plot seldom runs at all more than once a year, and in some seasons not at all. The fact is the vast accumulation of decomposing organic matter on the plot, annually dunged at the rate of 14 tons of farmyard-manure per acre, lightens the soil and promotes the disintegration of the clayey portions, and altogether renders the surface-soil more porous, and capable of retaining much more water. Hence a much greater amount and continuity of rain is required before the porous surface is fully charged with rain, and an excess can reach the drains.

This result is interesting and important, for it illustrates in a striking manner the beneficial effects of farmyard-manure on the soil in ameliorating its texture, and, generally speaking, its mechanical or physical condition, in consequence of which the growing crops will suffer less during seasons of drought. Messrs. Lawes and Gilbert have found that the dunged soil, when saturated, retained within 12 inches of the surface, an excess of water which would be equivalent to about $1\frac{1}{2}$ inch of rain more than that held to the same depth on the unmanured and the artificially manured plots in the same field, which fully explains the circumstance that during the five collections of drainage-waters, samples from the dunged plot could be obtained only on two occasions.

The thirteen samples collected by Dr. Gilbert on 29th December were submitted to full analyses as before. No ammonia determinations, however, were made, as the qualitative examinations showed mere traces of ammonia in all the samples, and numerous determinations have been given in previous samples. The results of the analyses are given in detail in Table V. (pp. 158, 159).

1. It will be seen that the total amount of solid matter was almost precisely the same in the drainage from the continuously unmanured Plots 3 and 4, and from Plot 16, which was highly manured previous to 1865, but was left unmanured in that year and since. In both cases the amount of solid matter was 16 grains in round numbers. In the drainage from the other plots the solid matter varied with the kinds of artificial manures employed, and ranged from 19·80 to 37·45 grains per gallon.

2. The unmanured plots furnished drainage which contained appreciable quantities of nitric acid, which, no doubt, owes its origin to the decomposition and gradual oxydation of the vegetable remains left on the land by the previous wheat crop.

3. Nitrate of soda was applied as a top-dressing on Plot 9 in the middle of March, and as the drainage-water from that plot contained in December scarcely more nitric acid than the unmanured Plots 3 and 4, it may be presumed that any excess not consumed by the wheat crop was completely washed into the drains by the autumn and winter rains.

4. In the wheat experiments the ammonia-salts, on the contrary, were always sown broadcast in the autumn, and ploughed or harrowed in before sowing the seed; and it will be seen that the amount of nitric acid in the drainage-water was much greater on the three occasions of winter collection, soon after the ammoniacal-salts were sown, and when there was no growth, than on either of the two occasions of spring collection, when active growth had set in and the winter rains had, no doubt, removed a good deal of nitric acid into the drains.

TABLE V.—FIFTH SERIES. DRAINAGE-

COMPOSITION OF DRAINAGE-WATER FROM PLOTS

Broadbalk Field, Rothamsted; Wheat

Manures stated in Quantities per Acre; Constituents

PER GALLON.	Unmanured every Year.	Superphosphate and Sulphate of Potash, Soda of Magnesia. Without Ammoniacal-salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plots 3 & 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
Organic matter ..	2·85	1·55	1·95	2·75	3·20	1·60
Oxide of iron .. .. / Phosphoric acid ..	·85	·35	·15	·20	none	·50
Lime	5·15	7·22	8·62	11·17	12·88	5·04
Magnesia	·27	·63	·45	·46	·19	·14
Potash	·09	·20	·15	·10	·17	·45
Soda	·25	·59	·44	·59	·64	2·42
Chlorine	·58	·58	1·46	2·48	3·29	·58
Sulphuric acid	1·57	4·25	4·67	5·94	6·01	2·92
Nitric acid	1·35	1·43	2·57	4·03	5·06	1·78
Carbonic acid	1·49	2·20	1·94	2·28	2·71	3·27
Soluble silica	1·75	·80	·45	·40	·45	·55
	16·20	19·80	22·85	30·40	34·60	19·25

Combining the acid with the basic constituents, the composition of the preceding samples of

Chloride of sodium	·43	·95	·84	1·12	1·19	·96
Carbonate of soda	..	·15	..	..	..	1·52
Chloride of potassium	·13	..	·19	·15	·27	..
Carbonate of potash	..	·31	..	..	..	·66
Chloride of calcium	·35	..	1·34	2·70	3·61	..
Nitrate of soda ..	..	..	..	..	..	2·80
Sulphate of lime ..	2·67	7·22	7·94	10·10	10·22	4·96
Nitrate of lime ..	2·05	2·17	3·90	6·12	7·68	..
Carbonate of lime	5·61	6·27	5·98	6·36	7·37	5·36
Carbonate of magnesia	·57	1·32	·94	·97	·40	·29
Oxide of iron and phosphoric acid	·85	·35	·15	·20	..	·50
Soluble silica ..	1·75	2·20	·45	·40	·45	·55
Organic matter and difference	1·79	..	1·12	2·28	3·41	1·65
	16·20	20·94	22·85	30·40	34·60	19·25

'ATERS COLLECTED DECEMBER 29TH, 1869.

FFERENTLY MANURED, COLLECTED DECEMBER 29TH, 1869.

ery year, commencing 1844.

Drainage-Waters in Grains per Gallon.

400 lbs. AMMONIA-SALTS (82 lbs. of NITROGEN).					Bone-ash, Muriatic-Acid, and Sulphate of Ammonia.	Mineral Manure, and 800 lbs. Ammonia-salts, 1852-1864. Unmanured 1865, and since.	PER GALLON.
Without Mineral Manure.	With Superphosphate of Lime.	With Superphosphate and Sulphate of Soda.	With Superphosphate and Sulphate of Potash.	With Superphosphate and Sulphate of Magnesia.			
Plot 10.	Plot 11.	Plot 12.	Plot 13.	Plot 14.	Plot 15.	Plot 16.	
2·15	3·70	1·80	2·65	4·25	3·70	1·65	Organic matter.
·30	·20	·15	·10	none	·15	·10	Oxide of iron. Phosphoric acid.
9·57	9·94	11·62	11·87	13·94	12·82	6·38	Lime.
·37	·39	·38	·32	·50	·30	·20	Magnesia.
·03	·04	·14	·13	·01	·23	·09	Potash.
·19	·29	1·68	·34	·14	1·02	·42	Soda.
2·48	2·41	2·48	2·70	3·29	1·73	·79	Chlorine.
2·91	3·69	7·10	5·56	6·83	8·34	1·27	Sulphuric acid.
5·29	4·63	4·44	4·78	5·52	5·01	1·49	Nitric acid.
2·61	·35	·35	·20	·20	·45	·20	Carbonic acid.
·25	2·01	3·36	3·05	3·17	3·70	3·71	Soluble silica.
26·15	27·65	33·50	31·70	37·85	37·45	16·30	

drainage-water may be represented as follows:—

·36	·53	3·15	·63	·25	1·91	·79	Chloride of sodium.
..	..	..	..	..	..	..	Carbonate of soda.
·05	·06	·23	·20	·02	·36	·15	Chloride of potassium.
..	..	..	..	..	..	..	Carbonate of potash.
3·49	3·22	·72	3·48	4·89	·62	·37	Chloride of calcium.
..	..	..	..	..	..	..	Nitrate of soda.
4·95	6·27	12·07	9·45	11·61	14·18	2·16	Sulphate of lime.
8·03	7·03	6·94	7·26	8·38	7·61	2·26	Nitrate of lime.
5·41	5·96	7·12	6·69	6·86	7·28	8·11	Carbonate of lime.
·78	·82	·80	·67	1·05	·63	·42	Carbonate of magnesia.
·30	·20	·15	·10	..	·15	·10	Oxide of iron and phosphoric acid.
·25	2·01	3·36	3·05	3·17	3·70	3·71	Soluble silica.
2·53	1·55	..	·17	1·62	1·01	..	Organic matter and difference.
26·15	27·65	34·54	31·70	37·85	37·45	18·07	

TABLE VI.—DRAINAGE-WATER

BROADBALK FIELD, ROTHAMSTED; WHEAT

Nitrogen as Nitrates and Nitrites

	Farmyard Manure every Year.	Unmanured every Year.	Superphosphate and Sulphate of Potash, Soda, and Magnesia.				
			Without Ammonia-salts.	And 200 lbs. Ammonia-salts (41 lbs. Nitrogen).	And 400 lbs. Ammonia-salts (82 lbs. Nitrogen).	And 600 lbs. Ammonia-salts (123 lbs. Nitrogen).	And 550 lbs. Nitrate of Soda (82 lbs. Nitrogen).
	Plot 2.	**Plots 3 & 4.**	**Plot 5.**	**Plot 6.**	**Plot 7.**	**Plot 8.**	**Plot 9.**
Dec. 6, 1866, full flow	1·956	0·648	0·878	1·330	2·170	2·567	0·707
May 21, 1867, full flow	..	0·052	0·059	0·089	0·078	0·274	0·785
Jan. 13, 1868, full flow	1·256	0·667	0·926	1·704	2·811	3·104	1·196
Apr. 21, 1868, full flow	..	0·085	0·137	0·189	0·448	0·578	5·830
Dec. 29, 1868, enormous flow	..	0·500	0·530	0·952	1·493	1·874	0·659
Means	1·606	0·390	0·506	0·853	1·400	1·679	1·835

SUMMARY.

	Plot 2. Farmyard Manure.	**Plots 3, 4, 5, and 16.** No Nitrogen in Manure.	**Plot 6.** 41 lbs. of Nitrogen as Ammonia.
Dec. 6, 1866, full flow	1·956	0·809	1·330
May 21, 1867, full flow	..	0·072	0·089
Jan. 13, 1868, full flow	1·256	0·751	1·704
Apr. 21, 1868, full flow	..	0·270	0·189
Dec. 29, 1868, enormous flow.. ..	..	0·527	0·952
Means	1·606	0·486	0·853

ROM PLOTS DIFFERENTLY MANURED.

ERY YEAR, COMMENCING 1844.

r 100,000 parts of Water.

400 lbs. Ammonia-salts (82 lbs. of Nitrogen).					Mineral Manure, and 800 lbs. Ammonia-salts, 1852–1864. Unmanured 1865–1871.	Means.	
Without Mineral Manure.	With Superphosphate of Lime.	With Superphosphate and Sulphate of Soda.	With Superphosphate and Sulphate of Potash.	With Superphosphate and Sulphate of Magnesia.			
Plot 10.	Plot 11.	Plot 12.	Plot 13.	Plot 14.	Plot 16.		
..	2·263	2·615	2·796	9·289	0·900	1·818	Dec. 6, 1866, full flow.
0·041	0·052	0·107	0·093	0·119	0·104	0·154	May 21, 1867, full flow.
2·533	2·878	3·011	3·504	3·774	0·659	2·156	Jan. 13, 1868, full flow.
1·015	0·763	0·174	0·563	0·674	0·589	0·920	Apr. 21, 1868, full flow.
1·959	1·715	1·644	1·770	2·044	0·552	1·308	Dec. 29, 1868, enormous flow.
1·387	1·534	1·510	1·745	1·920	0·561	1·302	Means.

SUMMARY.

Plots 7, 10, 11, 12, 13, and 14. 84 lbs. of Nitrogen as Ammonia.	Plot 9. 82 lbs. Nitrogen as Nitric Acid.	Plot 8. 123 lbs. of Nitrogen as Ammonia.	
2·567	0·707	2·567	Dec. 6, 1866, full flow.
0·082	0·785	0·274	May 21, 1867, full flow.
3·085	1·196	3·104	Jan. 13, 1868, full flow.
0·606	5·830	0·578	Apr. 21, 1868, full flow.
1·771	0·659	1·874	Dec. 29, 1868, enormous flow.
1·622	1·835	1·679	Means.

5. In accordance with previous experience, more nitric acid was found in the drainage-water from the plots to which the larger quantities of ammonia-salts had been applied than in that from the plots on which smaller quantities had been used.

Other particulars which will be noticed in the composition of the drainage-waters of this last series fully confirm the statements already made.

The quantity of water which passes through the drains in the course of the year, as may be readily conceived, varies a great deal in different soils, according to the distribution of the rain in the year, and the quantity which falls at one period. The researches of Maurice of Geneva, Gasparin at Orange, Dalton in Manchester, Dickinson in Hertfordshire, and, more recently, by Mr. Risler of Geneva and by Messrs. Lawes and Gilbert, who have all endeavoured to determine the relative quantity of the rainfall which escapes into the air by surface-evaporation, and that which passes through the land into the drains, do not supply data from which an average estimate can be made. In the absence of satisfactory evidence, from which might be calculated the probable amount of water which passed annually through the drains of the different plots of the Experimental Wheat Field at Rothamsted, it is impossible to determine precisely the actual loss of fertilizing matter which the several plots sustained by drainage. It has been shown that the amount of nitrogen which passes into the drains, in the form of nitrates, is considerable when the land had been manured with ammonia-salts or with nitrate of soda. Messrs. Lawes and Gilbert, in a long series of experiments on the continuous growth of wheat on the same land, and on barley and meadow hay, have invariably experienced a great loss of nitrogen, which could not be accounted for satisfactorily; and it will be necessary to weigh the actual quantities of water which pass through the soil of a definite area, and to determine the composition of the whole of the drainage, before it can be ascertained how much of the nitrogen, which is not recovered in the produce, nor accumulates in the soil, passes away with the drainage-waters.

In order to afford a ready comparison of the preceding nitric acid determinations with others that have been obtained, or may be obtained, in similar experiments, a Table (VI., pp. 160, 161,) is given in which the amount of nitrogen as nitrates and nitrites has been calculated for 100,000 parts of water.

We learn from the foregoing calculated results how serious may be the loss of nitrogen by drainage when ammoniacal-salts, as nitrates, are liberally applied to the land in autumn, and there is much wet weather during the winter; or even when they are applied in the spring, if heavy falls of rain should set in. My analyses of drainage-waters from the Experimental Wheat-field, at Rothamsted, show that the drainage from land, manured in the autumn by an amount of ammonia-salts supplying 82 lbs. of nitrogen per acre, may contain from $2\frac{1}{2}$ to $3\frac{3}{4}$ parts of nitrogen, as nitrates and nitrites, for every 100,000 parts of water. For every inch of rain which passes through the drains and carries with it 1 part of nitrogen per 100,000 parts of water, there will be a loss of $2\frac{1}{4}$ lbs. (2·26 lbs.) of nitrogen of manure per acre. The drainage collected on the 13th of January, 1868, from Plot 14, contained in round numbers $3\frac{3}{4}$ parts of nitrogen, in the form of nitrates and nitrites, per 100,000 parts of water. For every inch of rain passing through the drains of that plot in January there was, consequently, a loss of about $8\frac{1}{2}$ lbs. of nitrogen, supplied in manure at a cost of about 1*s.* per lb. Although we do not at present possess data from which an accurate estimate can be made of the proportion of the rainfall which passes away by drainage, it may safely be assumed that during continued wet weather in winter several inches will pass through the drains, and a very considerable amount of the nitrogen supplied by the ammonia-salts, or nitrate of soda, in autumn will be wasted before the wheat crop makes a start in spring.

Probably the loss is much greater than it is generally admitted to be, and future quantitative analyses are likely to prove that by far the larger proportion of the nitrogen of manure not recovered in the crop is lost by drainage.

Conclusion.

Before concluding this Paper it may be of advantage to recapitulate briefly the more prominent and practically interesting points which have been brought out in the course of this investigation.

1. The proportions of ammonia and nitric acid in rain-water throughout the year are too trifling to afford an adequate supply of nitrogenous food necessary for the luxuriant and remunerative growth of wheat and other cereal crops.

2. Small as is the amount of ammonia in rain-water, the 70 samples of water from land-drainage examined by me contained still less. Practically speaking the drainage-waters contained only faint traces of ammonia.

3. On the other hand all the drainage-waters contained very much more nitric acid than rain-water at any time of the year.

4. The analyses of the drainage-waters from the different plots of the same field, variously treated as regards the supply of manure, afford striking illustrations of the power of soils to

modify the composition of the manures used, and to prepare plant-food, which is neither so soluble as to injure the crop, nor so insoluble as to remain inactive.

5. Although the drainage-waters were found to contain appreciable quantities of phosphoric acid and potash, practically speaking the land sustains by drainage no appreciable loss of these important mineral constituents of plants.

6. Whilst phosphoric acid and potash, which are the most valuable components of soils and manures, are retained in the land almost entirely, lime, magnesia, sulphuric acid, chlorine, and soluble silica, or the less important—because more abundant and widely distributed—mineral matters pass into the waters of land-drainage in considerable quantities.

7. The total amount of fertilizing matter which is carried off the land by drainage is greater on highly manured fields than on land left unmanured.

8. The loss of fertilizing matters by drainage is greater during the autumn and winter months than during the periods of active growth of plants.

9. Nitrogenous organic matters, applied to the land in farm-yard-manure, suffer decomposition, and are gradually resolved, at first into ammonia compounds, which are retained by the soil for a limited period, and finally oxydised into nitrates. Farm-yard-manure thus yields a more constant and gradual supply of nitrogenous food than nitrate of soda, which, unless consumed by the crop to which it is applied, is wasted to a large extent by drainage.

10. Although all soils have the power of decomposing salts of ammonia, and absorbing and retaining the latter for a limited time, the ammonia thus absorbed is rapidly oxydised in porous soils; and, in wet weather, a considerable proportion of the nitrogen applied to the land in the shape of salts of ammonia passes into the drains as nitrates and is lost.

11. With each increased supply of nitrogen by ammonia-salts, there was an increased loss of nitrogen in the form of nitric acid in the drainage-water.

12. Nitrate of soda is rapidly removed from the land by the rainfall, for soils have not the power to absorb and retain either nitric acid or soda to any great extent.

In one of the experiments the drainage from land after a recent application of a heavy dressing of nitrate of soda contained 5·83 parts of nitrogen as nitrates per 100,000 parts of water. This is equivalent to a loss of about 13 lbs. of nitrogen per acre for every inch of rain which then passed through the soil.

In wet seasons the loss of nitrogen by drainage is thus very considerable when nitrate of soda is applied to the land as a top-dressing for wheat.

13. The drainage from the unmanured parts of the Experimental Wheat Fields, as well as the manured plots, contained appreciable quantities of nitrogen in the shape of nitrates. There is, consequently, a loss of nitrogen by drainage, whether nitrogenous manures, ammonia-salts, nitrate of soda, or no manure at all is applied to the land.

14. The fertility of land is more readily impaired by the loss of nitrogen by drainage, than by the removal in that manner of those mineral matters which are food to plants.

15. Inasmuch as a considerable proportion of the nitrogen supplied by manure is wasted by drainage, much more nitrogenous food must be applied to the land than would appear necessary on theoretical grounds to produce a given increase in the crop.

16. Nitrates are invariably found at all times of the year in the watery liquid which circulates in the land, whereas ammonia-salts are never found in any appreciable quantity in that liquid. It may, therefore, be assumed that it is chiefly, if not solely, from nitrates that our crops build up their nitrogenous organic constituents.

17. It follows from the preceding paragraph that farmyard-manure fresh from the stables, or cattle sheds, as pointed out by practical experience, is best applied in autumn or winter. The manure will then have time to become rotten, and, by degrees, the nitrogenous constituents of the manure will become transformed into nitrates, of which there will be a ready supply in spring when vegetation makes a fresh start.

18. Ammonia-salts and other ammoniacal manures, as a rule, should not be applied to the land in autumn, but they may be put upon the land earlier in spring than nitrate of soda, with less risk of being washed into the drains. Probably the end of February, or beginning of March, is the best time for the application of ammoniacal dressings.

19. Nitrate of soda should be applied later in spring, and, generally speaking, the middle, or end of March, appears to be the best time in average seasons for the application of nitrate of soda as a top-dressing for cereal crops.

Laboratory, 11, *Salisbury-square, Fleet-street, London, E.C.*,
February, 1874.

IV.—*An Experiment in Pig-Feeding.* By C. G. Roberts, of Haslemere.

In the last number of this Journal, Dr. Voelcker, in an article upon Australian concentrated Mutton-soup as a Food for Pigs, gave the results of two experiments which I made with that substance. The supply of the mutton-soup was not enough to enable the experiment to be continued for a sufficient time to make it of much direct practical value, and, unfortunately, I have not yet been able to get a further supply. In that experiment it may have been noticed that the food used in conjunction with the mutton-soup was not barley-meal; although, from its uniformity of composition, its general use in practical feeding, and its adoption by Mr. Lawes for many of his elaborate feeding experiments, it might seem to be the material best fitted for the purpose. The substances used were malt-dust, palm-nut meal, and in some cases peas. These were chosen, not because of any special fitness for use in conjunction with mutton-soup, but simply because I had already been conducting a much longer feeding experiment, in order to ascertain whether malt-dust, with its comparatively low price and its extremely high manurial value, could be freely used to advantage as a food for pigs. Previous experiments had shown me that malt-dust, properly prepared by boiling or by long soaking, even when used alone, would keep store pigs in good condition. For the fattening of animals, however, we could only expect to employ this nitrogenous food economically when combined with some highly concentrated fat-forming food. Such a food we find in the best English palm-nut meal, the high percentage of oil (or ready formed fat) which it contains, rendering it, when used alone, too rich a food even for the assimilative powers of pigs.

The malt-dust used in the experiment was purchased in London, and I am indebted to the kindness of Dr. Voelcker for the following analysis of its composition :—

Analysis of Malt-dust.

Moisture	10·46
Oil	2·02
*Albuminous compounds	21·62
Starch, digestible fibre and a little sugar	46·46
Woody fibre (cellulose)	12·16
†Mineral matter (ash)	7·28
	100·00
* Containing nitrogen	3·46
† Containing sand and silica	2·14

The palm-nut meal was part of a quantity bought by the Agricultural Co-operative Association of Messrs. Smith and Co., Liverpool.

The following is an analysis, by Dr. Voelcker, of a sample taken at the works for the Association:—

Analysis of Palm-nut Meal.

Moisture	6·36
Oil	18·06
*Albuminous compounds	15·18
Mucilage, sugar and digestive fibre	37·96
Woody fibre	19·10
Mineral matter (ash)	3·34
	100·00
* Containing nitrogen	2·43

On the 26th September, 1867, four Sussex pigs of about ten months old, in very good store condition, were bought for 10*l.* 11*s.* They were fed for a few days, till they became accustomed to the food and the barn in which they were lodged, on a mixture of palm-nut meal and malt-dust, with a few boiled roots. They were weighed on the 27th October, at 3 o'clock, shortly before they received the first allowance of the weighed food.

	lbs.
No. 1, a black and white boar pig, weighed	149
2, a black sow, weighed	157
3, a black boar, ,,	149
4, a black sow, ,,	145

Food was prepared by mixing 112 lbs. of palm-nut meal and 56 lbs. of malt-dust in a thirty-gallon tub nearly filled with cold water. Of this mixture, as much as they could eat was given them twice a day. The experiment lasted for 94 days. During the first 40 days, 22 lbs. of cold boiled turnips were given with the other food each day, each pig thus getting 5½ lbs. of roots. As the pigs fattened the proportion of roots was diminished, and for the next 46 days only 11 lbs. per diem was given. No roots were given during the last eight days. From the 64th day till the time they were killed, 1 lb. of whole peas, in addition to the other food, was given per diem to each pig. My first intention was to have weighed the pigs each time they had finished their tubful of food; but when this happened at the afternoon, instead of the morning meal, it would have been necessary to weigh the fasting pigs in the morning instead of at 3 o'clock. To avoid the differences that might have resulted from weighing at different times of the day, the weighing only took place when the tub was nearly finished at the morning meal. Hence in Table I. the periods between the times of weighing will not be found uniform, but varying from seven to sixteen days. A glance at the Table will show that it does not record an even rate of progress for any one of the pigs. Observations recorded at such short intervals are liable to be affected by minor incidental circumstances in the health of the pig, that would not appear in observations made at longer periods; and even when we look along the line that gives the total increase in the weight of all four pigs taken

TABLE I.—SHOWING the GAIN in WEIGHT (in lbs.) of each PIG, and of the Pen of 4 PIGS, also the WEIGHT of FOOD consumed in each PERIOD between the TIMES of WEIGHING.

	First Period. 10 Days.	Second Period. 15 Days.	Third Period. 15 Days.	Fourth Period. 9 Days.	Fifth Period. 7 Days.	Sixth Period. 7 Days.	Seventh Period. 7 Days.	Eighth Period. 16 Days.	Ninth Period. 8 Days.	Total Period. 94 Days.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Pig No. 1 gained in weight	7	20	11	8	9	9	5	14	9	92
2 ,,	18	8	9	12	7	12	4	16	10	96
3 ,,	11	20	6	15	1	9	8	9	6	85
4 ,,	9	15	11	9	6	0	12	10	3	75
Total increase of weight in the 4 pigs	45	63	37	44	23	30	29	49	28	348
Palm-nut meal eaten	118	218	224	119	105	112	112	224	105	1337
Malt-dust eaten	59	109	112	59	53	56	56	112	52	668
Peas eaten	..	..	..	..	..	..	20	64	32	126
Total meal, &c. ..	177	327	336	178	158	168	188	400	189	2121
Boiled turnips eaten	220	330	330	99	77	77	77	176	None.	1386

together, it is difficult to find that the increase bears any proportion to the length of the period or the weight of the food consumed. To ascertain, however, the *pecuniary result* of the experiment, we need only compare the final total increase of weight with the total consumption of food, deferring for after consideration the progressive stages by which that result is attained.

Although when put up, and during the first half of the experiment, the pigs appeared to be all equally healthy and vigorous, a very marked difference occurred in the latter half. Pigs Nos. 3 and 4 progressed so slowly that something was supposed to be wrong with them. Pig No. 3 was restless, and breathed with a frequent grunt. On the 9th January, at the end of the 94 days, these two pigs were killed. No organic malady was found in No. 3, but in No. 4 the heart and lungs were found to be united, and a rib above them had been broken and imperfectly united. This casualty must have occurred a considerable time before the purchase of the pigs, as no sign of injury was then apparent.

Pig No. 3 had a live weight of 234 lbs., and a dead weight of 169 lbs.

Pig No. 4 had a live weight of 220 lbs., and a dead weight of 162 lbs.

Each of them was fairly well fattened, and was taken by the butcher at the top price of the day—6*d.* per lb.

On the 9th of January, the live weight of pig No. 1 was 241 lbs., and of pig No. 2 253 lbs. For convenience, these two pigs were not killed till the 24th of January, when pig No. 1 had a live weight of 257 lbs., and a dead weight of 190 lbs., and pig No. 2 had a live weight of 268 lbs., and a dead weight of 194 lbs. We may fairly conclude that, with pigs Nos. 1 and 2, the proportion between their dead and their live weights would be the same on the 9th as on the 24th January.

	Pork.
Pig No. 1. Since 257 lbs. live weight yielded 190 lbs. pork, 241 lbs. live weight would give	178 lbs.
Pig No. 2. Since 268 lbs. live weight yielded 194 lbs. pork, 253 lbs. live weight would give	183 ,,
Pig No. 3 yielded	169 ,,
Pig No. 4 yielded	162 ,,
Total weight of carcasses	692 lbs.

The money received, at 6*d.* per lb., amounted to 17*l.* 6*s.*, a sum slightly exceeded by the cost incurred.

	£	s.
Cost of store pigs	10	11
Cost of food	6	15
Cost of attendance	0	10
Cost of killing	0	4
	18	0

We find, therefore, that in this case we have no exception to the general rule, that the profits of feeding must be obtained from the value of the manure produced. Estimating the value of the dung produced from the food consumed at the rates given by Dr. Voelcker in the Journal for 1867, page 655, the following will be the balance sheet.

Costs.	£	s.	d.	*Receipts.*	£	s.	d.
4 store pigs	10	11	0	692 lbs. of pork, at 6*d.* per lb.	17	6	0
Attendance	0	10	0				
Killing	0	4	0				
1327 lbs. palm-nut meal, at 8*s.* per cwt.	4	14	10	Manurial value, at 34*s.* per ton	1	0	3
668 lbs. malt-dust, at 4*s.* per cwt.	1	3	9	,, ,, 71*s.* ,,	1	1	2
116 lbs. peas, at 1*d.* per lb. ..	0	9	8	,, ,, 62*s.* ,,	0	3	3
$12\frac{1}{2}$ cwt. turnips	0	5	5	,, ,, ,,	0	2	0
Balance, being profit	1	14	0				
	19	12	8		19	12	8

If all the pigs had been equally healthy the profit would no doubt have been greater, and even at the unusually low market price of 6*d.* per lb. it would then have been satisfactory to the feeder. Was the consumer also satisfied? This is a question that must never be overlooked in testing any novelty in feeding. The foods that may be most economical to the farmer, when first tried, will not continue to be so if the flesh produced by their use is of inferior quality. The free use of roots is known to produce a pork that wastes in cooking; where many peas are given the pork is hard; and with some foods rich in oil the fat itself becomes oily and wanting in firmness. An experience of some four or five years with the same food, given in slightly different proportions, enables me to say confidently that the food used in this experiment produced meat quite as good as that of pigs fed on barley-meal. The same butchers have purchased pigs so fed year after year, and have always given the top price of the day, some of them knowing that no barley-meal was used on the farm.

I will now compare the results given with those obtained in the feeding experiments conducted by Mr. Lawes. In this case the object was economical rather than scientific, not aiming at illustrating the general principles of nutrition, but with the much humbler intent of ascertaining the effects of a particular food; but we may yet learn something as to the fitness of the food used, by comparing it with those used in the experiments at Rothamsted.

In Table II. the whole time of fattening is divided into four nearly equal periods. The proportion of roots differs greatly in these periods, and we cannot compare the results obtained till we reduce the different dietaries to some one common standard of value. This is done in the last line but one of the table, which gives the weight of the dry organic matter, the only portion which is likely to possess a feeding value. The quantities there given are obtained by deducting the weight of the water and of ash contained in each constituent of the food.

TABLE II.—SHOWING the GAIN in WEIGHT (in lbs.), the WEIGHT of FOOD and of DRY ORGANIC MATTER consumed in each of 4 PERIODS of the TIME of FATTENING.

	25 Days, ending 1st Nov.	24 Days, ending 25th Nov.	21 Days, ending 16th Dec.	24 Days, ending 9th Jan.	Total 94 Days.
	lbs.	lbs.	lbs.	lbs.	lbs.
Pig No. 1 gained in weight ..	27	19	23	23	92
,, 2 ,, ,, ..	26	21	23	26	96
,, 3 ,, ,, ..	31	21	18	15	85
,, 4 ,, ,, ..	24	20	18	13	75
Total increase in the 4 pigs	108	81	82	77	348
Palm-nut meal eaten	336	343	329	329	1337
Malt-dust	168	171	165	164	668
Peas	..	..	20	96	116
Boiled turnips	550	429	231	176	1386
Total weight of food eaten	1054	943	745	765	3507
Weight of dry organic matter ..	482	482	466	524	1954
Consumption of dry organic matter to produce 100 lbs. increase in live weight ..	446	595	568	681	561

It will be seen that, as is almost invariably the case in fattening pigs, the highest return in flesh for the food consumed was obtained within the first month of the fattening process; the second period gives a much smaller return for each one of the pigs. In the case of Pigs Nos. 3 and 4, the return is still smaller in the third and fourth periods, so that they became less and less profitable as the experiment advanced: on the other hand, the thoroughly healthy pigs, Nos. 1 and 2, were more profitable in the third and fourth than they were in the second period.

From the last line in the table we see that less food was required to produce 100 lbs. increase in live weight at the beginning than at the end of the process of fattening.

The average for the whole period of 94 days shows that 561 lbs. of dry organic matter was needed to produce each 100 lbs. of increase. In the experiments at Rothamsted a similar increase was obtained from the consumption of smaller quantities of food. Mr. Lawes used various combinations of meal, from barley, beans, lentils, and Indian corn, with some bran. Taking the average of twelve pens of three pigs each, we find 100 lbs. of increase was obtained at Rothamsted from the consumption in Series I. (page 514) of 488 lbs., and in Series II. (page 516) of 461 lbs. of dry organic matter.*

The lower result obtained in the present case may be fairly attributed in part to the inferior powers of Pigs Nos. 3 and 4; but, even allowing for this, we must conclude that, comparing them weight for weight, and apart from the questions of prime cost and of the value of the manure, the mixture of malt-dust and palm-nut meal is as a *food* inferior to the mixtures of meals given by Mr. Lawes. The pigs did not consume it so freely; and, since the accumulation of fat results simply from the excess of assimilated food over the quantity required for respiration and to replace wasted tissue, the necessary result is that they fattened more slowly.

We shall, however, be better able to compare the results with those obtained by Mr. Lawes, if we reduce them to the standard adopted by him in Tables XXII. and XXIII. of his Report, pages 508 and 510, showing the *Average Weekly Consumption* per 100 lbs. live weight of animal, of dry organic matter.

Table III.

	During First Period.	During Second Period.	During Third Period.	During Fourth Period.	Total Period of 94 Days.
	lbs.	lbs.	lbs.	lbs.	lbs.
Average total weight of 4 pigs	654	748	830	910	780
Average dry organic matter consumed *per week* by 4 pigs ..	135	143	148	153	145
Average weekly consumption, of dry organic matter per 100 lbs. live weight of animal. Quantities stated in lbs. and tenths	20·64	19·12	17·83	16·81	18·60

In Mr. Lawes' experiments (Series I., page 508) we find, taking the mean of twelve pens of pigs fed on different combinations of meals and bran, 24·84 lbs. of dry organic matter was consumed per week for each 100 lbs. of live weight of animal, while in Series II., page 510, the consumption is even more, amounting to 26·8 lbs.

It will be seen that the rate of consumption at Haslemere was not much more than two-thirds of the consumption at Rothamsted; and when we consider how much of the food is required for respiration and the waste of tissue, I think we must be struck by the comparatively good return of 100 lbs. increase in live weight for each 561 lbs. of dry organic matter consumed. It

* 'Journal of the Royal Agricultural Society of England' for 1853.

certainly looks as though the fault did not lie in the nutritive power of the food, but rather in its being not sufficiently palatable to induce the pigs to consume it largely. If, by the addition of some highly-flavoured condiment, the pigs could have been induced to eat half as much again of the food, it seems probable that they might have fattened even more rapidly than those at Rothamsted, and the profits in that case would have been very much increased. This, however, is only a surmise, but may be worth testing by direct experiment. It is of course open to doubt, on the other hand, whether the limit of consumption was not fixed rather by the crudeness than by the unsavouriness of the food, for palm-nut meal and malt-dust contain fibre in a digestible and an indigestible form in larger proportion than many of the foods commonly giving to fatting pigs. The results obtained by Mr. Lawes in his most valuable and elaborate feeding experiments will always serve as a standard by which to test the results of isolated experiments. But for such a test, the pecuniary result of this experiment would not of itself lead one to suspect any great defect in the yield of flesh from the food consumed.

V.—*The Influence of the Wet Season of* 1872 *on Steam-cultivation.* By C. G. Roberts, of Haslemere, Surrey.

Within the last six years the agriculturists of this country have had to contend with exceptional difficulties caused by two years of extraordinary drought in 1868 and 1870, and one year of excessive rainfall in 1872. Seasons that thus differ from our ordinary experience are usually unfavourable to the agriculture of the country; and though each farmer may remember some crop that was benefited by an extraordinary season, there are probably few men who can look back with much satisfaction upon the general results obtained in the years 1868-72.

In agriculture, however, as in other arts, the history of our failures is often more instructive than that of our successes; and he whom experience teaches may, from past losses, gather material for future gains. "Some of the Agricultural Lessons of 1868" have been drawn out by Mr. J. C. Morton, in a former number of this Journal,* while Messrs. Lawes and Gilbert have described the "Effects of the Drought of 1870 on some of the Experimental Crops at Rothamsted."†

In the following paper an attempt has been made to gather together, for comparison, observations and experience from many quarters on a single department of farm practice. The general

* Second Series, vol. v., p. 27, 1869. † Ibid., vol. vii., p. 91, 1871.

advantages of steam-cultivation have been amply discussed and pretty generally admitted. Its special advantages in the very dry season of 1868 furnished one of the most interesting topics discussed by Mr. Morton; but the results obtained in a very wet season were wanted to present the subject fairly under all its aspects. The year 1872 will be long remembered as one unfavourable for almost all kinds of tillage. The first quarter of the year was remarkable for its high temperature and heavy rainfall. At Greenwich the warmth of the whole quarter was 5° above the average of 101 years, and the rainfall 1·4 inches in excess of the average of 57 years: in all parts of the country farm-work was impeded by an excess of moisture saturating the land. The prospect of an early spring was checked by quick alternations of temperature during April and the early part of May; the latter half of May and the beginning of June were remarkable for frequent frosts and a deficiency of daily temperature resulting from a cloudy sky. From the middle of June until the end of July hot weather prevailed: the rainfall at Greenwich was slightly below the average, but heavy thunderstorms visited many parts of the kingdom, and were especially violent in the northern counties. The early part of August was cold and wet. Short intervals of finer weather enabled a late harvest to be completed during the end of August and the beginning of September over the greater part of England; but in Scotland and on some of the high-lying land in the north of England the crops were not removed from the land before the commencement of a period of autumn and winter rain, almost unprecedented for its excess.

During the months of October, November, and December, a total rainfall of 11·32 inches was recorded at Greenwich, an amount 4·2 inches above the average of 57 years, and greater than is recorded for any one year since 1821, when it was 11·47 inches. The average fall of rain for the whole country was 13·97 inches. Out of the 92 days comprised in the quarter, rain fell at Greenwich on 67 days, a number which exactly corresponds to the average obtained from all the stations included in Mr. Glaisher's report, and is a greater number than is recorded for the same three months in any one of the 57 years registered at Greenwich.

This last quarter of the year was remarkable not only for the number of its wet days and the total quantity of rain that fell, but also for the violence of its storms, strewing our coasts with wrecks, and causing many of our largest rivers to overflow their banks and flood the surrounding country. In such a season we should expect to sustain the maximum amount of injury that excessive rain can inflict upon agriculture.

The injury and losses sustained by those who adhered to the old and beaten track of horse-culture were borne mostly in silence; and, presenting little novelty, they attracted comparatively little attention. On a great number of farms steam-cultivation had been recently adopted; everything that affected its success or failure was therefore keenly noted and often discussed. Companies under the Limited Liability Act had been formed to introduce sets of steam-tackle for hire-work into several districts of the kingdom, and some of these companies only commenced their work in the year 1872. The amount of hindrance and the difficulties of cultivating by steam in a wet season were so frequently the subject of remark, that in some minds a doubt arose whether the occasional occurrence of a season so unfavourable ought not to modify to some extent the praises that had hitherto been lavished upon steam as compared with horse-cultivation.

In attempting to ascertain with accuracy the comparative facility and results of tillage by steam and by horse power, it was thought best to defer the inquiry until the crops of 1873 had been harvested and partly threshed out. In December, 1873, inquiries were addressed to many leading agriculturists, and to the secretaries of different companies for steam-cultivation that had been at work long enough to enable them to compare fairly the results of 1872 with those obtained in other years. A sufficient number of replies have been received to give a true picture of the general experience; but a natural dislike to publishing misfortunes has perhaps influenced some who have not replied, as well as one who writes to decline on the score that an account of work done in 1872 would not give "a fair report" of work on his farm.

With a view to obtain some definite notion of how far the total amount of work done in each year was affected by the season, each contributor was invited to return the number of acres ploughed, dug, cultivated, and harrowed by him in the three years 1870, 1871, and 1872. From the 'British Rainfall' compiled and published annually by Mr. G. J. Symons, I have selected returns (p. 176) from stations in different parts that, taken in the aggregate, represent the whole country; and, taken singly, show the rainfall of particular districts from which accounts of steam cultivation have been received. A glance at this Table will show that in the year 1871 we had an average rainfall; in 1870 one very much below, and in 1872 one very much above the average: the rainfall in 1872 being, in many cases, twice as much as in 1870. The same result, so far as the years 1871 and 1872 are concerned, will be found very clearly given in the Meteorological Report prefixed to the Journal for last year, where, on page VIII., a Table is given "Showing the Rainfall in different parts of England and Wales from information supplied by Members of the Council of the Royal Agricultural Society of England."

TABLE I.—RAINFALL at 15 STATIONS in ENGLAND and SCOTLAND, recorded in the 'BRITISH RAINFALL,' compiled by G. J. Symons, Esq., F.M.S.

Stations.	Authorities.	1870.	1871.	1872.
Greenwich ..	J. Glaisher, Esq., F.R.S. ..	18·55	22·30	30·02
Rochford	A. H. White, Esq.	17·64	20·66	31·80
Lewes	Mr. J. McLeod	27·96	31·36	43·48
Gloucester ..	J. C. Hayward, Esq. ..	19·15	27·96	42·12
Alcester	A. Winkfield, Esq.	22·92	28·79	41·62
Oxford	Rev. R. Main, F.R.S. ..	17·56	21·14	29·47
Nottingham ..	C. Paget, Esq.	17·66	25·93	34·26
Hull	J. Smith, Esq.	25·81	25·68	36·50
Durham	J. L. Plummer, Esq.	24·66	24·69	48·47
Alnwick	F. W. Collingwood, Esq. ..	25·38	30·17	50·87
Dunbar, N.B. ..	A. Buchan, Esq.	22·08	26·70	50·50
Stirling	Mr. Gorrie	26·65	38·10	51·40
Perth	Dr. Miller, F.R.S.E.	20·14	30·13	44·74
Aberdeen	Rev. A. Beverly	26·59	28·15	45·44
Lawrencekirk ..	A. Buchan, Esq.	31·32	34·12	49·63

A careful examination of the replies received showed that, unfortunately, only a few of them could be fairly used for comparing the work done in different years. It was, of course, necessary to reject returns that were stated to be imperfect for any one of the three years, nor could those be fitly included in which any considerable alteration had been made in the tackle, such as using engines of different powers in the different years.

For the first return of this sort I am indebted to Mr. Carey, of Rochford, who, in the summer of 1873, not only afforded me every facility for inspecting in the fields the effects of work done, but also placed at my disposal the whole of his accounts for 8 double-engine sets of Fowler's tackle employed constantly at hire work in the Eastern Counties; from these I selected the returns of work done by 5 sets under similar circumstances in each of the three years (Table II. p. 177), and found, to our mutual surprise, that not only was there no marked deficiency in 1872, but that the work done in that year was slightly in excess of that of the two previous years. The reason of this appears, in part, to be that while there were many stoppages from wet weather in 1872 these were very frequently employed by the men in cleaning the engine and boiler, and in doing such necessary repairs as in the finer years often had to be done in dry weather. Thus, in the wet season, no fine days were lost. Besides this, more work was done per day in 1872, because the ground was never in that indurated state that hinders the cultivation of undrained

TABLE II.—WORK done in the EASTERN COUNTIES by Five Sets of STEAM-CULTIVATORS.

No.		1870.		1871.		1872.		1873.	
		Ploughed or Dug Acres.	Cultivated Acres.	Ploughed or Dug Acres.	Cultivated Acres.	Ploughed or Dug Acres.	Cultivated Acres.	Ploughed or Dug Acres.	Cultivated Acres.
1	Pair of 10 Horse-Power Engines	155	524	229	441	321	449	593	521
2	,, 10 ,, ,, ...	383	400	527	398	400	468	402	616
3	,, 14 ,, ,, ...	350	355	514	162	301	447	268	349
4	,, 10 ,, ,, ...	103	715	373	509	113	846	444	344
5	,, 10 ,, ,, ...	428	356	299	252	134	426	487	509
	Totals	1,419	2,350	1,942	1,762	1,269	2,636	2,194	2,339
		3,769		3,704		3,905		4,533	

No.		Work Commenced.	Work Ended.	Work Commenced.	Work Ended.	Work Commenced.	Work Ended.	Work Commenced.	Work Ended.
1	Pair of 10 Horse-Power Engines	April 9	Oct. 13	May 24	Nov. 27	March 11	Oct. 26		
2	,, 10 ,, ,, ...	May 30	Dec. 8	March 2	Nov. 27	April 9	Oct. 31		
3	,, 14 ,, ,, ...	April 2	Nov. 14	March 11	Nov. 25	March 21	Nov. 27		
4	,, 10 ,, ,, ...	April 11	Oct. 19	Feb. 27	Dec. 21	March 14	Oct. 26		
5	,, 10 ,, ,, ...	June 27	Nov. 4	March 4	Nov. 16	June 18	Oct. 19		

clay when a hot summer is followed by a dry autumn. The greater part of the land worked by Mr. Carey's engines consists of strong deep Essex clay that, in spite of the unflagging energy of Mr. Mechi's advocacy, still remains in an undrained state. In June, 1873, I found the cracks in this land 2 to 3 inches wide. While watching the difficulty with which two 10-horse engines, with steam up to 110 lbs., dragged through it a cultivator with all its tines removed except five, it was not difficult to understand that a higher rainfall than that of 1873 might help rather than hinder its cultivation. The cultivator used was one of Fowler's newest pattern, which turns upon the headlands, and is much less apt to swerve and jerk about than the older balance cultivators. In spite, however, of this advantage in form, the hardness of the ground made it impossible to keep the implement steadily to the desired depth of 10 inches. The clay was torn up in great lumps, leaving the surface of shaken but unmoved soil beneath it very uneven. This unevenness of the subsoil was almost the only point of disparagement against steam cultivation that was mentioned in the course of several conversations with occasional and regular employers of steam power in the neighbourhood. It was said that this unevenness caused the water in a wet season to stand in pools beneath the surface, and that the land would not be so fit to carry horses in early spring as it would have been if ploughed by horses with a furrow of even depth. This is, no doubt, true; for, when land is water-logged, the deeper it is the worse it is to tread upon. But horses ought never to be put upon such land until the surplus water has passed away. So long as water is there it matters not whether the pond have an even or an uneven bottom: and there is this disadvantage with horse-ploughed land, that the water will flow over its level subsoil instead of penetrating the rough surface of a subsoil that has been thoroughly shaken by the violence of steam power, forcing its way through the hard clods of the upper surface.

An inspection of the land in the last week in April, 1873, convinced me that steam cultivation caused the land to dry more rapidly in spring. Among other proofs of this I noticed at a short distance from Rochford two similar fields on opposite sides of the road, both of them intended for potatoes. The field on the left had been cultivated by steam, and was already planted and in good tilth; the other had been worked throughout by horses, and, though it had received a greater number of tillages than the first, it was not yet fit for planting. Ill effects from steam cultivation are not difficult to find, but they are to be attributed almost always to mismanagement. Here, as elsewhere, loss is often incurred by rashly ploughing up a raw subsoil: but a practice more characteristic of the district is to be found on the farms of some half-hearted men who, while they call in the aid of steam, will not modify their ordinary practice to suit the new agency. Heavy land that is intended for spring corn, and has been ploughed flat by steam, should not be touched by horses until seed time; those Essex farmers who adhere to their old practice of throwing the land up into narrow stetches, and to effect this set horses to work on the land early in spring, will, of necessity, come badly off in a wet season; the bad results should not, however, be attributed to steam culture, but to an incongruous blending of old and new systems. Although the rainfall of 1872 was much greater than usual, an average taken from the 28 stations recorded in Mr. Symons's 'British Rainfall' shows us that it was less than 32 inches over the county of Essex, an amount not exceeding the ordinary fall in many parts of the kingdom that are not considered specially wet. We need not, therefore, be surprised to find that, though here, as elsewhere, the amount of rain was a common subject of comment, no serious impediment to steam cultivation was felt.

In this district a very dry season is often quite as trying as a wet one. In the summer of 1870 it was often almost impossible to penetrate the hardened surface of the soil, and still more difficult to regulate the depth of the work; the earth was often torn up in huge lumps of 1 or 2 cwts. each, the tackle was often broken, and the shares and other wearing parts constantly required to be renewed. Delays from this cause would have been very great if it had been necessary to send to any distance for repairs or new fittings. The advantages of possessing a good workshop with forges and powerful lathes, &c., and a storehouse well fitted with duplicates, was never more marked than in 1870. Mr. Carey's thorough knowledge of his business, and his judicious management of a large staff of men all trained by himself, enabled him to overcome such difficulties with much greater facility than those who work upon a smaller scale. Only one instance could I find, in the neighbourhood of Rochford, of land much injured by the wet; and the water in this case had come not from the clouds but from an inundation of the sea. In October, 1872, a breach occurred in the sea-wall near the mouth of the Crouch, and for 3 months a tract of low-lying land was covered by 6 feet of water. In June, 1873, this land was covered by a mass of rank couch a foot high; two 14-horse engines, with steam pressure over 100 lbs., were slowly dragging a 5-tined cultivator a depth of only 6 inches through the still moist and tenacious deposit of blue clay, and were every now and then pulled up by the heaviness of the work. The policy of stirring land at all in such a condition is more than dubious; but there could be no doubt of the fact that (though no signs of it might be seen elsewhere in that neighbourhood) a very great excess of water during the winter months very seriously interferes with the next year's tillages. In the wet season of 1872 there were many days in which no work could be done, and some delay was caused by the slipping of engines on wet headlands; but, taking the season as a whole, there was no reason for dissatisfaction in this district, either with the amount or the results of the work done in it.

I will now proceed to give a summary of the replies received from various correspondents to the following questions:—

1. Have the general advantages of Steam-tillage over Horse-cultivation been increased or diminished by the excessive rainfall of 1872? Please compare the facilities with which the land was cultivated by Steam and by Horse-power and note the comparative results in the crops of 1873, describing any instances in detail.

2. Has deep tillage enabled you to dispense with open water-furrows? Has it in any case obviated the necessity of draining the land?

3. Have you found Steam-cultivation hasten or retard the commencement of harvest?

4. Has the wet season much increased the labour of transporting Steam-tackle?

5. Has the wet season produced any other special advantage or disadvantage in Steam-cultivation as compared with Cultivation by horses?

6. Please state which system of Steam-cultivation you employ; how long you have used it; the character of your soil and the average depth of the cultivations.

It will be seen that questions 2 and 3 refer to points of special importance in a wet season, but yet somewhat apart from the main inquiry. For the sake of clearness, it will be convenient to defer the consideration of Nos. 2 and 3 till the other questions have been disposed of, and when it can be done without at all affecting the context. I shall omit for the present the portions of my correspondents' letters that refer to these points.

The first of the questions issued—"Have the general advantages of steam tillage over horse cultivation been increased or diminished by the excessive rainfall of 1872"—has elicited a considerable difference of opinion. A few correspondents think that the relative advantages have remained unaltered; many are of opinion that the advantages of steam were diminished, and, among these, are some who think that, in 1872, cultivation by horses was better than by steam; the greater number, however, state that the advantages of steam over horse power were greater in 1872 than in other years. Among those who think the advantages of steam were diminished, Mr. W. B. Lowe, of Eastington, near Stratford-on-Avon, writes:—"I consider the advantage of steam cultivation was much diminished by the great rainfall of 1872, to a great degree on the work done, but still more because much was given up altogether in consequence of the autumn rain, and horse-ploughed through the winter, to the falling off of the bean crop in particular. . . . The wet season increases the labour of transporting the Steam-tackle from farm to farm to some extent; more particularly in the trouble it gives in taking off and putting on the irons to the wheels of the engines. The wet season materially curtailed the length of time the engines could be used on the clay land, but there is great advantage in all seasons in being able to accomplish much work in little time. I employ a pair of Fowler's 10-horse engines, with a 4-furrow balance plough, a turning cultivator of Fowler's of medium size, and a narrower cultivator of Howard's for hard work. I have had the engines, balance plough, and Howard's cultivator about five years. The soil is clay of the stiffest possible description, and I like to work 10 or 12 inches deep; and as we do not like to work much beyond 90 lbs. pressure, we are obliged with hard work to dispense with one of the ploughs, taking 3 furrows only each way."

From a farm on the Sussex Downs of a mixed character, but chiefly consisting of a stiff clay overlying the chalk, Mr. Charles Ellis, of Beddingham, near Lewes, writes:—"I consider on the whole the advantages of steam cultivation have been decreased by the wet season of 1872. I was unfortunate enough to have the main axle of my engine broken early in October 1872, and being thereby delayed ten days' working, I missed a good seed-bed for beans and wheat: having made myself dependent on steam-power to a great extent, my loss was equal to that of the work of 12 horses for 10 days; this was the more severely felt from the fact that the wet season set in, and we had great difficulty in moving the engine by her own power, and could only at last get out of the field in November with the assistance of 8 horses. I mention this as one of the casualties attaching to steam power, you are liable to delay from any accident, and consequently deprived of its service for several days.

"In a piece of heavy land of 44 acres, I ploughed about three-fourths by steam and the remainder by horses, and I could never satisfy myself, *cæteris paribus*, of the superiority of the one mode over the other in the crop. I may say generally that I do not think on my chalk land I have had so good a crop of wheat after steam as after horses, owing to the land not being sufficiently consolidated. I feel bound to say that, notwithstanding steam power is of greater use in dry seasons than wet, it should not be lost sight of that when the weather is suitable you have a power which will do you a great quantity of work in a short time."

A third report of a somewhat similar character is given by Mr. W. Bulstrode from Mount Farm, Cookham Dean, Maidenhead, where the soil is "partly a sharp gravel, and partly a stiff loam, with portions of an intermediate description." "In the autumn of 1872 I did not use the cultivator at all on account of the wet state of the land. I ploughed all with horses, and stirred as much as possible in the spring of 1873. There can be no doubt that steam tillage was greatly retarded by the wet autumn of 1872, and that horse-ploughing was preferable under the exceptional circumstances. The open weather fortunately enabled all to be ploughed, even with the diminished horse-strength, and the dry though late spring weather of 1873 was invaluable in enabling us to make up arrears with the steam-cultivator." Lest his abandonment of steam power in this one season should be supposed to imply any dissatisfaction on his part with steam cultivation generally, Mr. Bulstrode adds, "I think you will agree with me that too much stress is often laid on a comparison between the cost of *individual operations* by horse and steam-power. They must be compared as *systems*, and either the one or the other systematically adopted. I do not believe that any one who has taken up steam cultivation in a practical and intelligent manner can have a shadow of doubt as to its economical advantages." Mr. J. Darlington, of New Buildings Farm, Stafford, and Mr. F. Ball, manager of the Avon Vale Steam-Ploughing Company, both report briefly that the wet season of 1872 diminished the advantages of steam over horse-power cultivation. And a still more decided opinion to the same effect is expressed by Mr. J. L. Bolden, Secretary to the Durham and North Yorkshire Steam-Cultivation Company, who says that the advantages were "very much diminished;" adding, "this Company did much work during the wet seasons of 1871 and 1872, which so disgusted the farmers that they took a strong prejudice to steam-cultivation altogether." Mr. Bolden is the last on the list of witnesses to a diminution of advantages, and the importance of the Company which he represents makes his evidence of so much value that his report may be taken in full as an admirable expression of this view of the subject. Mr. Bolden says:—"As this Company only started early in 1871 it is somewhat premature to give a positive opinion as to the effect of steam-cultivation so far as we are concerned, for, of course, the wet season of 1872 (and to some extent of 1871 too) put everything wrong. When this Company first started, many farmers were anxious to try steam-cultivation, and a good deal of land was done (chiefly ploughed or dug) in a moist unfit state. A great deal of poor clay-land, too, has been ploughed deep, and a miserable subsoil brought to the top, no help in the shape of manure being given, and, when a wretched crop was the result, steam-ploughing has been blamed by the employer. As regards the excessive rainfall increasing the cost of steam-cultivation: when the land was in the sodden soaking state in which it was during 1872, we had immense difficulty in shifting about, and very great breakages; the quantity of coal was greatly increased, to say nothing of men's wages having to be paid when they did nothing half their time. The earnings during 1873 have been about one-third more than during 1872, with but little difference in the price charged. I cannot fill in the number of days' work done; many times we have got steam up, and, after doing half-an-hour's work, had to stop. Moreover, great numbers of our customers have very small fields, and we spend a very large portion of our time in shifting long distances. I would add that, in many cases, farmers seem to imagine that their land is fit to work with horses when they will not allow us to start: this is generally owing to the heavy engines making such havoc on headlands, &c., in wet weather. There is one remark I wish to make, which you can take into account in comparing steam-cultivation by a Company with work done by a farmer's own horses: if there is one bit of land more difficult to do than another, more dirty or fuller of big stones, &c., this is what a company gets to do, and the immediate effect of steam-cultivating such places does not show to the advantage of steam for some little time." Table III. (p. 184) is compiled from returns of work done by this Company.

With regard to these figures Mr. Bolden remarks that it should be borne in mind, "1st, that the year 1871 with us was not a complete one; 2nd, that the autumn of 1871 was wet up here, the harvest late, and the land for some time wet; 3rd, that the early spring of 1873 was very wet; indeed, our total earnings for the first six months of 1873 were scarcely any larger than those of the same time in 1872; it is the second half-year of 1873 which compares favourably with 1872, and also, but in a less degree, with 1871." "Considering the number of sets at work and the length of time at work, the amount done in 1872 was much less than in either 1871 or 1873, but I must add that, with a Company like this, the amount of work done does not in all cases necessarily increase with the prolonged dry weather, that is, beyond a certain amount, for I have had sets standing in fine weather for want of work. With a very fine

TABLE III.—WORK done by the DURHAM and NORTH YORKSHIRE STEAM CULTIVATION COMPANY (LIMITED).

No.		1871.			1872.			1873.		
		Ploughed or Dug Acres.	Cultivated Acres.	Harrowed Acres.	Ploughed or Dug Acres.	Cultivated Acres.	Harrowed Acres.	Ploughed or Dug Acres.	Cultivated Acres.	Harrowed Acres.
1	A set near Gateshead. Soil chiefly clay. Began work April, 1871	155	680	252	289	816	420	515	1,067	498
2	A set near Durham. Soil chiefly strong. Began work April, 1871	274	660	475	281	630	664	336	935	660
3	A set about Thirsk and Ripon. Soil various. Began work towards end of April, 1871 ..	162	943	113	304	647	79	296	1,623	223
4	A set about Piercebridge. Soil generally gravelly and stony. Began work towards end of April, 1871	505	730	380	520	939	215	615	1,011	247
	Totals	1,096	3,013	1,220	1,394	3,032	1,378	1,762	4,636	1,628
		4,109			4,426			6,398		
5	A set near Northallerton. Soil various, but a good deal strong. Began work late in 1871	..	..	..	319	977	..	318	1,536	..
6	A set near Bedale. Soil generally very gravelly. Began work late in 1871	..	..	..	352	854	202	357	1,229	178
	Totals	..	..	..	671	1,831	202	675	2,765	178
					2,502			3,440		

spring no doubt farmers are glad to avail themselves of steam cultivation, as they are all anxious to get their crops in, and labour is scarce; but with prolonged dry weather in autumn, farmers (at any rate with the high price coal has been at) have done a great deal of their work with their own horses, and we have had many miles to travel to get work. I have omitted to add that (as might be expected), in the gravelly districts we work in, the excessive wet of 1872 did not make so much difference: see Return of the Piercebridge set of tackle."

"Work was much more plentiful in 1872 than in 1873, as other sets of tackle were within reach during the latter year."

The average prices charged by this Company for cultivating 8 or 9 inches deep are—After a crop, once over, 9*s.* 6*d.*; twice over, 15*s.* 6*d.* After digging, once over, 8*s.* 6*d.*; twice over, 14*s.* 6*d.* Ploughing 12*s.* 6*d.* to 16*s.* per acre.

Let us now stop to consider the exact import of the evidence that has been given. Each particular case is undoubtedly an instance of either a diminution or a total loss of the advantages that steam generally gives over horse-power in tillage; but is it equally clear in each case that this was a necessary result of the wet season?

No one probably would be more ready than Mr. Ellis to admit that his loss resulted from an accident that is as likely to happen in a dry as in a wet season. But for that accident he would probably have been able to report an increased advantage over horse-power in a season in which it was particularly desirable to sow wheat and beans early. The instances given by Mr. Lowe prove simply this, that on a strong lias clay it was impossible when the land was saturated with rain to cultivate by steam; cultivation by horse-power was *possible* indeed, but it is doubtful whether it was *beneficial.* The advantage that Mr. Lowe speaks of "in being able to accomplish much work in a little time," he did not stop to avail himself of. By using horses when he could not use steam he obtained as bad a crop as his neighbours; but we can hardly accept this as an instance of a diminution of advantages in the use of steam: it is rather an example of the bad effects of *abandoning* steam-cultivation even in an exceptionally bad season. A full faith in the advantages of steam would have left the ground untouched until the headlands were dry enough to carry the engines; if then it had been necessary to take peas or some other crop instead of beans, the result could have been fairly compared against the bean-crops obtained from horse-ploughed land. The diminished advantages must not be put down simply to the wet season, but to the want of confidence that, in the face of a wet season, abandoned the coigne of vantage that steam-power affords.

This view of the case receives strong confirmation from a letter which accompanied the more formal replies to my questions. Mr. Lowe says, "Having 2 engines, we, of course, work with the direct pull one from the other. At one time I thought of getting a windlass so as occasionally to use the roundabout system, and in wet weather keep the engine off the land; but I have finally made up my mind that if our clay will not carry the engines fairly well, we had much better not plough at all. . . . I do not consider steam-ploughing *cheap* on any other ground than the superior quality of the work, and the favourable mechanical condition in which the soil is left. We never plough for less than 16*s.* an acre, and I do not consider we could afford to lower the rate, for the cost of engine repairs is very heavy. Coal and water added to 16*s.* must bring the ploughing here to 20*s.* or 21*s.* at least. Only a very few of the employers care about deep ploughing, they are afraid of bringing up the subsoil. Not a little of the work is done for farmers whose work is in arrears from a fresh entry on the farm or from other causes, and not from any great desire for steam-ploughing in itself. There are others who, like myself, find they can grow mangolds, beans, and spring crops much better than from horse-ploughing; but the wheat crop is not much, if at all, improved on the average, and it is much more liable to lose plant and die out after a frosty winter: in fact, I dare not plant wheat after breaking up ley, on this ground, and I have been obliged materially to alter my farming. Deep ploughing suits beans amazingly: I have often seen them 1 foot higher in the same field after steam than after horse-ploughing. In the very dry season of 1870 this was particularly observable: light ploughing giving short ones, while after steam many were more than 5 feet high, with a produce of 40 bushels to the acre. The average rent of our clay, undrained, is under 20*s.* per acre; good draining would add 5*s.* or 6*s.* per acre, and the fertility raised as it ought to be, by a continuance of good farming, would add perhaps 5*s.* more per acre; but men of capital will not look at it unless from local circumstances they are induced to do so. I hold between 700 and 800 acres of this poor land, partly my own, partly in tenancy, and I have for more than forty years never had less than 300 acres in occupation. The more I see of steam cultivation the better I like it; but I must have horses as well, and make my own selection as to which to use. Steam for the hard work and deep cultivation, but not for harrowing, drilling, or *light* scarifying."

From these extracts I think we may infer that when Mr. Lowe, with true public spirit, tells us of the bad effects that followed the substitution of horse-power for steam in 1872, he does not hold up his practice in this instance as worthy of imitation, but would rather hold such custom to be "more honoured in the breach than the observance."

In the same way the interesting report from Mr. Bolden shows clearly that the bad results that disgusted some of those who tried steam-cultivation for the first time arose simply from its injudicious application. Deep ploughing by horses would have been even more injurious to poor clay, or to land in a wet state. On heavy land it is no real disadvantage that the engines slip upon the headland after hard rain, for harm may be done by cultivating such land when it is only wet enough to *hinder* the engines without making it impossible to work them. No such remark, however, can be fairly made upon the experience narrated by Mr. Bulstrode. In his case the substitution of horse-power for steam was not only thought to be advisable, but the result obtained was satisfactory. The explanation of this difference of experience is doubtless to be sought in the difference of soil. On clay all cultivation does harm when the land is almost, though not quite, wet enough to stop the engines from travelling on the headland. A moderately free-working loam, on the other hand, will not be injured by being ploughed late in winter. On such a soil the engines *may* slip upon the headland before any harm is done by the plough or cultivator. This, however, was not the case on Mr. Bulstrode's farm, for the tackle he uses is one of Howard's round-about sets, driven by one of Clayton and Shuttleworth's 10-horse power double-cylinder engines; and, in answer to a further inquiry, he says:—"I was unable for various reasons to cultivate very early in the autumn of 1872, and during the long subsequent wet period, I kept creeping on with the horse-ploughing till all my stubbles were turned over. Ploughing has certain advantages over smashing, unless the latter is done early and followed by dry weather, as, for instance, in the destruction of annuals and such weeds as will decay when buried. Probably had I a suitable plough for my tackle I should have used it in preference to horses, but none of the steam *ploughs* I have yet seen seem to me well adapted to the 10-horse power round-about tackle." With this explanation, this last of the unfavourable reports resolves itself into the statement that, under certain circumstances, the work of a cultivator is inferior to that of a plough. The soil being loam, and not clay, no bad effects resulted from working it in a wet state by horses.

Every case in which steam-power appeared to disadvantage in the wet season has now been considered. One or two correspondents briefly remark that they think steam shows most to advantage in a very dry season; and a few others, as already stated, are of opinion that the advantages of steam and horse power are relatively the same in wet as in dry years. It now remains to give a few examples of the far more numerous letters that report the merits of steam-cultivation as being specially conspicuous in the trying season of 1872. Wherever a correspondent has a farm large enough to give full occupation for his tackle in an ordinary year, the number of acres cultivated by him in the three years 1870–1872 will be printed, if given in his report. The following returns are received from correspondents, who either do not wish their names published, or whose report is not given separately:—

Table. IV.—Work done by 10 Sets of Steam Cultivation Tackle in the Middle and South of England.

	1870.	1871.	1872.
Acres Ploughed or Dug	730	1,030	896
,, Cultivated	7,652	10,182	9,093
,, Harrowed	2,090	2,470	2,284

It will be seen that much more work was done in each of the two wet years than in the very dry season of 1870. This is so far a confirmation of the report from Essex, that drought sometimes hinders the work more than rain: it differs from the Essex report in one respect, however, for in this return we find that about 10 per cent. less work was done in 1872 than in 1871. In 1872 a rainfall of a little less than 32 inches in Essex did not seriously impede the work; the greater fall in other parts of England somewhat checked the work, but it is only in the northern counties and in Scotland that the evil effects of the wet season were felt in their full extent. It may be said that such a deduction cannot be safely made from a mere collection of figures, and I gladly turn from the discussion of such dry bones to the more interesting reports of those who have clothed their figures in the flesh and blood of individual experience and comment.

The following contribution from Mr. W. J. Edmonds, of Lechlade, affords a good example of the advantages that may be obtained by the energetic application of steam power in a wet season. Mr. Edmonds has employed Fowler's double-engine system for about eight years, on land resting on the Oolite formation, varying in character from a tenacious clay to light stonebrash; his average depth of cultivation against winter on the heavy soil is about six inches, and on the light soil about four inches: —

" In the year 1870 I cultivated land other than my own farms to the extent of about 80 acres. At Michaelmas that year I took another farm, upon which there is a considerable quantity of strong land, and since that time my engines have not been away from home. This accounts for more work being done in 1872, together with the fact that through the autumn of 1871 being so wet, less than usual was done in the autumn of that year.

TABLE V.—WORK done by Set of DOUBLE ENGINE TACKLE at LECHLADE, GLOUCESTERSHIRE.

	1870.	1871.	1872.
Number of Acres Ploughed	130	196	391
" " Cultivated once or Steam-harrowed twice over..	1,654	1,605	1,630

" As I think it may be interesting to you to know when the work was done, I have copied from our labour books the number of days in each fortnight on which work was done :—

1870.		1871.		1872.	
Fortnight ending	Days.	Fortnight ending	Days.	Fortnight ending	Days.
March 11	2	March 10	5	March 9	5
,, 25	12	,, 24	2	,, 29	9
April 8	6	April 7	8	April 12	4
,, 22	8	,, 21	4	,, 26	10
May 5	9	May 5	6	May 10	9
,, 19	5	,, 19	9	,, 24	3
June 3	7	June 2	1	June 7	11
,, 17	4	,, 16	12	,, 21	8
,, 31	7	,, 30	5	July 5	11
July 14	..	July 14	7	,, 19	12
,, 29	3	,, 28	9	August 2	10
August 12	5	August 11	9	,, 16	2
,, 26	9	,, 25	8	,, 30	12
Sept. 9	10	Sept. 8	..	Sept. 13	12
,, 23	12	,, 29	8	,, 27	10
October 7	7	October 12	6	October 11	12
,, 21	9	,, 27	6	Nov. 22	5
Nov. 4	8	Nov. 10	5		
,, 12	7	,, 24	9		
	130		119		145

" You will see that we took advantage of the dry weather in August and September, 1872 ; and besides working every day we worked over hours, so that all my strong land, excepting a few acres, was cultivated before the wet weather set in. We should have completely finished autumn work had we not had a breakage, which detained us until the rainy season, hence the few days' work in November. The advantages of steam-tillage over horse-cultivation have been more apparent from last season's wet, inasmuch as with the steam all my winter work was done in good time, and only required little work this spring, and that with the cultivators only, so that the wet unkind soil was not brought to the top. My root-crop is excellent; and the only piece which partly failed was one of five acres, which the horses or oxen ploughed, and was what we term here in a *raw* state." . . . . "Formerly I could not in a wet time get my fallows worked in the spring sufficiently early to prevent a very strong growth of weeds; I can now with steam-implements catch opportunities to run over them all and keep the weeds down; and I will say more, and that is, that I can now prepare my land for turnips, and plant them as soon as I *choose*, instead of as formerly planting them as soon as I *could*."

Mr. John Roynon, of Havering Park Farm, near Romford, writes that in 1872 the advantages of steam over horse cultivation were increased on land thoroughly drained, and diminished on undrained land. Steam-power enabled him to get the land up mostly in the dry weather, whereas if he had been dependent on horses alone, there would hardly have been time, after getting the harvest in and carting out manure and lime, to have begun cultivating by horses before the rain set in.

Another correspondent, from Kent, who has for the last six years been in the habit of hiring steam-power to work his land, writes:—"I have ploughed each year 600 acres, more or less, excepting in 1872, when the weather rendered it impossible to do about 150 acres, which otherwise would have been ploughed." But, in spite of this inability to do all that he wished to do, he adds emphatically:—"I consider that on wet soils the great rainfall of 1872 has shown the greatest advantage of steam-cultivation over horse-work."

Similar replies in great number have been sent from different parts of the southern and midland counties of England; but as nothing would be gained by a frequent repetition of the same evidence, it will be enough to take the experience of one of the earliest pioneers of steam-cultivation, and then to turn northward and learn more about the doings of those who may be reckoned among the most recent converts to the principles that have now for many years been advocated by Mr. Smith, of Woolston, with indefatigable energy and perseverance.

Mr. Smith writes:—"My farm consists of heavy clay, hilly, and uneven land, 107 acres arable, 15 acres of poor grass land, with a set of new buildings upon it, arranged about the middle of the arable land; and of mixed gravel and clay in the valley, 105 acres of good grassland, with 73 acres of arable, all good. Total 300 acres. There is a separate set of buildings in the valley land. The system of cropping on the heavy clay land is beans, wheat, and barley, without any fallow whatever. Under horse-cultivation this land was farmed upon the three-crop and one-year fallow system, and its average produce, including the fallow, was not over 20 bushels per acre a year. The good land in the valley is farmed upon a six-crop system, *i. e.* roots, barley, clover, wheat, beans, and wheat. The whole of my arable land in the valley, excepting No. 6, roots, being fed on the land, is now (January 12th) ready for planting with its 19th crop, under steam-cultivation. A portion of my heavy clay land is also ready for its 19th crop, under steam-power cultivation; the other portion I bought in 1869, and is now going in for its 5th crop, under steam, particulars of which will be given further on. The implements with which I work my land by steam-power are a cultivator and a combined ridger and subsoiler, worked upon the roundabout plan. The cultivator takes the bean-stubbles for wheat only, while the ridger and subsoiler takes all the heavy work on my farm.

The following returns of work done are extracted from Mr. Smith's Diary:—

1870.

Finished harvest August 27.

September 12. Started the smasher on No. 4, heavy land, a pea and bean stubble, 24 acres; on the 13th worked only a quarter of a day, stopped through rain. The 14th was wet again, worked only half a day. The 15th was a fine day, on which we finished the 24 acres, at 4.50 P.M., when we shifted the tackle to No. 3, heavy land, 29 acres bean stubble. September 16, started the smasher and worked regularly on till September 20, when at 10·45 A.M. we finished the 29 acres. Consumption of coal for the 53 acres, 4 ton 15 cwt., at 12*s*. The cost of this work stands thus:—

	£	*s.*	*d.*
Men at 16*s*. per day, for $6\frac{3}{4}$ days	5	8	0
Coal, 4 ton 15 cwt., at 12*s*.	2	17	0
Oil at 9*d*. per day	0	4	10
Wear and tear at 1*s*. 6*d*. per acre	3	19	6
Total	12	9	4

Or an average of 4*s*. $8\frac{1}{2}$*d*. per acre.*

September 26. Started the ridger and subsoiler on No. 2, heavy land, a wheat stubble for beans, $22\frac{3}{4}$ acres; worked on regularly till 3.10 P.M. on September 29, when we finished this field, and then shifted the tackle to No. 1, heavy land, $16\frac{1}{4}$ acres, which we finished on October 3, at 1.30 P.M. Then shifted the tackle to No. 6, light land, 14 acres, barley stubble, for barley, which we finished on October 6, at 9.30 A.M. Then shifted the tackle to No. 4,

* In this calculation no charge is made for interest on capital or for annual depreciation in the value of the machinery.

light land, 12 acres, which was finished on October 8, at 12·10 P.M. The cost for the 65 acres of ridging and subsoiling stands thus:—

	£	s.	d.
Men at 18*s*. 6*d*. per day, for 12 days	11	2	0
Coal, 6 ton 10 cwt., at 12*s*.	3	18	0
Oil at 9*d*. per day, for 12 days	0	9	0
Wear and tear at 1*s*. 6*d*. per acre	4	17	6
Total	20	6	6

Or an average of 6*s*. 3*d*. per acre.

1871.

September 18. Finished harvest.

October 10. Started the smasher on No. 1, heavy land, 39 acres, bean stubble; worked on regularly till 4·50 P.M. on October 14, when we finished the 39 acres. The cost of this work is as follows:—

	£	s.	d.
Men 5 days, at 16*s*. per day	4	0	0
Coal, 3 ton 5 cwt., at 12*s*.	1	18	0
Oil at 9*d*. per day, for 5 days	0	3	9
Extras at 1*s*. 6*d*. per acre	2	18	6
Total	9	1	3

Or an average of 4*s*. 7½*d*. per acre.

October 16. Started the ridger and subsoiler on No. 2, heavy land, wheat stubble 29 acres; worked on regularly till 9.20 A.M. on October 21, when we finished the 29 acres. Then shifted the tackle to No. 3, heavy land, 24 acres, which was finished at 3·50 P.M. on October 26. The tackle was then shifted on to No. 6, light land, 14 acres barley stubble, for barley, which we finished at 11·30 A.M. on October 30. From there we moved to No. 2, light land, 13 acres, which we finished on November 1 at 4·40 P.M. Then moved to No. 5, light land, 12 acres wheat stubble, which we finished on November 3, at 5.15 P.M. The cost of the 92 acres of ridging and subsoiling is:—

	£	s.	d.
Men at 18*s*. 6*d*. per day, for 17 days	15	14	6
Coal, 9 ton 5 cwt., at 12*s*.	5	11	0
Oil at 9*d*. per day, for 17 days	0	12	9
Extras at 1*s*. 6*d*. per acre on the 92 acres	6	18	0
Total	28	16	3

Or an average of 6*s*. 2*d*. per acre.

1872.

September 14. Finished harvest the 17th under steam cultivation.

September 24. Started the smasher on No. 2, light land, bean stubble, 13 acres, which was finished at 5.50 P.M. on September 25, when we shifted the tackle to No. 2, heavy land, bean stubble, 29 acres, which was finished at 6.10 P.M. on September 30. The cost of the 42 acres stands thus:—

	£	s.	d.
Men at 16*s*. per day, for 6 days	4	16	0
Coal, 3 ton 13 cwt., at 14*s*.	2	10	0
Oil at 9*d*. per day, for 6 days	0	4	6
Extras at 1*s*. 6*d*. per acre, for 42 acres	3	3	0
Total	10	13	6

Or an average of 5*s*. per acre.

October 1. Started the ridger and subsoiler on No. 1, heavy land, 37 acres wheat stubble, which was finished at 9 A.M. on October 8. The tackle was then shifted to No. 3, heavy land, 36 acres. On October 9 we lost half a day by rain. On the 10th it was wet again, but we worked on and did an average day's work. On October 12 we lost half a day by wet. The 36 acres were finished at 11.20 A.M. on October 16, when the tackle was shifted to No. 3, light land, Part I., 5 acres, which was finished at 11.15 A.M. on October 17. The cost for the 78 acres is as follows:—

	£.	s.	d.
Men, 14½ days, at 18*s.* 6*d.*	13	8	3
Coal, 8 tons 14 cwt., at 16*s.*	6	19	6
Oil, at 9*d.*, for 14½ days	0	10	10
Extras, at 1*s.* 6*d.* per acre, for 78 acres	5	17	0
Total	26	15	7

Or an average of 6*s.* 10*d.* per acre.

1873.

September 6. Finished harvest.

September 22. Started the smasher on No. 3, heavy land, 38 acres bean stubble, which was finished at 4.10 P.M. on September 26, when the tackle was shifted to No. 2, heavy land. Here is the cost of the 38 acres:—

	£.	s.	d.
Men, at 19*s.* per day, for 5 days	4	15	0
Coal, 72 cwt., at 22*s.* per ton	3	19	3
Oil, at 9*d.* per day, for 5 days	0	3	9
Extras, at 1*s.* 6*d.* per acre, on 38 acres	2	17	0
Total	11	15	0

Or an average of 6*s.* 2*d.* per acre.

September 27. Started the ridger and subsoiler on No. 2, heavy land, 30 acres wheat stubble, which was finished at 11 A.M. on October 2. The tackle was then shifted to No. 1, heavy land, 39 acres barley stubble, but through a breakage of the windlass we did nothing that day. The next morning we started. On October 7 it was wet, we worked only half a day. On October 10 the 39 acres were finished, excepting three short turns, when we had another breakage of windlass. On October 11 we shifted the tackle to No. 2, light land, 13 acres wheat stubble, on which on Monday, October 13, we started; and at 4.50 P.M. on October 14 we finished the 13 acres, when we shifted to No. 1, light land, 12 acres, which we finished at 12·45 P.M. on October 16. The cost of the 94 acres of ridging and subsoiling is as follows:—

	£.	s.	d.
Men, 17 days, at 22*s.* per day	18	14	0
Coal, 235 cwt., at 22*s.* per ton	12	18	6
Oil, 17 days, at 9*d.* per day	0	12	9
Repairing two brackets to windlass	2	0	0
Extras, at 1*s.* 6*d.* per acre	7	1	0
Total	41	6	3

Or an average of 8*s.* 9*d.* per acre.

The quantity of work for the 4 years stands thus:—

	1870. Acres.	**1871.** Acres.	**1872.** Acres.	**1873.** Acres.
Cultivating	53	39	42	38
Ridging and subsoiling ..	65	92	78	94
Totals per year	118	131	120	132

The consumption of coal per acre for the 4 years stands thus:—

	1870. lbs.	1871. lbs.	1872. lbs.	1873. lbs.
Cultivating	201	135	195	212
Ridging and subsoiling ..	232	225	250	280

The average quantity of work per day for the 4 years stands thus:—

	1870. Acres.	1871. Acres.	1872. Acres.	1873. Acres.
Cultivating	8	$7\frac{4}{5}$	7	$7\frac{3}{5}$
Ridging and subsoiling ..	$5\frac{5}{12}$	$5\frac{1}{3}$	$5\frac{1}{3}$	$5\frac{2}{9}$

The number of days' work per year for the tackle stands thus:—

	1870.	1871.	1872.	1873.
Cultivating	$6\frac{3}{4}$	5	6	5
Ridging and subsoiling ..	12	17	$14\frac{1}{2}$	17
Total per year	$18\frac{3}{4}$	22	$20\frac{1}{2}$	22

"Now I will proceed to remark upon the above tables and extracts from my diary.

"The wet season of 1871 and the excessive rainfall of 1872 did not in any way unusually interfere (more than in the fine years of 1870 and 1873) with the working or shifting of the tackle, for it may be seen that in each year I had some hindrance by wet about the same time each year; but the consumption of coal in 1873 proves that the wet years of 1871 and 1872 had so saturated and toughened the land, that the work to the engine was harder in 1873 than in either of the wet years. When at work we found such to be the fact. When my tackle is stopped by wet it is not fit for men to be out at work." . . . . "It may be seen by the extracts from my diary that in each year there is an interval of some days after finishing harvest before I started my steam tackle. Take, for example, 1873, when I finished harvest on September 6, I did not get my steam-power tackle to work till September 22. This interval of time, excepting Sundays, was occupied in carting dung upon my land. For instance, No. 1, heavy land, 39 acres barley stubble, for beans, was manured at the rate of 13 tons per acre. No. 2, heavy land, wheat stubble 30 acres, at the rate of 7 tons per acre for barley. No. 1, light land, 12 acres wheat stubble for beans, at the rate of 14 tons per acre; and No. 2, light land, 13 acres wheat stubble for roots, at the rate of 14 tons per acre. To carry out steam cultivation successfully, I find it necessary to apply all my manure in the autumn, before working my land at all for the next year's crops. 500 tons of manure were had by canal from London, the rest was made from the straw and hay produce of my farm, no cake or corn used in it. Now to show the advantages of steam-power, especially in wet seasons, I must remark upon the several portions of work done. I will take the heavy clay land first. Field No. 1: 39 acres barley; stubble was manured with 13 tons per acre, then ridge-ploughed and subsoiled by steam-power 10 inches deep, at a cost of 8*s.* 9*d.* per acre. It is now ready for planting with beans without any further operation for its nineteenth crop under steam cultivation without any fallow whatever. Yes, and I have had, like the horse farmers, the wet seasons, including those of 1871 and 1872, to contend against, yet it is clean. My way of cleaning is to hand-pick in the winter all my ridged work, the man walking between the ridges. This land was walked and picked by one man at the rate of from 2 to 3 acres per day at a cost of about 1*s.* per acre; therefore as this land is walked and picked twice in three years, it is kept clean at a cost of 2*s.* per acre for three years. Its average yearly produce, wet years included, is not as little as 32 bushels per acre; last year's crop was quite that, therefore I am on this land a gainer of 12 bushels of corn per acre as compared with its produce under horse culture. Now I will compare on like land with the horse farmer. The wet years of 1871 and 1872 have caused heavy clay-land to be fallowed in many directions two years in succession, viz., in 1872 and 1873, which will bring the average produce on such farms under 20 bushels per acre a year. The very best clay-land farmers who have been farming upon the summer green-crop system or roots for the winter, have been driven to a dead fallow in 1873, and it is generally known that the two wet years caused the whole country to be less clean (to say the least of it) from end to end, hence the reduced crops in 1873 with a much diminished total produce throughout the country. Now take field No. 2: 30 acres wheat-stubble manured at the rate of 7 tons per acre for barley, then ridged and subsoiled 10 inches deep, at a cost of 8*s.* 9*d.* per acre, since which the ridges have been hand-picked and then split by horse-power, the latter operation costing 4*s.* per acre. It will be hand-picked again. It is the best heavy-land tilth I ever walked over. Total cost of seed bed, excepting hand-picking, 12*s.* 9*d.* per acre worked 10 inches deep. This land is a portion of that bought in 1869, which was then sadly out of condition, needing draining and cleaning all over; that has been done, excepting some remnants of the latter. The cropping since 1869 has been two crops of wheat and two crops of beans, and now it is going in for barley. Its average produce has been 32 bushels per acre; my last year's wheat was quite that, while in 1869, the year I bought it, the average all over that farm was not 20 bushels per acre. This increased produce of 12 bushels per acre yearly is due to steam cultivation, for until the last two years, I have used no other manure than the straw [and hay produce of my farm, without cake or corn, on purpose to prove the value of deep work on my land without enriched manures. Now I am going to mix deep work and enriched manures together to see what they will do. My dung carting is noted on purpose to let all know what I am at and how I work.

"Now I must remark upon No. 3, heavy land, 38 acres, now wheat, after beans—the beans a good crop last year. It is a nice plant. The greater part of this field was bought in 1869, and was in like condition to No. 2. During my occupation it has been under corn cropping without any fallow; it is now clean. The operations for the wheat were one steam-power smashing, at a cost of 6*s*. 2*d*. per acre, 5 inches deep, and one crossing with horses, at 2*s*. per acre. Total cost of seed bed, 8*s*. 2*d*. per acre. This surely is a bit of evidence on the side of steam-cultivation, especially so when we take into consideration the two wet years while I was cleaning this land without fallow.

"Now I will collect the cost of seed-beds on these three fields for working them in 1873, the year after the two wet years. No. 1 stands at 8*s*. 9*d*. per acre, 10 inches deep. No. 2, at 12*s*. 9*d*. per acre, 10 inches deep; and No. 3, at 8*s*. 2*d*. per acre, 5 inches deep. Total 1*l*. 9*s*. 8*d*., or an average of 9*s*. 10*d*. per acre, which hereafter will be my yearly average for working them. Horse farmers cannot work land and keep it clean for such a sum, 5 inches deep, in any season, to say nothing about wet seasons.

"I will not go into particulars about the working of Nos. 1 and 2, light, for their cost will come out the same as Nos. 1 and 2 heavy land; but I must state an experiment that I have tried on No. 6, light land, since 1868. The field is in character fen land, rich in vegetable mould, but poor in lime. It has always grown heavy crops of wheat, oats, and barley not of fine quality. It would grow neither beans nor peas well, producing a heavy crop of straw with but little corn.

"In 1868 I had a crop of barley after wheat; the barley gave a produce of 54 bushels per acre; the seed bed was obtained by a smashing by steam and two crossings by horses, at a total cost of 10*s*. 8*d*. per acre. In 1869 I had it barley again, giving it 6 cwt. of superphosphate per acre. The produce was 63 bushels per acre. The seed-bed was a ridging and subsoiling by steam-power and a splitting by horses, total cost 10*s*. per acre. In 1870 it was barley again, which had 6 cwt. of superphosphate, giving a produce of 56 bushels per acre. The operations were similar to those in 1869, at a cost of 9*s*. 7*d*. per acre. In 1871, with 6 cwt. of superphosphate per acre, I had it barley again, which gave a produce of 61 bushels per acre. The operations were a ridging and subsoiling, at a cost of 6*s*. 3*d*. per acre; it needed nothing but harrowing down before drilling. In 1872, with 6 cwt. of superphosphate, I had it barley again. The seed-bed was similar to that in 1871, costing only 6*s.* 2*d.* per acre. The produce was 51 bushels, thus showing that the wet year reduced the produce a little. The ridges were hand-picked yearly at a trifling cost, and although it had gone through the two wet years, as well as its heavy cropping, it was so clean that it had nothing but a ploughing over with horses for roots this year, which had 8 cwt. of superphosphate per acre (and a part of it, by way of experiment, a little sulphate of ammonia, which, for what I could see, did but little or no good). The crop is a heavy one, particularly the portion of kohl-rabi. About one-third part of the crop will be drawn off, and the rest fed on with a lot of corn and cake, &c. Not a shovelful of cart-dung has been used during the whole of these years, all the straw having gone off; this shows plainly what steam cultivation can do on good land, be the seasons wet or fine.

"The evidences contained in the above are that by the aid of steam-power, heavy clay-land can be worked 10 inches deep, and kept clean, at a cost of 10*s.* per acre a year for 19 years, under a system of corn cropping during the whole period, taking wet and dry years as they come; and that clay-land out of condition may be bought, kept under corn cropping, and made clean in six years, at a cost of about 10*s.* per acre, excepting the hand-picking; and also that good land may be as successfully treated, especially so fen land in character, which may be made to grow six white straw crops in succession, the two last years wet ones, and at the end turned up clean for roots at a single horse ploughing, while two wet years drive the best of our horse farmers to a dead fallow, and others to a dead fallow two years in succession, while filthy land rules throughout the country—I hear the latter from all quarters.

"Steam-power properly applied makes the farmer master of his position in all seasons. I am now buying London dung, because the canal passes through my farm within 100 yards of my heavy land, taking away the wheat-straw and bringing back manure. I am quite certain that a deep and clean working of the land with a liberal mixture of manure of any kind, according to circumstances and judgment, would give good results; but one thing must be remembered, all the steam-power work *must* be done in the autumn, therefore farmers must have tackle of their own; the contract system cannot do it, for the contractor to make it pay must work many months in the year."

Not many farmers of clay-land can give as satisfactory an account of their experience during the wet seasons as Mr. Smith does. Two points in which his practice differs from the usual routine of farm-work seem mainly to have secured his success. The systematic hand-picking of weeds continued for many years has rendered his farm so clean that there are few weeds left upon it to flourish and overrun land in seasons specially favourable to their growth. In clearing land of weeds a gleaning pays much better than a harvest; men who stop the work as soon as the land is *clean enough*, not only have all the work to do over again every three or four years, but whenever a wet season stops horse-hoeing and harrowing, their land becomes full of the weeds they despised. The other speciality in Mr. Smith's practice is the uniform depth of his cultivation. On many farms the land is occasionally stirred to a depth of 10 inches, or even more, but the usual depth will not exceed 5 inches. At Woolston it is only the land intended for wheat that is cultivated 5 inches deep; for all other crops, including barley, the land is worked in autumn to a depth of 10 inches. After nineteen years of such work on land well drained we need not be surprised if even the heavy clay-land stands wet seasons better than other land.

Although Mr. Smith's strongly-expressed opinion of the advantage a farmer derives from having steam tackle of his own is entitled to all the weight that long experience confers, his sweeping condemnation of the contract system cannot be accepted in the face of overwhelming evidence from all sides of benefit derived by those who have had their land cultivated either occasionally or periodically by one or other of the steam cultivating companies that have sprung into existence within the last few years. On clay-land the work done in autumn is unquestionably of the highest value and importance, but so far is it from being the fact that *all* steam cultivation should be confined to the autumn months, that in the north of England we find the demand made upon those who let out steam cultivating machinery is actually more severe in spring than at any other time of the year.

Mr. J. R. Bromley has employed a pair of Fowler's double 12-horse engines on heavy land, near Newmarket, since September 1868. Steam-power enabled him and others to plough their land quickly before the rains set in, and to sow their whole shift of wheat, which many heavy land farmers, who only depended on horse-power, could not do. Heavy land cultivated by steam in the autumn of 1872 produced a first-rate crop of roots, while in many instances, where only horse-power could be employed, the land had to be in bare fallow for the year. "No root crop means less *stock*, which if ever wrong must certainly be so now."

It will be noticed that those who farm clay land speak of the improved crops obtained as well as the greater facility in cultivating by steam instead of horse power. The next on the list of contributors writes from the alluvial soil of Lincolnshire, and, although he says he "cannot see much difference in the crops" resulting from steam or horse power cultivation, he is none the less satisfied with his investment in steam tackle. Mr. J. Sowerby has used a set of Howard's roundabout tackle for 14 years at Aylesby, near Grimsby. "My farm is upwards of 900 acres, of which 650 acres are in tillage managed on the 4-course system. I have about 160 acres of roots. Previous to the last three or four years I broke this up immediately after harvest; it lay in that state until spring, when it went through the same process, and was then made ready for sowing; but lately I have used the steam-plough more in autumn, and in spring have worked entirely with the cultivator before harrowing and rolling, which I have partly done by steam." . . . . "I do not think I could get on without steam, and have felt more benefited by it these two or three wet seasons than even in dry ones."

Mr. G. B. Skipworth, of Moretown House, Caistor, writes:—

"I have in my own occupation about 1500 acres of land, chiefly arable; about 500 acres strong land, the rest a mixture and light. That being so, I can work on some lands in a wet time, when it would not be possible to work on others.

"(1). The advantages of steam-cultivation are certainly increased by a wet time in this respect, that, though we cannot generally then work to advantage strong land (to which these remarks principally apply) either by steam or horses, we are better able to recover the arrears by the extra force we can put on after the wet weather is over.

"(2). I do not think, as a rule, deep tillage enables us to dispense with open water-furrows, or obviates the necessity of draining the land; indeed, the stronger the land, the greater seems the necessity of top-gripping. It sounds reasonable that the deeper we cultivate the greater will be the facilities for the water getting away. I have not so far practised such a great depth of cultivation, but intend to do so more and more, and readily believe that the advantages in those respects will be much greater.

"(3). I cannot say that I have found steam-cultivation hasten or retard the commencement of harvest, though it may be inferred that, if a finer state of tilth be produced, the crop would sooner arrive at maturity.

"(4). A wet season, of course, increases the labour of transporting steam-tackle, as in dry time one may get anywhere without trouble; but with a double set of traction-engines, the difficulties and expense are not so much so; they are more noticeable at the latter end of the year than during the long days of summer.

"(5). There might be special advantage or disadvantage in steam-cultivation, as compared with horses, according to particular local circumstances. Horses might get where engines could not; but if headlands were suitable, steam might be employed more profitably, particularly for ploughing, as there would be no treading of the land.

"(6). I employ Fowler's double set of tackle—one a 12-horse engine, and the other a 10. The latter I formerly used in a single set, but had it made for a double one when I got the 12-horse, and they both work well together. I commenced steam-cultivation about seven years ago. I have hitherto cultivated from 6 to 12 or 14 inches deep.

"In giving the quantities of work done, I regret that it must be a good deal by estimate, as I have not kept a strict account of all work done. There are 22 working horses on the three farms, therefore a great deal of work necessarily falls on the engines. I plough, cultivate, and harrow (not much of the latter) 700 or 800 acres a year, beginning in March and ending in November, being of course partly guided by the weather; occasionally doing work for parties in the neighbourhood in addition. The men are often employed in other work, therefore the number of days they are at work cannot be stated with accuracy. They may be taken to cultivate 10 to 18 acres a day, according to depth, and plough (with 4-furrow) 5 to 8 acres, according to stiffness of soil, and harrow 30 to 40 acres.

"Prices:—Stiff seed land, cultivating twice over, 16*s.* or 18*s.* per acre; fallows, about 12*s.* or 13*s.*, parties finding coals, a water leader, and board for the men."

From the north of England, and from Scotland, very few returns have been sent of work done by the same tackle in the dry and the wet years. It is from these parts that the maximum effects of season might be expected; but, unfortunately, the use of the steam-plough in the North has only recently become general. Companies like that which commenced operations in 1872 in the York District and East Riding, have not been sufficiently long in the field to speak with any confidence as to the *special* effects of a wet season. To the account, already given by Mr. Bolden from Durham, the following may be added from the same county. Mr. Burnett, of the Washington Steam Cultivation Company, says: "From the quantity of work to be done on the land last spring, owing to the stoppage of work from rain in the autumn, I am of opinion a great quantity of land was prepared for potatoes and turnips—that would otherwise have lain as bare fallow—by the assistance of the steam-plough."

The following are the prices charged by this company:—

Digging or Ploughing.

	s.	d.	
Not exceeding 7 inches deep	13	0	per acre.
7 to 9 inches	14	6	,,
10 inches	16	0	,,

Cultivating after Crop.

Not exceeding 8 inches.

	s.	d.	
Once over	11	0	per acre.
Twice over	18	0	,,

Cultivating after Ploughing by Horses.

Not exceeding 8 inches.

	s.	d.	
Once over	10	0	per acre.
Twice over	16	6	,,

Not exceeding 10 inches.

	s.	d.	
Once over	11	0	per acre.
Twice over	18	0	,,

Cultivating after Ploughing or Digging.

By this Company, and not exceeding the same depth.

	s.	d.	
Once over	9	6	per acre.
Twice over	15	6	,,

Harrowing.

		s.	d.	
Single Harrowing	.. ..	3	6	per acre.
Double ,,	.. ..	5	6	,,
Twice ,, (across)	.. ..	7	0	,,

The agriculturists of the North may be the last, but certainly cannot be reckoned the least, among those who have taken up the practice of steam cultivation. The Northumberland Steam Cultivation Company is a young giant of barely four years old; it commenced work in 1872 with 18 sets, and increased them the next year to 20 sets of Fowler's double-engine tackle.

For the following report I am indebted to Mr. Philip Hobbs, the manager and secretary to the company :—

"This Company started in January, 1870; 18 sets of tackle were procured at different periods of that year, making an average of 12 months for 11 sets; the work done was 6164 acres ploughed, 4864 cultivated, and 4458 harrowed.

"I cannot tell you the number of days' work done in any year, the men failing to keep their registers, but we never have much more than six months' work in the year,—three cultivating and harrowing, and three ploughing and digging. If the season is fine, as in this last year, all the cultivating is over by the 1st of July (in 1872 we were cultivating for turnips in August), and from that time, until the middle of October, we have scarcely anything to do, there being no bare fallow in the district. I enclose you three price cards, but must own that I have not been able to obtain my advanced terms for ploughing, although I anticipate no difficulty with the cultivating prices in the spring. Very few of our customers systematically employ us, and very little wheat is grown, so they are very independent of us in the autumn, but very anxious for our assistance when oats, barley, potatoes and turnips, have to be planted.

"In 1872 the average rainfall in 10 places in my district was 46 inches, being 20 inches above the usual quantity; this excessive rainfall increased our difficulties immensely. I found on the stiff clays that we could get to work before the horses, but on the deep soils, such as those on Tweedside, when we might have worked the implements, we could not travel on the headlands. Our customers dispense with open water-furrows, but I do not know of a single instance where deep tillage has obviated the necessity of draining the land, in fact the deeper the cultivation on undrained land the bigger the sponge for holding the water. On well drained, well farmed land, I believe steam cultivation hastens harvest, but on undrained ill-conditioned land I believe it retards it. I observed on the former, in the winter of 1872, that after steam the wheat land was comparatively dry, and the crops afterwards much better than after horse ploughing, and, in the past year, the barley and turnips were much better after steam than horses, the roots being able to run downwards for moisture after those on the horse-ploughed land had ripened off for want of it. In my opinion many farmers make a great mistake in ploughing too deep on stiff land, turning up a lot of cold virgin clay to the surface at one operation instead of doing it gradually and cultivating deeply with an implement which would stir the subsoil, without bringing it to the surface, and would let the water off in wet weather and allow the roots to get moisture in dry. The high price of coal, and the difficulty of getting it, is telling very much against the Company at the present time. At Christmas, 1872, we had 400 names of customers in our ledger; only 100 of these have employed us in 1873, and 100 new customers. If they would sell some of their horses and regularly employ steam I am sure it would be to their advantage; but where the bill for steam cultivation is an extra it is often a serious item."

TABLE VI.—WORK done by 20 Sets of FOWLER'S DOUBLE-ENGINE TACKLE in NORTHUMBERLAND, BERWICKSHIRE, and ROXBURGHSHIRE.

	1871.	1872.	1873.
Acres Ploughed ..	6,910	5,588	7,993
„ Cultivated ..	8,711	8,524	8,503
„ Harrowed ..	7,892	12,974	11,689

The following is a reprint of the third of the price cards sent by Mr. Hobbs:—

NORTHUMBERLAND STEAM CULTIVATION COMPANY, LIMITED, Town Hall Buildings, Cloth Market, Newcastle-on-Tyne.

REVISED PRICES.

Commencing 1st September, 1873.

PRICE PER ACRE FOR

	Ploughing or Digging.	Cultivating after Crop.		Cultivating after Ploughing by Horses.		Cultivating after Ploughing by Steam.	
		First Time.	Second Time.	First Time.	Second Time.	First Time.	Second Time.
	s.	*s.*	*s.* *d.*	*s.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
6 inches deep ..	13	11	7 6	9	6 6	8 6	6 0
7 ,, ..	13	11	7 6	9	6 6	8 6	6 0
8 ,, ..	14	11	7 6	9	6 6	8 6	6 0
9 ,, ..	14	..	..	10	7 0	9 0	6 6
10 ,, ..	15	..	..	10	7 0	9 0	6 6
11 ,, ..	16	..	..	11	7 6	10 0	7 0
12 ,, ..	17	..	..	11	7 6	10 0	7 0

Cultivating with Light Land Cultivator by special agreement.

Harrowing.

	s.	*d.*	
Single each time	4	0	per acre.
Double	5	6	„

N.B.—10*s.* per hour will be charged when the engines are kept standing for want of a sufficient supply of coals and water.

Farmers to find coals and water, and on leaving to fill the engine bunkers with coal, and tanks with water, and to send on water cart to the next farm.

These rates may at any time be altered by the Manager.

Five per cent. discount allowed on all accounts paid within a month from the completion of the field. Interest at the rate of 5 per cent. per annum will be added to all accounts not paid within six months.

PHILIP HOBBS,
General Manager.

The Scottish Steam Cultivation and Traction Company, Limited, only commenced working their first set of tackle in the autumn of 1871; they had 10 sets working in 1872. Although the report received from them only commences with the year of excessive rainfall, it derives interest from the large scale upon which the company works, and the important influence it is likely to have upon the future of farming in Scotland.

This company is fortunate in having for its chairman a nobleman who has paid special attention to the question of steam-cultivation. Lord Dunmore has sent me the following notes, in answer to queries:—

"1. The general advantages of steam-tillage have undoubtedly been increased by the excessive rainfall of 1872. A vast area of land in this country was cropped that otherwise must have lain in fallow had not steam-cultivation been extensively employed, for the work could not have been overtaken by horse-power. Many instances are known where farmers employing this Company's tackle have dispensed with several horses. The crops grown on land that was steam-ploughed in 1872 have generally been very good, and the samples in many known instances have been exceptionally good: the crops raised on steam-ploughed and steam-*harrowed* land have been stronger in straw and stood the weather better than horse-wrought land. 2. Nearly all the farmers who have been in the habit of employing the Company's tackle have dispensed with open water-furrows. I am not aware of any case where steam-cultivation has obviated the necessity of draining the land; but there can be no doubt that steam-cultivation does materially assist the drainage. If land is not *properly* drained, I should consider deep cultivation, especially in wet clay soils, rather injurious than otherwise. 3. The commencement of harvest has not, to my knowledge, been influenced to any marked extent by steam-cultivation. 4. The wet season of 1872 considerably increased the labour and expense of trans-

TABLE VII.—WORK done by the SCOTTISH STEAM CULTIVATION and TRACTION COMPANY, LIMITED, in 1872 and 1873.

	1872.				1873.				Average Price charged for Cultivating 9 Inches deep in 1872.
	Ploughed.	Cultivated.	Harrowed.	Hours Work Done.	Ploughed.	Cultivated.	Harrowed.	Hours Work Done.	s. d.
No. 1 Station, Dunmore, Stirling. Soil chiefly Carse clay, very little rain stops the tackle on this land	620	242	557	1110	665	538	1252	1808	8 8
No. 2 Station. Carse of Gowrie, Perth	345	896	573	1420	280	638	666	1319	7 11½
No. 3 Station. Ditto (principally). Soil chiefly Carse clay	363	623	454	1050	306	523	616	976	9 0
No. 4 Station, Forfarshire. Soil Carse clay and black loam	305	609	255	1410	412	450	166	1049	9 4
No. 5 Station, Midlothian. Soil generally light with many boulders	668	330	152	1120	797	401	867	1450	10 0
No. 6 Station, Anstruther, Fifeshire. Soil various	348	518	434	1050	419	509	854	1281	9 4
No. 7 Station, Dunbar. Soil generally light, but some strong clay	621	400	409	1500	752	404	89	1331	9 0
No. 8 Station, Haddington. Soil principally very stiff clay	492	233	955	1290	828	121	475	1383	..
No. 9 Station, Aberdeenshire. Soil various and abounding in boulders ..	77	274	22	550	406	223	780	1128	9 8
No. 10 Station, Anstruther, Fifeshire. Soil various	198	255	140	500	366	350	915	1090	10 2

porting steam-tackle, the tear and wear of the tackle, and consumption of coal and water, were in consequence much above the average. The system of steam-cultivation employed by this Company is Fowler's double-system. All the engines, with two exceptions, are 12-horse power: the first set was started on 21st September, 1871. The character of the soils over which this Company's operations extend is various, embracing the lightest loam and also the stiffest clay. Very few Scotch farmers care to cultivate deeper than nine inches."

But one more return of work done remains to be reported; it is from the Kincardineshire Steam-Cultivation Company. This Company has for the last eight years employed Fowler's double-engine system in a district varying from a friable clay to peaty loam and gravelly soil. The average depth of its cultivation has been from 11 to 13 inches for digging, and from 7 to 9 inches for spring-work.

TABLE VIII.—WORK done by the KINCARDINESHIRE STEAM CULTIVATION COMPANY.

	1870.	1871.	1872.
Number of Acres Ploughed ..	..	95	262
„ Dug ..	445	539	230
„ Cultivated	765	1431	876

It will be seen that there is here a very considerable falling off in work done in 1872 as compared with 1871; and this is all the more noticeable, since Mr. J. B. Greig, the secretary to the company, remarks that "the plant till March, 1871, consisted of one set, since then of two." The rainfall in 1872 over the whole county of Kincardineshire, as recorded in the tables compiled by Mr. G. J. Symons, attained an average of nearly 50 inches. Although we have found the falling off of work greater as we passed northward and reached districts with a rainfall greatly exceeding that of the south of England, we do not find the advantages of steam, *as compared with horse power*, at all diminished. Mr. Greig states of the Kincardineshire district that "land was sown that, but for steam, must have lain fallow. The land was rarely dry enough to admit of horses treading on it."

Reviewing the whole of the evidence that has been given on the effects of the wet season on cultivation by steam, and bearing in mind the fact that the year 1872 was a disastrous one for almost all kinds of agriculture, it is satisfactory to find that comparatively little or no inconvenience was felt in the south and east of England; while in the north of England and in Scotland, though it was particularly unfortunate that such an unfavourable season should occur when many newly-formed companies were just starting their work, yet this ought not to discourage the efforts of those who are promoting the introduction of steam-cultivation—for the difficulties experienced by steam-cultivators were less serious than those encountered by the general farming community. The severity of the agricultural losses of that year were referred to incidentally by Mr. G. Hope, when leaving his farm of Fenton Barns, in terms that, but for the well-known character of the speaker, might to a southerner seem exaggerated:—"I have suffered with you in the disastrous harvest of 1872. Nothing like it has occurred in my experience. It has brought absolute ruin on not a few, great distress on many, and even the most wealthy must feel it severely." When fields are deluged with rain and all tillage is rendered impossible, the farmer who has horses eating their heads off in enforced idleness in his stable is in a far worse plight than the man whose steam-horse never eats except when it is at work, and who knows that though he may for a while lose the interest of the capital he has invested, he will be better able than his neighbours to make up for arrears of work as soon as the land is fit for cultivation. In former days, when the use of oxen in agriculture was much more common than it now is, the advocates of horse-power often urged, as one of its great advantages, that when horses took the place of oxen on a farm, its whole pace was quickened, and the agricultural mind was stirred to more activity. A similar advantage may be claimed for steam as a motive power. An energetic management is everywhere necessary to secure the full advantages afforded by steam-power. Such energy shows itself most conspicuously amid difficulties that press equally heavily upon all, and there is reason for thinking that the advantages which steam-power confers upon a farmer were rather increased than diminished in the wet season of 1872.

From most of the Reports that have been printed I have omitted the replies given to the following questions:—

No. 2. *Has deep tillage enabled you to dispense with open water-furrows? Has it in any case obviated the necessity of draining the land?*

No. 3. *Have you found steam cultivation hasten or retard the commencement of harvest?*

The replies received need not detain us long; by far the greater number of them give an affirmative to the first part and a negative to the second part of question 2. Indeed, the inquiry whether deep tillage has ever made draining unnecessary may seem to some readers itself unnecessary: and the reply "of course not," received in one instance, probably expresses the thought of many whose answers were less brusque. Yet cases are to be found, although they are of rare occurrence, where land that seemed to require draining has been made comparatively dry by deep cultivation. A case of this sort has come under my observation on a farm on the Surrey Hills near Reigate. A stiff clay, with flints overlying the chalk to a depth varying from three to four feet, when cultivated by horses frequently had water standing in the furrows; a single deep cultivation by steam-power so stirred the first 12 inches and shook the clay below, that, in the following winter, the rain, as it fell, rapidly found its way into the chalk below, and the land was benefited more than it could have been by any amount of draining. The more immediate cause, however, of the insertion of this question was the interesting fact recorded by Messrs. Lawes and Gilbert on page 115 of their Report of the 'Effects of the Drought of 1870 on some of the Experimental Crops at Rothamsted' in the Journal for 1871. It is there mentioned "that whilst the pipe-drains from every one of the other plots in the experimental wheat-field run *freely* perhaps on the average four or five times annually, the drain from the dunged plot seldom runs at all more than once in a year: indeed, it has not with certainty been known to run, though closely watched, since about this time last year." . . . . "Such a fact as the one here recorded is obviously of great interest and significance. Whether the porosity of a clay soil be increased by the application of manure, by mechanical means, or by a combination of the two, its power to retain and absorb water, without being wet, and in an available state, will be proportionally increased, and the necessity for artificial drainage, at any rate on some soils, would be greatly obviated." No instance is given by any correspondent of a case similar to the one just quoted, and, so far as this inquiry goes, we fail to find any instance in which a soil has been enabled by mechanical means alone to retain without injury all the rain that falls upon it. The experience already given by Mr. Hobbs from Northumberland is common to other parts of the country, and his remark that "the deeper the cultivation on undrained land the bigger the sponge for holding the water," probably expresses the whole truth. A large sponge will hold a moderate amount of water without being saturated. At Rothamsted the application of 14 tons per acre for 29 years has rendered the plot so spongy that it now holds all the rain that falls upon it without being saturated by it, but the same plot would obviously still require the help of drains to carry off the surplus water, if the 25 inches that form the average rainfall at Harpenden were increased till it equalled the average fall in the north or west of England. Only two returns stated that deep cultivation served instead of draining, and each case was so modified on further inquiry as to remove it from the same category as the Rothamsted land. Mr. J. C. Robinson, who has used Howard's roundabout tackle for 14 years on heavy clay land at Stevington, near Bedford, says that if land is cultivated when dry it will not suffer from want of draining for that year. Dry air let into the subsoil as well as topsoil enables it to absorb all the rain-water except in a very wet season; but he is careful to add that, though he has observed this several times the last 15 years, he is not indifferent to the great advantages of draining, but considers it the first operation to be performed on all clay soils.

Mr. J. Darlington, of New Buildings Farm, Stratford, writes that deep cultivation has greatly improved that part of his farm on which he has used it. The land appeared to want draining very badly, and was much water-logged in previous wet seasons; but since it has been cultivated by steam it has not been water-logged at all, even in the wettest seasons. The soil is here a stiff stony clay, about two feet in depth, resting on a bed of strong marl, and when the land is well stirred and shaken the wet passes from the surface without being seen. Conditions similar to those in the experimental plot at Rothamsted are probably not to be found elsewhere, except in land long used for market-gardening or naturally rich in humus: on almost all farms with an impervious subsoil provision must be made for artificially removing the surplus water either by drains alone or by drains supplemented by surface-furrows. We might naturally expect to find the use of water-furrows most prevalent in those districts that have the heaviest rainfall; but this is not by any means the case: several correspondents from the southern and eastern districts say that, even with the adoption of deep cultivation by steam-power, they have not yet altogether abandoned the use of water-furrows, but in most cases they are given up after steam-tillage has been continued for a few years on the same land. It will not be necessary to print more than one or two of the numerous replies that report the disuse of water-furrows, but I will give every one of the exceptional cases reporting their partial retention. Mr. Neilson, who manages Hainault Farm, in Essex, for Mr. J. Alison, writes—"Deep cultivation has enabled us in part to dispense with open water-furrows, we only use them occasionally now on heavy land so as to relieve the surface as quickly as possible during very heavy rainfalls. In no case could drains be dispensed with." The tackle used on this farm consists of Fowler's cultivator and plough, driven by a pair of Mr. Alison's engines with vertical boilers and vertical drums.

From the same county Mr. J. Roynon, of Havering Park Farm, writes, "We have not yet worked steam-power sufficiently long to get the land thoroughly opened, but I believe that in a few years we might dispense with a great number of water-furrows. We have one piece of land in particular which was the wettest of all we have, and we put the knifer through it two feet deep, with one tine, three feet apart, and it has so altered it that it has become as dry as any we have: but I find the deeper we cultivate, the more necessary it is we should be thoroughly drained to get the water out of the subsoil quickly. This identical piece of land was drained twelve or fourteen years ago, and, after heavy falls of rain, scarcely any water would discharge from the drains, but, after the knifer had been through it, as soon as the rain came the drains discharged full."

Mr. W. B. Lowe, of Eatington, near Stratford-on-Avon, says on this point:—"Deep tillage has not wholly enabled us to dispense with open water-furrows, but has much lessened the necessity of them. The autumn-ploughing for spring crops is left as it is ploughed. It has not obviated the necessity of draining, but it appears to make the drains much more effective, as a much larger portion of the rainfall can be passed through the strong clay than was possible under horse-ploughing."

A correspondent from Kent writes:—"I have been able to do away with all *ridge* furrows, only keeping open, as matter of precaution, almost unnecessary, the *load* furrows through the parts most liable to flood." Mr. C. Ellis, of Beddington, near Lewes, is among the number of those who continue to use water-furrows. Mr. J. Edmonds, of Lechlade, writes:—"Deep tillage has to a great extent enabled us to dispense with water-furrows; the land not being trodden allows of the passage of the water through it to the drains without staying in the soil long enough to chill it, neither does the soil get so *washed* as it does under horse cultivation (I am speaking here of heavy land). I have never known deep tillage obviate the necessity of drains; the only case in which it would be possible for it to do so is where a retentive soil rests upon a porous one. I have one piece on my farm where 4 or 5 feet of clay rests on stone: had it been only from 2 to 3 feet I think the steam-ploughing would have shaken it sufficiently to have obviated the necessity of draining."

The following is from Mr. Smith, of Woolston:—"My land was all drained before I commenced steam tillage upon it; for on clay, and mixed gravel and clay land, drainage is the foundation to steam tillage. Water-furrows have been dispensed with ever since I commenced steam-cultivation, and not a drop of water for the 19 years has ever been seen standing upon it."

In the accounts already printed in full from the Northumberland and the Scottish Steam-Cultivation Companies it is stated that the customers of both these companies dispense with water-furrows; to the same effect Mr. Burnet, of the Washington Steam-Cultivation Company, says:—"We have dispensed with open water-furrows, and think we are now better off than with them before. Deep tillage by steam, I know, has enabled drains to act that had ceased to do so before, but could not say whether land would do without draining: in some cases it would." From still further north, Mr. J. B. Greig, of the Kincardineshire Steam-Cultivation Company, says, that deep tillage "has caused existing drains to act more equally and more perfectly. It has also produced a more equable condition of the soil as regards humidity."

The much less frequent use of water-furrows in the north, in spite of its greater rainfall, than in the south of England, is a natural result of the smaller breadth of wheat that is sown there. So far as *the land itself* is concerned it is best that all the rain that falls upon it should pass *through* it, however slow the process may be: but with a plant of autumn-sown wheat upon it, if the land has not been previously sufficiently opened up for heavy rain to find its way freely to the drains, the use of surface-furrows is less objectionable than having the land water-logged and the young plant killed. When thorough drainage has been followed by efficient steam-cultivation continued for several years, we have ample evidence that even on the heaviest soils wheat may be sown without using surface-furrows at all.

The inquiry as to the effect of steam-cultivation has elicited some difference of opinion. Out of twenty-one replies received, nine report simply that they have not observed that the time of harvest is in any way affected by steam-cultivation, two say that harvest is retarded, while nine correspondents express an opinion, with more or less confidence, that harvest is in some degree hastened by it. Mr. J. B. Greig, of the Kincardineshire Steam-Cultivation Company, says that steam-cultivation "has, under favourable circumstances, been followed by a more luxuriant crop, and a heavy crop will not ripen so quickly. Early sowing and early varieties of seed have counteracted this tendency largely." Mr. F. Sherborn, of Bedfont, Hounslow, has found steam-cultivation retard the harvest on his farm; it is important to notice, however, that even in the wet season of 1872, he says his "land is so light and dry that, with a few exceptions, the work was uninterrupted." On a "gravelly loam very variable" crops often ripen in a hot summer prematurely, and deep tillage will give not only a later, but a better, harvest. From another farm with soil quite as variable the crops are noticed to ripen more evenly for the deep cultivation.

Mr. Neilson, from Hainault Farm, in Essex, with soil varying from a stiff clay to loam and gravel, writes,—"Not any perceptible difference to be noted in commencing harvest, but the crops after deep cultivation certainly ripen more evenly."

Mr. W. Bulstrode, of Mount Farm, near Maidenhead, says,—"I do not consider the time of harvest has been affected on my farm by the adoption of steam-cultivation, except that by its use my work has been always more completely in hand, and I am able with more certainty to secure a satisfactory seed-time."

Among those who express an opinion that harvest is slightly hastened are Mr. Bolden and Mr. Burnet, both writing from the Durham district; Mr. G. Hodgkinson, M.P., from Northgate, Newark; and Mr. J. C. Robinson, from Stevington, Bedford.

Mr. Smith, of Woolston, writes,—"Steam-cultivation has not (while growing red wheat) hastened or retarded the commencement of harvest; but for the last three years, during which I have grown white wheat, it has done so, for in each year I have been able to begin cutting my wheat five or six days earlier than my neighbours could under horse-culture; and there is an additional gain in this beyond time—that of getting a wheat of a better quality, and as many bushels per acre of it. I am not comparing against Rivett's."

Mr. J. R. Bromley, of Playford Mount, near Woodbridge, says,—"Drainage and steam-cultivation certainly hasten the commencement of harvest. Mr. J. Darlington, of New Buildings Farm, Stafford, also believes that harvest is hastened; while Mr. W. B. Lowe, of Eatington, near Stratford-on-Avon, observes that "steam-ploughing would appear to retard the too rapid ripening of the crops, but it enables spring tillage to be begun earlier, and consequently places some crops in a more forward condition." It thus appears, amid some difference of opinion, that the balance of evidence is slightly in favour of the view that the time of harvest is in some degree hastened, and with greater unanimity it is shown by experience that a better crop is obtained after steam than after horse culture. Better in some cases, because a higher class of grain can be sown; in others, because the crop is more bulky or more even: while on hot and dry soils the deeper tillage prevents the crop ripening prematurely. As the general result of this inquiry we may say that, though the use of steam-power has not enabled those who have adopted it to pass unscathed through such a season as that of 1872, yet the heavy rainfall of that year has rather increased than diminished the confidence they feel in its superiority over horse-power in the cultivation of the soil.

VI.—*On Concrete as a Building Material for Farm Buildings and Cottages.* By GEORGE HUNT, of Evesham, Architect and Surveyor to the Royal Agricultural Society.

THIS Paper has been prepared, at the request of the Journal Committee, with the view of bringing the merits of concrete as a building material clearly and practically before the readers of the Royal Agricultural Society's 'Journal.'

The question whether the use of concrete is likely to reduce the cost of building operations has been much discussed of late, in consequence of the high price that all kinds of building materials and skilled labour have recently attained.

To some extent I believe it will have such an effect, but I would not go so far as to say that concrete will prove cheaper than brick or stone in all situations and under all circumstances.

I would rather treat concrete as an auxiliary material, to fall back upon in situations where the usual building materials must be brought from a distance, and where those adapted for making concrete are readily obtained upon the spot.

I would also adopt it in cases where the greatest possible economy is absolutely necessary.

The plain face of a concrete wall, it must be borne in mind, would not please every eye, especially where economy is the chief consideration and farm labourers are the workmen. Of course, concrete-buildings can be made ornamental, but their cost then would be equal to, if not greater than, that of erections of a similar character in brick or stone. The adoption of concrete, beyond its use as the cheapest and most reliable material for foundations (as it unquestionably is), will therefore depend entirely upon the taste and means of the proprietor.

Concrete is not a new material; but its modern use is of recent date, and was first revived in this country by the late Sir Robert Smirke, who used concrete extensively in the foundations for most of his principal buildings; and his example has been extensively followed with signal success.

In addition to its being used for foundations it has also been used with varying success in the erection of docks, sea walls, breakwaters, and similar purposes; and also, to some extent, in the erection of warehouses and domestic dwellings.

Where care has been bestowed in the selection, preparation, and method of using the materials, there is abundant proof of its adaptability, great strength, and durability; but it is in the selection of the materials, and in the care bestowed on their preparation and use, that the whole secret of concrete-building lies. Neglect in these respects causes failure, and failure in concrete means something more than failure in brick or stone work. In the former case, it is more difficult to detect a defect in one day's work during the progress of the works; if not remedied at once, the defect would cause partial, or even total, destruction of the entire work; hence the reason of concrete not being more generally adopted for building purposes.

However, these remarks are not intended to detract from, or lessen, the value of concrete as a building material, but merely to show that great care is requisite in its use, so as to secure that strength for which it is so famous.

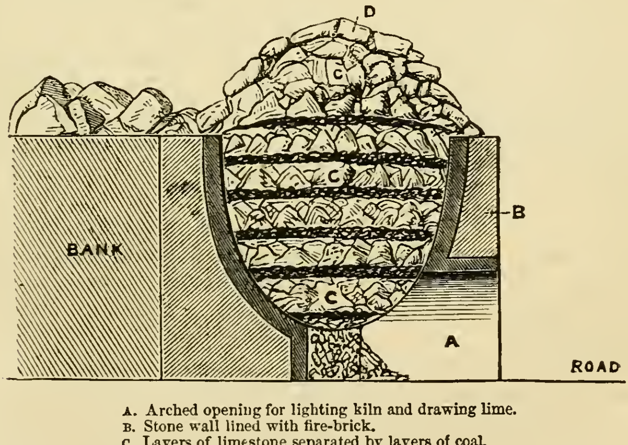
Materials.

Materials for making concrete (apart from lime and cement) are so numerous, varied, and generally abundant, that I shall only mention the principal.

Pit gravel (large and small), sand, and shingle with sand, are, no doubt, the best; next to these I shall place *débris* removed from old buildings, in the shape of broken tiles, bricks, and stone, not omitting the old mortar; after these come any kind of stone that can be easily broken up, slag from furnaces, and ashes of all kinds; lastly, when the above materials cannot easily be obtained in sufficiently large quantities, I should use hard burnt clay ballast, which, if mixed with some of the harder kinds of material just enumerated, would also make a good concrete.

Lime.—Limestone of various qualities is found nearly all over the country; the most suitable for concrete purposes are the poorer limes, that burnt from claystone being the best. Lime is easy of manufacture, and, where stone is procurable and coal moderately cheap, is not expensive; it can be burnt by any

Fig. 1.—*Common Lime-kiln.*



A. Arched opening for lighting kiln and drawing lime.
B. Stone wall lined with fire-brick.
C. Layers of limestone separated by layers of coal.
D. Covering of large stones to keep in the heat.

farm labourer, after a little instruction, in the simple open kiln. Fig. 1 represents a section of a common open limekiln filled with limestone ready for burning, the thick black lines indicating the layers of coal; the opening A is the fire-hole.*

Lime for making concrete is best if ground by machinery to

* See also Mr. C. Turner's Prize Essay on "Ordinary and Improved Kilns for Burning Lime for Agricultural Purposes," 'Journal of the Royal Agricultural Society,' 2nd series, vol. vii., p. 132.

a fine powder, in which state it may be secured in casks or bags for transit or storage. Where machinery cannot be had, it will answer the purpose if it is air slaked, or, to make this operation quicker, water may be thrown upon the lime, thus producing the characteristic flour. In both of the two latter methods care must be taken that every particle of lime be slaked. To ensure this the lime should be passed through a fine sieve, and the residue gone over again. If lumps of unslaked lime are incorporated in the concrete, its stability and strength will be greatly reduced by the portions of unslaked lime bursting, which may not take place until the walls are completed, thus causing a great deal of damage. The effect would be similar, in fact, to that of a lump of lime bursting in a brick.

Lime concrete for walls above ground is not to be compared to cement concrete ; of course it is cheaper than the latter, and good enough for foundations below ground, or even in walls of a bulky nature, such as retaining and breast walls.

Cement.—Cement for making concrete is of two kinds, the natural, or "Roman," and the artificial, or "Portland." Both are hydraulic, and of very simple manufacture, the former being made out of the natural cement stone found in many parts of the country, and the latter being a mixture of lime and clay. Both may be burnt in a common open lime-kiln ; they are ground to powder and stored away in casks or bags, as previously mentioned for lime. Before the recent advance in the price of coal and labour, Roman and Portland cement could be bought at from 30*s.* to 35*s.* per ton ; now the price is from 40*s.* to 45*s.*

Great care should be exercised in procuring cement for concrete ; its quality should always be guaranteed by the manufacturer as up to a certain standard of excellence ; a register of the strength of each sample sent out is generally kept by the manufacturer.

Owing to the great experience in the manufacture of "*Portland*" cement, and the methods adopted for testing it, there can be no doubt that it is now superior to the natural, or "*Roman.*"

A great deal has been written upon limes and cements, and many valuable and costly experiments have been made, especially by Major-General Pasley ; yet there is still scope for a great deal more with respect to these important building materials.

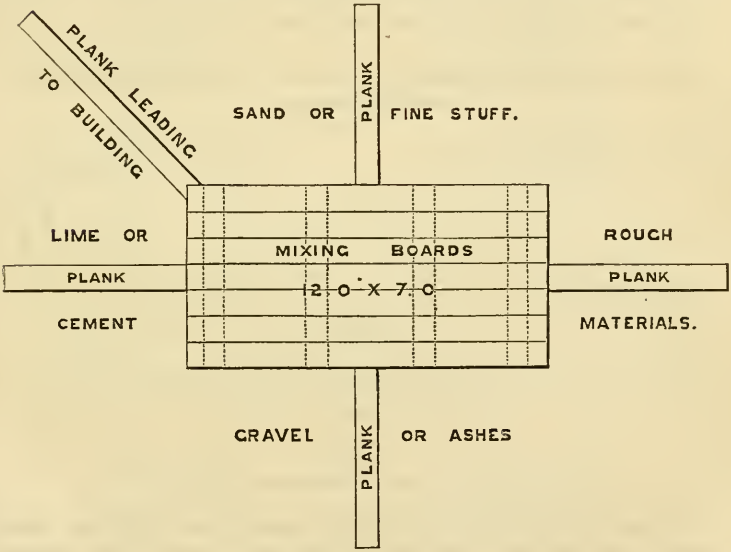
Twenty-five years ago I spent the greater part of a year in experimenting upon these materials, and, after numerous trials to produce a good water cement, I could not beat in quality, much less in price, the Portland cement made on the banks of the Medway from the chalk and blue clay of that locality.

Making Concrete.

Lime Concrete (chiefly for Foundations).—We will suppose that the position of the intended building is staked out, that the trenches for the foundations are dug, and that the several materials of which it is intended to make the concrete are upon the spot.

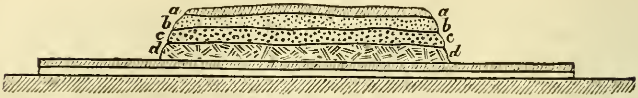
Two mixing-boards are required, a useful size being about 12 feet by 7 feet; but this will depend greatly upon the nature and extent of the proposed building. They should be made of 3-inch planks firmly secured to cross sleepers, without sides, so as to form a good firm and solid floor upon which to mix the concrete (see Fig. 2).

Fig. 2.—*Mixing Boards, &c., for making Concrete.*



The larger materials must be broken up to about the size of a hen's egg, or walnut, and deposited in heaps around the mixing-boards, as shown in Fig. 2, conveniently within reach; it will be seen that a plank is laid from each heap to the board, and also towards the building, so as to facilitate wheeling. The men should now proceed to wheel on to the mixing-board sufficient of the different materials at hand as can be conveniently turned by four men; two of the men would wheel the stuff on, while the other two would spread it evenly, thus depositing the whole in layers, as shown in Fig. 3.

Fig. 3.—*Materials for making Concrete in layers.*



aa. Cement or Lime. *bb.* Sand or Fine Stuff. *cc.* Gravel or Ashes. *dd.* Rough Material.

I must again mention that the lime should be thoroughly slaked, the proportions being one part lime to six or seven of broken material, both large and small.

These should now be thoroughly mixed together in a dry state, by turning the mass over twice. Commencing at the centre A, Fig. 4, and throwing over towards the right and left, the mass would be divided into two heaps, as B, C, Fig. 5, which should be again thrown together in the direction of the arrows, and would again form one heap as D, Fig. 6.

Figs. 4, 5, and 6.—*Illustrating the mode of mixing Materials for making Concrete.*

Fig. 4.

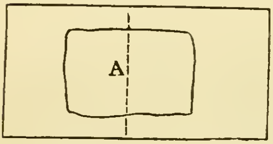


Fig. 5.

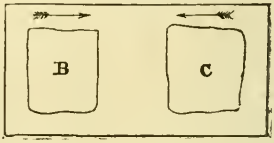
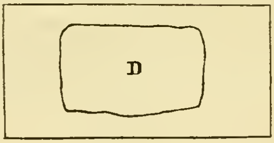


Fig. 6.



Water should now be sparingly added, and then the whole thrown back again in two heaps, and again back to one as first described, so that the various materials may be thoroughly incorporated together.

The mixture is now ready for use, and should be at once wheeled to the building and thrown into the trench or mould, as the case may be.

Cement Concrete (chiefly for Walls above Ground).—This is made in exactly the same manner as previously described for lime concrete, and the materials are used in the same proportions. The only difference is that cement is used in the place of lime as the binding material, and the rough materials are reduced to a smaller size than for lime concrete. It should be

Figs. 7, 8, and 9.—*Illustrating the method of building Walls with Concrete without a Patent Apparatus.*

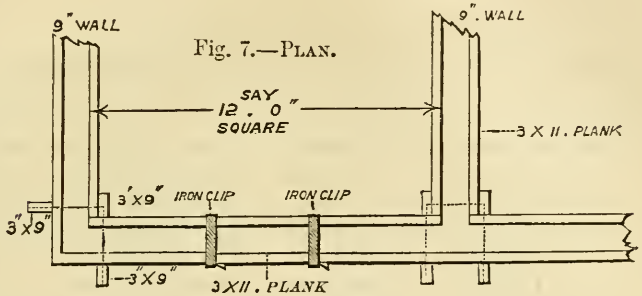
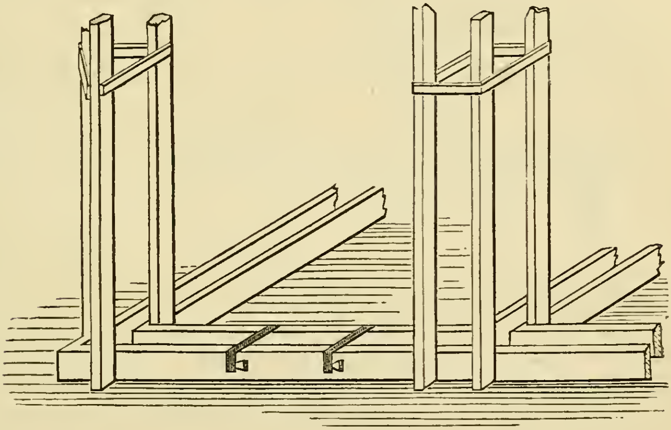


Fig. 7.—PLAN.

Fig. 8.—ELEVATION.



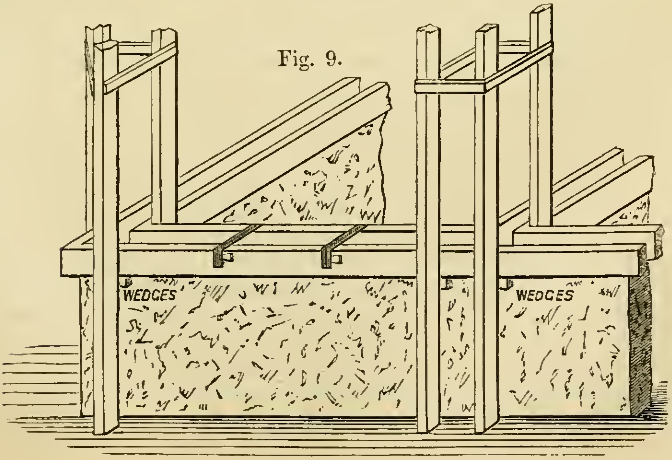


Fig. 9.

observed, however, that the smaller the rough materials are broken up the stronger will be the concrete.

Building Walls with Concrete.

1. *Without a Patent Apparatus.*—The simplest method of building with concrete is as follows. See Figs. 7, 8, 9, previous page.

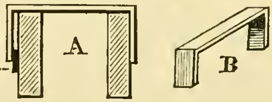
Firmly fix stout wooden uprights, say 3 × 9 in., at each angle of the building, and at the junction of cross or division walls. They should be kept at one uniform width apart, either with bolts, or cross-pieces of wood; they should also be stiffened with stays from the ground, so as to keep them perfectly steady and upright.

Two 3 × 11 in. planks, one for each face of the wall (or four 3 × 7 in. deals, *i.e.*, two for each face, each pair firmly secured with ledges), are required to form a trench the whole length and width of the intended wall.

A piece of iron, as shown in Fig. 10, A and B (suited to the thickness of the wall), dropped over the planks at intermediate distances between the uprights and wedged up, will prevent the planks from being bulged out by the pressure of the concrete; a few such pieces, to suit 6-inch or 9-inch walls, could easily be made by any village blacksmith, of light bar iron.

Fig. 10.—*Iron Clamp.*

Wedge

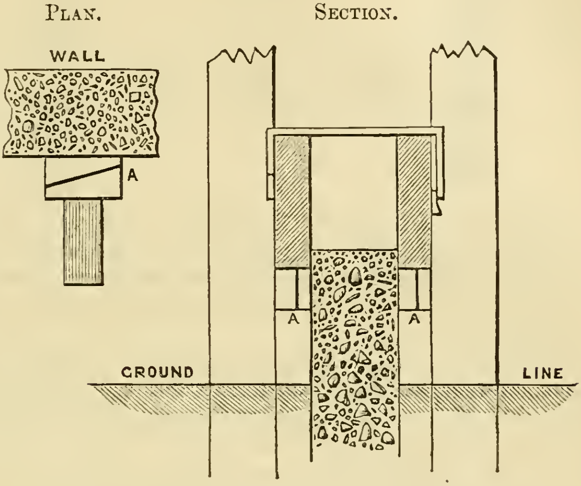


When the trench is filled with concrete up to the ground line, and above that to the top of the planks, they should be moved higher up, and secured with counter wedges (see Figs. 9 and 11). The lower edges of the planks should be allowed to cover the concrete about an inch and a half (see Figs. 11 and 12), so as to securely confine the next layer of concrete and prevent any oozing out, see also Figs. 8 and 9. It will be observed that the trench being shallow it may be filled in a day, thus allowing the concrete to set during the night, so that the trench may be ready for moving higher up the next morning for refilling. The sides, too, being only a single plank, will be lighter and more handy to move up and down than if made up of two or three in depth; the shallowness of the trench (only 9 or 10 inches deep) will enable an unskilled labourer to fill it in better with the concrete, and so make better work. It will also be more open to supervision, although the rate of progress will not be quite so fast as if the trench had been 18 inches deep; but where unskilled workmen (such as farm labourers) are employed, the slower rate of progress will be advantageous because more sure.

I should mention that no scaffold-poles will be required, as strong wood brackets can be secured to the wood uprights to carry the scaffold-planks.

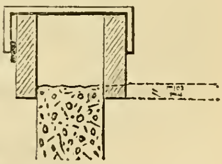
Figs. 11 and 12.—*Wall-building in Concrete.*

Fig. 11.



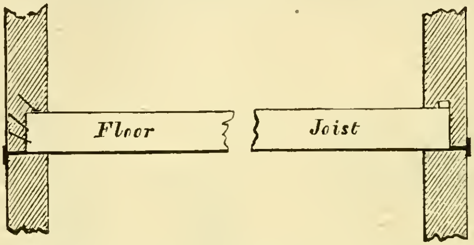
Special provision will have to be made for fireplaces and for gables; this would be arranged by the managing man, who should be a carpenter. Door and window frames should be built in, partially driving a few nails in at the backs of the frames, so as to take a firm hold of the concrete. Joists, too, should be fixed in place, and either wood fillets, hoop iron, or nails driven in at the ends, so as to secure them to the concrete, and form a perfect tie from wall to wall, see Fig. 13, p. 220 (one side showing nails driven in, and the other side the wood fillet). In the case of any opening being required, such as fireplaces or arches, &c., wood cores or moulds made tapering should be used, so as to be afterwards easily withdrawn when the concrete was set; wood cores will be required for chimney flues, which may be either round, square, or oval, and by the same means air-flues or other openings for ventilation can be easily formed as the work proceeds.

Fig. 12.



The face of concrete being smooth, no pargetting will be required for flues, and also one coat of plastering to walls will be saved. The floors of kitchens, &c., if formed with concrete, will be drier and warmer than either tiles or stone. Concrete also makes a good floor for barns, cow-houses, and sheds.

Fig. 13.—*Methods of fixing joists in a Concrete Wall.*



As concrete (if made of Portland cement and tolerably fine broken material) is impervious to moisture, it is evident that it will make both a drier and warmer house than one built of brickwork or stone, both of which materials hold a great deal of moisture.

2. *With the aid of a Patent Apparatus.*—There are several kinds of apparatus now before the public, the principal being "Drake's" and "Tall's," which are equally good and simple, their cost being also about the same. They are made chiefly of iron; the uprights are about 8 feet long, and together with the plates forming the trenches, are moved up higher as the work proceeds. Iron uprights the whole height of a building would be both heavy and expensive, and would not suit every case, but wood uprights can be utilised as rafters for the roof, &c. In "Tall's" there is but one set of angle uprights, as in Fig. 14, which are bolted together; but in "Drake's" the angles of the building have two sets of angle uprights, as shown in Fig. 15.

Figs. 14 and 15.—*Plans illustrating Patent Apparatuses for Concrete Building.*

Fig. 14.

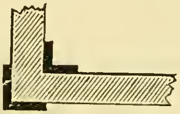
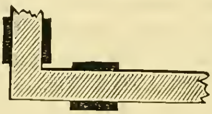


Fig. 15.



The method of building with either kind of apparatus is precisely the same as I have already described, and I should recommend those who intend building largely with concrete, to purchase or hire one in preference to the simpler and cheaper wood contrivance that I have described, and I therefore give the addresses of the proprietors :—

J. Tall, 8, Lawson Street, Dover Road, London, S.E.

Drake's Patent Concrete Building Company, 37 to 41, Rockingham Street, Newington Causeway, S.E.

THE COST OF CONCRETE COMPARED WITH THAT OF BRICKWORK.

To show the relative cost of concrete and brickwork, I will take for example the Cardiff plan of a pair of labourers' cottages, which appeared in the 'Journal' for 1873,* and I will suppose that a patent concrete building apparatus will be hired.

In that design there are 618 yards of reduced 9-inch brickwork, which at 5*s*. per yard superficial would amount to 154*l*. 10*s*. The same quantity of concrete, which costs on an average 2*s*. per yard superficial, 9-inch thick, would amount to 61*l*. 16*s*.; to this I will add the cost of hire of one of these patent apparatuses for a month, which would amount to about 18*l*. 9*s*., making a total of 80*l*. 5*s*. against 154*l*. 10*s*., leaving a balance in favour of concrete, even when the apparatus was hired, of 74*l*. 5*s*.

This comparison should direct the attention of those interested in building to the consideration of this valuable and economical material, and help to remove any prejudice respecting its use as a building material for farm-buildings or labourers' cottages.

ORNAMENTATION OF CONCRETE.

In commencing this paper I said that the bare concrete face would not please every eye. We have been so long accustomed to see regular horizontal and vertical joints, with the usual building materials, that when a new material is introduced, having a different appearance, we cannot all at once bring ourselves to like it; hence a certain prejudice against the appearance of concrete as well as against the material itself. A concrete wall, in opposition to one of bricks or stone, is a large slab, being a mixture of broken stones, bricks, ashes, gravel, sand, &c., and lime or cement. There are no joints; all is one conglomerate mass, resembling, as it were, in its texture, magnified granite. Now the finer the several materials are of which it is composed, the more perfect the mass, both in strength and in appearance. Of course the expense of manufacture is increased, as it takes men a longer time to break material up to the size of small gravel than to the size of a walnut. The bare concrete face may be improved by putting some of this fine concrete to the face of the work, and backing it up with coarser stuff, at little extra trouble. Again, I would suggest that a brick or stone plinth be put round the building, brick arches of various colours put to windows or doors, stone heads to windows (stop-

* Second series, vol. ix., part 1, p. 246, and Plate I.

chamfered or otherwise ornamentally treated), moulded brick or stone strings, ornamental brick eaves, or the rafter-feet projecting (stained and varnished); these expedients would certainly make a concrete house look quite as well as one built either of brick or stone, and at little additional expense. Everything would be real, and show itself; nothing would be hidden by a sham facing, which would be the case, if the walls were coated with cement; for then the appearance of the building would be the same, whether built of brickwork, stone, or concrete. At a short distance it might even be mistaken for stone, until the weather and time brought a little of this veneering off and revealed the real material.

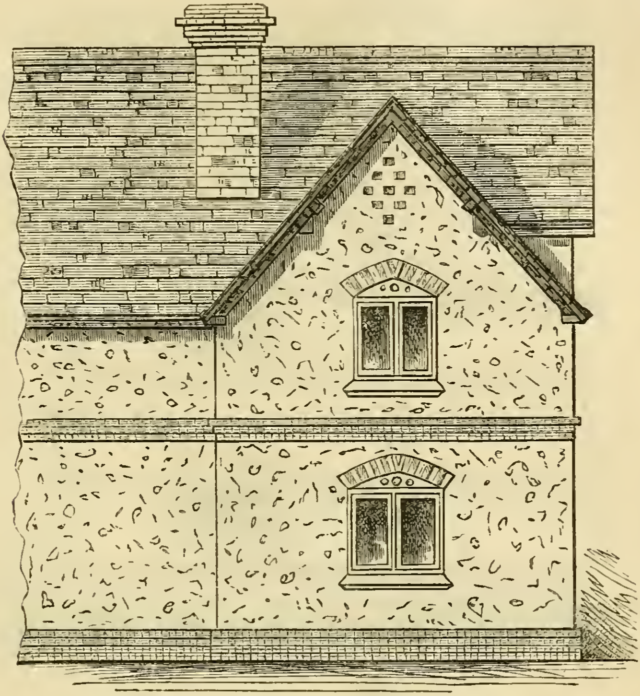
I have, in the accompanying Plates, I. II. and III., shown what may be done in treating concrete ornamentally, taking as a basis the Cardiff cottage design previously referred to.

Plate I. (p. 223) shows a very simple way of treating concrete. The plinth, strings, window-arches, and chimneys, are of red brick; the window-sills are of stone. A stop-chamfered wood barge-board, $1\frac{1}{2} \times 9$, is put to each gable, projecting about 10 inches; the rafter-feet also project about 4 or 5 inches; and both are stained and varnished. Figs. 1, 2, 3, are details of strings to a half-inch scale; Figs. 4 and 5 are details of plinths; and Fig. 6 shows a window with stone head and chamfered red brick jambs.

Plate II. (p. 224) is the same design, treated rather more ornamentally. The base, of red brick, is in two orders, and reaches up to the ground-floor window-sills, see the subjoined Fig. 2. Red brick strings run round the building, and the angles have brick quoins. Barge-boards are dispensed with, and brick corbelling to gables substituted, see Fig. 3. The gables, too, have alternate layers or bands of concrete and red brick; brick arches and jambs are put to windows and doors; the rafters are not projecting, as is shown in Fig. 1. A brick cornice is used, see Fig. 1. A plan of chimney-stack is shown in Fig. 4.

Plate III. shows the same design treated with stone instead of brick; this is supposed to apply to a stone district. The plinth, strings, window-dressings, coping, and chimneys, are of stone. Figs. 1 and 2 are details of a bedroom window. The pointed arch is of red bricks, the head or tympanum being set back, as shown in Fig. 2, and finished with Portland cement, the sun and date being either stamped upon it or afterwards applied. Fig. 3 is a plan of chimney-stack. Fig. 4 is a detail of the upper part of the gable, showing the gable coping, enclosing a shield, which might bear the proprietor's arms or monogram. Fig. 5 is a detail of the main string; *a* is moulded stone-work; *b* is intended for 6-inch ordinary red floor quarries.

Plate I.—*Concrete Cottage, with slight Ornamentation in Brickwork.*



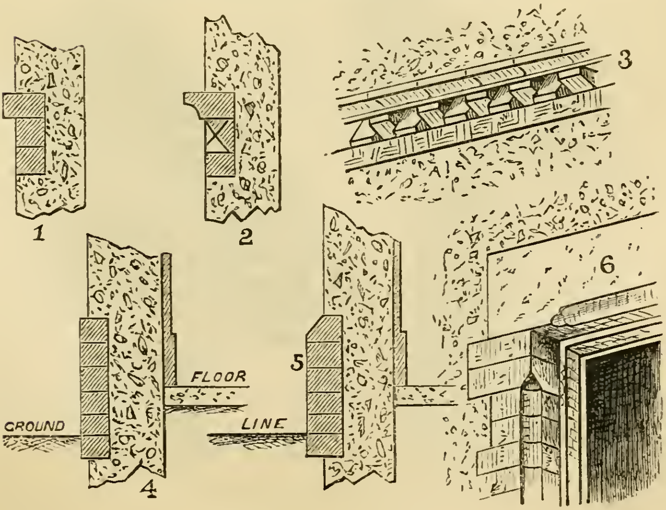


Plate II.—*Concrete Cottage, with further Ornamentation in Brickwork.*

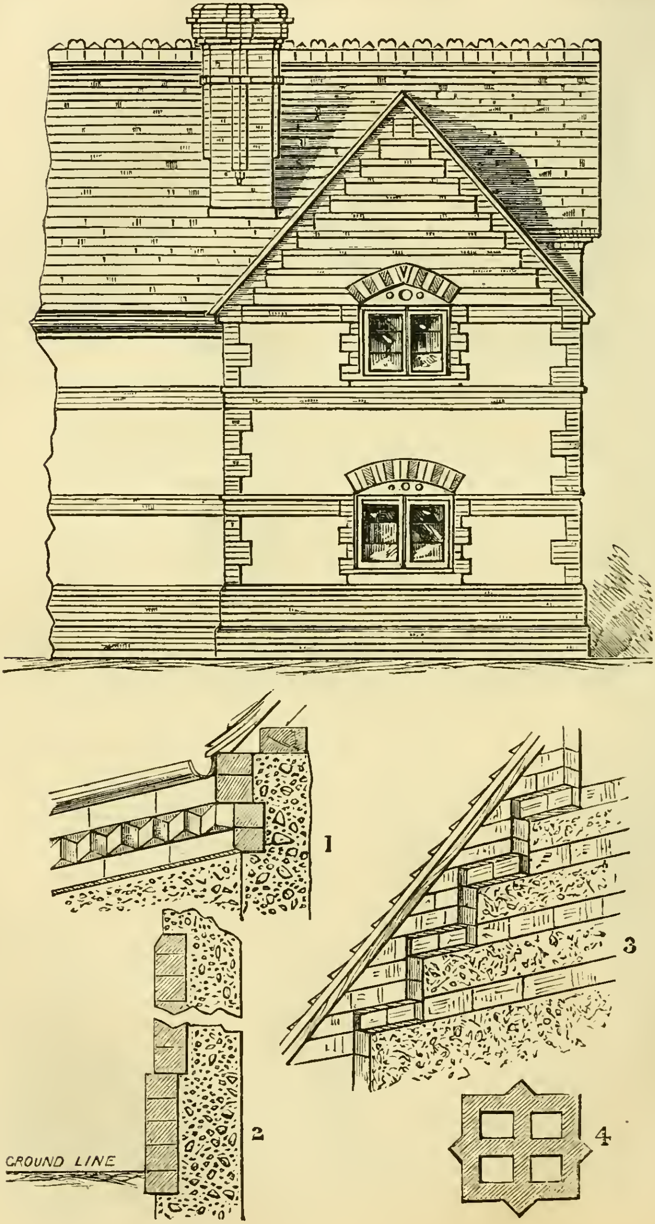
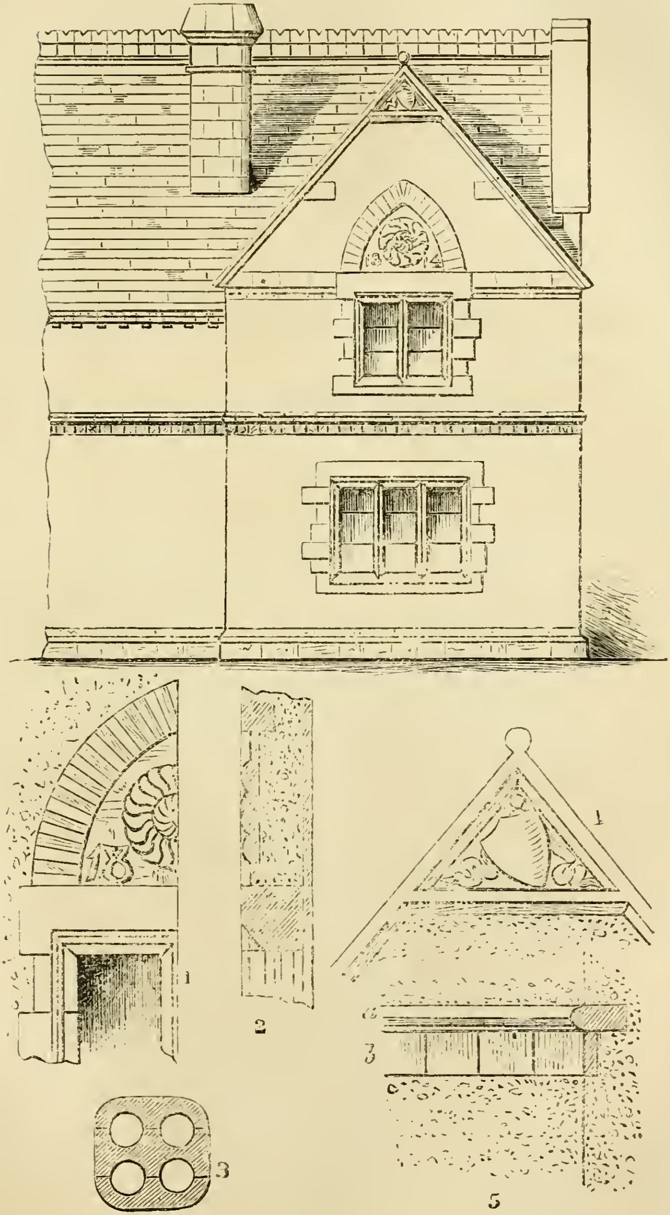


Plate III.—*Concrete Cottage, with Stone Ornamentation.*



In each design the roofs are supposed to be covered with Broseley tiles, having plain or ornamental ridge-cresting, and all brickwork jointed with black mortar.

These few hints will show that the honest face of concrete can be made to look quite as ornamental as either brickwork or stone; and I hope they will be the means of restricting the general custom of coating or facing with cement, which prevents the passer-by from judging of what material the building is erected, until time and weather has caused some of it to crack and fall off.

The following specification and estimate of the several works are intended to show what the probable cost of the Cardiff pair of cottages* erected in concrete would be, but with a slated instead of a tiled roof; the porches and dormer windows being omitted on the score of economy.

SPECIFICATION AND ESTIMATE.†

LABOURER.

Yds.	Ft.			£	s.	d.
		Remove all vegetable soil off the site of intended erection, and deposit same in the garden as directed, say two days' work for a labourer ..			5	0
		Fix the wood stiles, and set out the building; stuff, nails, and time			5	0
		Dig trenches for the foundations, 16 inches wide, to a uniform depth of 2 feet, and level the excavated earth around the site as directed.				
35	0 cube	Digging and levelling..	at 1s.	1	15	0
		Construct the foundations up to the finished ground line with lime concrete.				
30	0 cube	Lime concrete	at 6s.	9	0	0
		Provide materials, and put a damp-proof course on top of foundations of external and internal walls throughout, ½-inch thick, composed of gas-tar, pitch, and saud, applied hot.				
40	0 supl.	Damp-proof course	at 1s.	2	0	0
		Provide the necessary deal planks and other scantlings for the mixing vats, wheeling planks, moulds, stays, and scaffolding required, fix same in place, and after the walls are built, use them up in constructing the internal partitions, ceilings, and roofs.				
		Waste, labour, iron bolts, and nails on the above, a lump sum		10	0	0

* See 'Journal of the Royal Agricultural Society,' 2nd series, vol. ix. part 1, 1873, p. 246, and Plate I.

† The drainage, water supply (including pump), boundary fences, and laying out the gardens, are not included in this estimate.

Yds.	Ft.		£	s.	d.
		Build up the walls, fireplaces, and flues, off the damp-proof course to the heights and thicknesses shown, with cement concrete, viz.—			
300	0 sup[l].	9 inches thick in external walls .. .. at 2*s*. 6*d*.	37	10	0
12	0 cube	In fireplaces and flues .. .. at 12*s*.	7	4	0
80	0 sup[l].	6 inches thick in internal walls .. .. at 2*s*.	8	0	0
		Level up and well pun the soil to the ground floors, and spread a layer of concrete, 4 inches thick, over the same, to receive the finished cement floors.			
85	0 sup[l].	Concrete .. .. at 1*s*.	4	5	0

CARPENTER AND JOINER.

		£	s.	d.
	The carpenter must assist the labourer in fixing the wood uprights, stays, horizontal planks and moulds for the plain walls; he must also provide the labourer with proper turning pieces, centres for arches, wood copes for fireplaces and flues throughout; materials, nails, and labour, a lump sum	7	10	0

Door Frames.

		£	s.	d.
72 run	3 × 5½ solid wrought red deal rebated and chamfered door frames to front and back doors, with centre boards .. .. at 8*d*.	2	8	0
64 run	3 × 4½ ditto to coal-places and privies .. at 7*d*.	1	17	4
102 run	Solid frames to the inner doors on ground floor, 2 inches thick, and in width the thickness of the respective walls, with rebates laid on .. at 6*d*.	2	11	0
93 run	1 inch casings to the bedroom doors, with rebates laid on .. .. at 4*d*.	1	11	0
	The door frames on ground floor to be secured to the stone plinths with iron dowels and to be built in as the work proceeds in reveals, and all to be firmly secured to the walls at sides either with hoop iron or stout nails driven in so as to take a firm hold of the concrete, 10 in number .. at 1*s*.		10	0

Window Frames.

		£	s.	d.
206 run	Solid red deal 3 × 5½ rebated and chamfered window frames with splayed and rebated oak sills with double centre boards, the whole to be set in reveals and built in as the work proceeds, and firmly secured to the concrete as previously mentioned for the door frames .. .. at 8*d*.	6	17	4

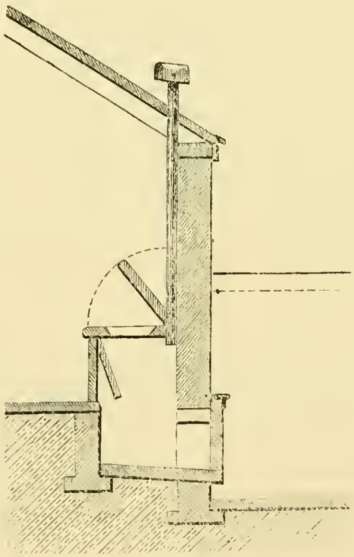
(It is intended that both window and door frames should finish flush with the inside surface of walls).

Yds. Ft.		£	s.	d.
	NAKED FLOORS.			
	The bedroom floors to have $2\frac{1}{2} \times 7$ (or 2×9) Baltic fir joists, placed 16 inches from centre to centre, framed with trimmers to all fireplace and other openings, built into the concrete walls as the work proceeds, and secured thereto by means of an iron cramp turned up and down to every other joist; care to be taken that the concrete is perfectly level to receive joists, as no bond timber is intended. The concrete should rest upon the upper edge of the joists, but the sides and ends should be kept clear, so as to prevent dry rot.			
	Insert cast-iron air-bricks in the outer walls on opposite sides, and bore holes through the joists in a line therewith, so as to allow a free circulation of air.			
550 run	$2\frac{1}{2} \times 7$ or 2×9 joist .. .. at $4\frac{1}{2}d.$	10	6	3
	Iron cramps	1	0	0
	Cast-iron air-bricks		10	0
24 run	Herring-bone truss .. .. at $4d.$		8	0
	STUD PARTITIONS.			
	Construct the stud partitions with 3×4 Baltic fir, sills, heads, and laces, and fill in with 2×4 intermediate studs, placed 16 inches from centre to centre.			
100 run	3×4 sills, heads, and laces .. .. .. at $3d.$	1	5	0
300 run	2×4 studs .. .. at $2d.$	2	10	0
	ROOF.			
	Frame and construct the roof in a workmanlike manner, with the following-sized scantlings, viz:			
160 run	3×7 wall plate .. .. at $5\frac{1}{4}d.$	3	9	9
100 run	Stout hoop-iron ties .. .. at $1d.$		8	4
100 run	3×7 purlins .. .. at $5\frac{1}{4}d.$	2	3	9
650 run	2×4 rafters, placed 16 inches from centre to centre .. .. at $2d.$	5	8	4
45 run	$1\frac{1}{4} \times 7$ ridge .. .. at $2d.$		7	6
60 run	Hip-and-valley rafters .. .. at $4d.$	1	0	0
300 run	$2\frac{1}{2} \times 3\frac{1}{2}$ ceiling joists .. .. at $1\frac{3}{4}d.$	2	3	9
	Extra for all timbers in sight to be wrought		10	0
63 run	$1\frac{1}{2} \times 7$ wrought and stop-chamfered barge boards to each gable, with a 2×3 moulding planted on .. .. at $7d.$	1	16	9
	Extra for 2 finials .. .. at $5s.$		10	0
	Provide a small trap-door and frame on each landing for access to roof .. .. at $5s.$		10	0

Yds. Ft.		£	s.	d.
	FLOORS.			
6 sq. 0	Lay the bedroom floors with dry inch wrought spruce-deal boards, batten width, with mitred margins to hearths, to be well secured with 2½-inch cut floor-brads (punched in) to the joists .. at 25*s.*	7	10	0
	STAIRS.			
	Construct the stairs with inch elm treads and risers, and inch deal strings and newels 3 inches square, enclose the space under stairs to form cellars or closets with inch wrought matchboarding, provided with door to each to correspond, hung with T-hinges; also form the bulk-head in bedroom with similar boarding .. .. at 63*s.* each	6	10	0
	DOORS.			
	All the doors on ground floor to be 1-inch red deal wrought and V-jointed ledged doors; the front doors to have false heads to resemble batten doors; all to be hung with 18-inch strong wrought-iron T-hinges. Fix 7-inch iron-rim locks upon the front and back doors, dead locks upon coal-places, and iron-rim bolt-latches, with brass knobs, upon all the other doors of ground floor.			
236 sup'.	Inch ledged doors .. .. at 7*d.*	6	17	8
	14 pairs of hinges .. .. at 1*s.* 4*d.*		18	8
	4 7-inch iron-rim locks .. .. at 4*s.*		16	0
	2 dead locks .. .. at 2*s.*		4	0
	8 iron-rim latches, bolted .. .. at 1*s.* 6*d.*		12	0
	The bedroom doors to be ¾-inch wrought, ledged, hung with 14-inch wrought T-hinges, and fix on each one iron-rim bolt-latch, as before described.			
90 sup'.	¾-inch ledged doors .. .. at 6*d.*	2	5	0
	6 pairs of hinges .. .. at 1*s.* 2*d.*		7	0
	6 iron-rim latches .. .. at 1*s.* 6*d.*		9	0
	WINDOWS.			
	The windows to be 1¾-inch red deal casement-sashes; one casement in each window to be hung with 2-inch wrought-iron butt hinges, and fix on each a good brass casement fastening and back-stay; glaze the windows with 16-oz. 2nds. sheet-glass, bedded in putty.			
140 sup'.	.. .. at 1*s.* 6*d.*	10	10	0
	Put rounded bay boards to all the windows, 40 ft. run .. .. at 3*d.*		10	0
	Fix single inch plain band mouldings round all doors and windows where plastered.			
500 run	.. .. at 2*d.*	4	3	4

Yds. Ft.		£	s.	d.
	Fit up each pantry with 2 tiers of 1 × 9 wrought deal shelves, resting upon cement fillets.			
32 run	1 × 9 shelving .. .. at 4*d.*		10	8
6 run	Cement fillets .. .. at 3*d.*		1	6
	Provide a wood cover, with handle, to each boiler, at 3*s.* 6*d.*		7	0
	Fit up the privies with inch oak seat and riser, and deal flap, hinged with brass butt hinges. Fix on top of each seat a 3-inch cast-iron pipe, running up through roof, filled with pieces of charcoal, and bonneted on top to keep out the rain, as shown in Fig. 16 .. .. at 25*s.*	2	10	0

Fig. 16.—*Section of Privy.*



BRICKLAYER.

	£	s.	d.
Provide and set solid stone plinths to the door frames on ground floor throughout, to be in width the thickness of the walls, and to be 6 inches thick, 14 pairs .. .. at 2*s.* 6*d.*	1	15	0
Put solid stone steps to front and back doors, 12 feet run .. .. at 10*d.*		10	0
Put blue brick on edge sills in cement to coal-place, privies, and to thresholds of open sheds, 22 feet run .. .. at 6*d.*		11	0

Yds. Ft.		£	s.	d.
6 0 sup[l].	Lay the floors of sheds with blue bricks on edge, set in mortar .. .. at 4*s*.	1	4	0
	Provide a 16-gallon galvanized iron boiler, with fire-grate and door complete, and set same in brick-work to each shed, and connect the flues therefrom with the scullery chimney stack .. at 30*s*. each	3	0	0
	Provide and fix a 36-inch oven-and-stove range in each kitchen, set with fire-bricks .. at 40*s*. each	4	0	0
	Fit up the scullery fireplaces with a fire-brick hearth and iron sway	1	0	0
	Provide and fix 16-inch sham stoves to each bed-room fireplace, set with fire-bricks .. at 10*s*. each	2	0	0
9 0 cube.	Build up the chimney stacks with smoke and air-flues above the ceiling-line in brickwork, as shown, the top courses to be set in cement .. at 25*s*.	11	5	0
	Fix stones to privy vaults (as shown) secured with iron holdfasts, so as to be easily removed when required for cleansing		7	6
	Provide and fix the sink-stones, as shown, in scullery .. .. at 1*l*. each	2	0	0

SLATER AND PLUMBER.

12 sq. 0	Cover the roofs with best Bangor ladies' slates, upon red deal sawn laths, to leave 2-inch lap, and well pointed on the under side with hair mortar, at 35*s*.	21	0	0
73	Cover the ridges and hips with slate roll ridge cresting .. .. at 8*d*.	2	8	8
30	Lay the valleys with 5-lb. milled lead, laid upon ¾-inch valley boards, and turning 6 inches on each side up the slating .. .. at 1*s*. 8*d*.	2	10	0
52 run	Step flushing with 4-lbs. milled lead round chimneys and other junctions of slating with brick-work .. .. at 1*s*.	2	12	0
	Fix a glass slate over each coal-place .. at 2*s*. 6*d*.		5	0

PLASTERER.

270 0 sup[l].	Plastering equal to one coat of work to the whole of the walls internally, except sculleries and out-offices .. .. at 4*d*.	4	10	0
200 0 sup[l].	Lath and plaster the stud partitions and ceilings throughout, 3-coat work, finished white, at 1*s*. 6*d*.	15	0	0
350 run	Plain cement skirting to entrance passages, kitchens, and bedrooms .. .. at 2½*d*.	3	12	11

Yds.	Ft.		£	s.	d.
		Cement the jambs of each fireplace (except sculleries), and put to each a cement shelf, fixed upon a floor tile or stone core; kitchens, 10s. each; bedrooms .. .. 5s. each	2	0	0
		Grout-out and lime-whiten the walls of sculleries, sheds, coal-places and privies	1	0	0
		The floors on the ground-floor throughout, except the two sheds, to be in Portland cement.			
80	0 sup'.	Cement floors, at 1s.	4	0	0
		The hearths throughout to be in concrete and cement	1	0	0
		The top edge of plinth, the window-sills, chamfers to door and window, external openings, to be executed in cement .. .. lump sum	2	10	0
		SMITH AND PAINTER.			
		Spout the eaves throughout with 4-inch cast-iron eaves-spouting, and 2-inch down pipe, with all necessary brackets, stop-ends, nozzles, and shoes, complete	5	0	0
		Paint the whole of the wood and other work usually painted three times good oil colour; the iron work to be painted once before and twice after fixing	6	10	0
		Total	£ 284	9	0

VII.—*Report on the Contagious and Infectious Diseases of Animals, referred to in the Contagious Diseases (Animals) Act, 1869, especially with respect to their degree of prevalence in 1872.* By Professor G. T. Brown, Chief Inspector of the Veterinary Department. (*Concluded from* vol. ix. part 2, No. xviii. p. 502.)

[Reprinted from the Report of the Veterinary Department for the Year 1872.]

Pleuro-Pneumonia.

This malady, which is so well known to stock-owners, appears to have been recognized in this kingdom in the latter part of the year 1840. Previously to that time, however, it was known in various parts of the Continent. In the middle of the eighteenth century pleuro-pneumonia prevailed in Germany and Switzerland, and the affection is probably identical with the "peri-pneumonia maligna" which existed on the Continent in the latter part of 1600.

In the year 1840 pleuro-pneumonia appeared in the south of Ireland, in the town of Cork, into which place it was introduced, according to report, by Dutch cows which were imported by a friend of the English consul from one of the Dutch ports. No precise evidence has been obtained as to the manner of the introduction of the disease into Ireland from Holland, but there is little doubt that the affection existed in the neighbourhood of Cork in the latter part of 1840, and there is also positive evidence of the fact that it appeared in the London dairies in 1842, since which time it has never been absent from some districts of this kingdom.

Owing to the fatality which attends the progress of the disease, scientific and practical men have devoted a considerable amount of attention to the investigation of its causes, nature, methods of cure, and means of prevention. Several scientific commissions have been established in Germany, France, Belgium, Holland, and also in our own country; but it unfortunately happens, notwithstanding the investigations which have been carried out, that some of the most important points in connexion with the malady still remain undetermined.

For some time after the appearance of lung disease in this country a difference of opinion prevailed among scientific and practical men as to its contagious character. It is now, however, admitted that pleuro-pneumonia is a contagious disease. The experiments which have been made, however, do not satisfactorily determine the manner of the communication of the disease. It is certain that the introduction of a diseased animal into a healthy herd will, in the majority of instances, be followed by the extension of the disease to a certain per-centage of the healthy animals. But it is remarkable, on the other hand, that all attempts which have been made to communicate the disease by the matter obtained from the lungs have invariably failed, at least in this country.

It is asserted by Vix that pleuro-pneumonia followed the introduction of a portion of diseased lung under the skin of the dew-lap of a bull, and another portion, after being washed in cold water, placed in the same position in a cow produced the same effect. In both these cases, however, only six days elapsed before the symptoms of pleuro-pneumonia presented themselves—a fact which goes far to prove that the animals were the subjects of the disease at the time of the inoculation.

Introduction of the fluid exuded from a diseased lung produces local symptoms, which have been asserted to resemble those which are presented by the lungs of the animals which have taken the disease naturally. Frequent examination of such cases has convinced me that the exudation which takes place into the areolar tissue is identical in character with that which is obtained from the lungs; but in no instance has it been found that constitutional symptoms of the disease follow inoculation, and in no case has it occurred that disease of the lungs has been produced by introduction of the morbid matter into any part of the animal's body.

In the majority of cases considerable swelling of the inoculated parts occurs after the expiration of a week to a fortnight. But during this period no rise of temperature has been remarked, nor has there been any indication of febrile disturbance except in those instances in which severe local inflammation has occurred, followed by mortification, and finally loss of the tail.

Professor Baldwin, of Glasnevin, states that he has succeeded in producing pleuro-pneumonia by the introduction into a healthy animal's nostrils of a little cotton wool which had previously been placed in the nostrils of a diseased beast. The same experiment has been performed in this country recently without any injurious consequences to the animal experimented upon; the lungs taken from a diseased animal have also been placed in a shed in which a healthy heifer was kept, but failed to communicate the disease to her.

So far as our observations enable us to decide, pleuro-pneumonia can only be communicated by actual contact of a diseased animal with a healthy one; and it is, at least, exceedingly probable that the mode of communication is by the inhalation of the breath of the diseased subject.

The period of incubation of lung disease is very valuable, extending from ten days, which may be taken as the minimum, to three months, which may be taken as the maximum. Under ordinary circumstances three weeks may be accepted as the average period of incubation.

In the majority of cases of direct infection, that is to say, where diseased cattle have been placed in contact with healthy animals, the signs of pleuro-pneumonia have manifested themselves in from sixteen to twenty-one days after exposure. Some animals have resisted the infection up to the fiftieth day; but it must be remarked, in reference to those long periods of apparent incubation of the disease, that there is no precise evidence as to the moment when the virus introduced into the system meets with the conditions which are necessary for the development of the disease; for it is the case, in reference to all maladies which are propagated through the means of contagious virus, that a certain susceptibility must exist in the system of the healthy subject before the disease can undergo development.

Pleuro-pneumonia is confined to the Ox tribe, and, on this account, the choice of the term is unfortunate, as pleuro-pneumonia of the ordinary kind, namely, inflammation of the lungs and membrane covering them, is common to all domesticated animals. Pleuro-pneumonia of the ox, or contagious pleuro-pneumonia, or, as it is commonly termed, "lung disease," is distinguished from the ordinary affection by the absence of any acute signs of inflammation of the respiratory organs, and the gradual advance of congestion with the exudation of lymph into the connective tissue of the lungs.

As a consequence of these changes the affected lung acquires a considerable increase in bulk, and is distinguished by a characteristic marbled appearance, which is seen on making a section, and which is due to the presence of the exuded lymph of light colour between the lobules, which are rendered dark in consequence of the retention of the blood in their vessels. It has been observed that in the course of three weeks the lung on one side, which normally would weigh about 15 lbs., has been increased by interlobular deposit to a weight of 45 lbs.

Appearances similar to those which are seen in the diseased lung of the ox affected with pleuro-pneumonia have occasionally been seen in the lungs of the horse and sheep. There is no reason, however, to suspect that any form of lung disease in the ox, sheep, or pig is contagious, or in any way resembles the pleuro-pneumonia of the ox, save in the occasional occurrence of interlobular deposit.

The treatment of pleuro-pneumonia is very rarely effectual. Animals have recovered under all kinds of treatment, and the fact that nearly equal results have been obtained by the depletive and the stimulant systems is tolerably good evidence of the inutility of remedial measures. The most successful remedy which has been recently employed is carbolic acid, which has been, and still is, used extensively by Mr. Priestman. Professor Baldwin also has employed the same agent as a curative and preventive of the disease, and he states that the results in his hands have been satisfactory. Mr. Priestman uses carbolic acid externally and internally, giving doses once or twice a day, combined with spirit and diluted largely with water; at the same time that he keeps the floor of the cowshed covered with sawdust, which is saturated with a strong solution of the agent. Whatever kind of medical treatment may be employed it is highly important that the sick animals should be carefully isolated.

Preventive measures naturally take the precedence of curative means in all cases where pleuro-pneumonia has broken out in a district, but it unfortunately happens that, owing to the uncertainty as to the progress of the disease, it is exceedingly difficult to decide as to the efficacy of the means which are employed. Sometimes pleuro-pneumonia spreads with remarkable rapidity through a herd, and only ceases when the last animal has been attacked. In other cases, apparently when the conditions are precisely the same, the disease attacks one or two animals of the herd and then ceases. Under those circumstances it is difficult to decide whether or not the cessation of the disease is due to measures which have been employed to arrest its spread. This difficulty becomes most apparent in considering the effects of inoculation.

Pleuro-pneumonia, it has been already stated, cannot be produced by the introduction of matter from the diseased lungs; but a knowledge of the fact of the immunity which attends animals which have once suffered from a contagious malady, even in its mildest form, led Dr. Willems in 1852 to try the effect of the introduction of some fluid from a diseased lung into the system of a healthy animal. After numerous experiments Dr. Willems came to the conclusion that animals which had suffered from the development of the local effects of this inoculation were, as a rule, secure from the natural attack of the disease. He accordingly made known his discovery to the Belgian Government.

Dr. Willems's discovery attracted considerable attention, and several commissions were subsequently appointed to investigate and report as to its efficacy. The Dutch commission appointed in 1852 declared that inoculation possesses the power to temporarily prevent infection, but they declined to express any opinion as to the permanence or otherwise of the security thus afforded.

The Belgian commission appointed in 1853 reported that inoculation was not a certain preventive of pleuro-pneumonia, that the effects of inoculation are manifested several times in the same animal whether it has had pleuro-pneumonia or not; that they are developed even when the inoculated animal is suffering from the natural disease. The commission gave no opinion as to the protective effect of the operation.

Professor Simonds, who was commissioned by the Royal Agricultural Society to visit Belgium in 1853, reported that inoculation made by superficial punctures and small abrasions of the skin failed to produce any local effects; that deep punctures were followed by the ordinary phenomena only of such wounds when some highly irritating agent is introduced into them; that when bad decomposed matter is employed, and the incision is roughly made, ulceration and gangrene follow, sometimes causing the death of the patient; that inoculation with irritating agents was followed by similar phenomena to those observed in inoculation with the exuded serum from a diseased lung; and that pleuro-pneumonia occurs at various periods of time after the so-called successful inoculation—the severity of the disease being in no way modified by the operation.

The French commission appointed in 1854 reported that inoculation with fluid obtained from a diseased lung has a preventive influence. It imparts to the organism of the great majority of animals on which the operation is performed a power of resisting infection for a period which is as yet undetermined.

These conflicting opinions have not been in any way reconciled by the results of subsequent investigations, and there are still two sides to the question of the efficacy of the operation. On the one hand it is contended that it invariably arrests the spread of the disease, but on the other it is held that inoculation is entirely inoperative, that the disease progresses in spite of it, or that it ceases in obedience to the influence of certain conditions which are not understood.

The fact remains that in many instances an outbreak of pleuro-pneumonia is occasionally arrested in herds on which inoculation has been performed. It is also true that it ceases in many instances when no such operation is had recourse to; but it is certainly the case that the records of instances of the spread of the disease being stopped by the operation of inoculation are far more numerous than those in which it has ceased spontaneously.

The present position of the question of the precise value of inoculation as a protective against pleuro-pneumonia is such as to forbid the hope that the matter will ever be satisfactorily determined. When on the one side there exists an absolute conviction of the certainty of the measure as a preventive, and on the other an entire disbelief of the existence of any benefit which may arise from it, it is not probable that experiments on a sufficiently extensive scale will be undertaken by either side, and there does not seem to exist any third party with whom the solution of the problem is a matter of sufficient importance to justify the outlay of time and money which would be necessary for the conduct of an exact investigation.

Preventive measures in general would include all those means which have been suggested in reference to the prevention of the spread of cattle-plague, foot-and-mouth disease, and, indeed, all contagious and infectious maladies to which stock are liable. Isolation or slaughter of diseased animals, prevention of movements except by license, and the stoppage of fairs and markets in infected districts, may be placed among the measures which have been proved to be effectual in arresting the spread of the disease.

It cannot be inferred, however, that the mere slaughtering of diseased animals which have been some time affected, and the recovery of which is scarcely to be expected, is a measure which is calculated to be of much benefit. The stamping-out system, as it is understood on the Continent, means the slaughter of diseased animals immediately on the discovery of the disease, and the careful isolation of the rest of the herd until the period of incubation has passed.

Early removal of diseased animals is undoubtedly an effective measure; and, in order to apply this precaution before the disease has advanced sufficiently to render its diffusion a matter of certainty, it is desirable that the herd among which the disease has appeared should be examined by the aid of a thermometer, and all the animals which indicate a temperature of 102° be removed from the rest, and carefully isolated, until symptoms of the disease appear, when they should be immediately slaughtered.

In reference to the disinfection of premises in which diseased animals have stood there is a difference of opinion among Continental veterinary authorities, some contending that cleansing and disinfection are not sufficient to destroy the vitality of the infecting germs; and they illustrate this remark by reference to cases of the recurrence of disease among animals which have been placed in sheds some months after diseased beasts have been removed from them, notwithstanding the places had been cleansed and disinfected in the interim. We have no facts which would justify us in accepting this conclusion as applicable to the disease in this country. When premises have been properly cleansed by washing and subsequent use of lime, or chloride of lime, it has not been found that animals placed in these premises shortly after the process of cleansing has been completed, have suffered from the malady.

In attempting to deal with pleuro-pneumonia under the Contagious Diseases (Animals) Act two great difficulties have presented themselves—first, it has been found impossible to ascertain the extent of the disease, owing to the facility with which it can be concealed, especially when it occurs in the dairies of large towns, which may be looked upon as the chief centres of infection; secondly, the long period of incubation, which makes it impossible, in many instances, to determine whether an animal is infected with the disease or not. Without a large staff of inspectors with compulsory powers of entry no exact information can be obtained as to the extent of the prevalence of the disease; and, owing to the uncertainty of the period of incubation, no regulations which could be applied to an infected herd would be likely to arrest the spread of the infection unless they were continued for a long period or made permanent.

Sheep-Pox.

On the first appearance of this disease in England its true nature was not immediately recognised, although Professor Simonds, who inspected the diseased sheep at Datchet in 1847, remarked a considerable resemblance between the eruption which he observed on the skins of the diseased animals and that of small-pox as it occurs in man. The matter was considered of so much importance that an investigation was immediately undertaken by Professor Simonds, Mr. Ceely, Mr. Erasmus Wilson, and Mr. Marson. After considerable inquiry and numerous experiments the following conclusions were arrived at.

Sheep-pox is so far allied to small-pox in man as to deserve the title of ovine small-pox. The affection is communicated by inoculation or association from the diseased to healthy sheep. Experiments which were made to test the communicability of sheep-pox to other farm stock, including horses, cattle, and pigs, gave negative results, as did also inoculation of the human subject. An attack of sheep-pox gives the animal protection against subsequent attacks of the disease, but vaccination is found to have no preservative influence. In fact the vaccine vesicle was not perfectly developed in the sheep in any one instance.

When sheep-pox is allowed to run its course without interference it passes through a definite number of stages, each of which occupies a certain period. The time of incubation varies from 7 to 14 days, and is followed by the febrile stage of invasion, and this by the development of hard red pimples, which are called papulæ, and which appear from the fourteenth to the sixteenth day after infection. Vesication takes place from the seventeenth to the nineteenth day. Pustules are developed from the twentieth to the twenty-second day, and from the twenty-second to the twenty-eighth day the surface of the pustule becomes covered with a brown scab. During the latter part of the period of incubation and the period of invasion considerable fever is present, which is indicated as usual by a rise of the internal temperature. The constitutional symptoms which are apparent vary according to the stage of the disease, but they generally resemble those which are present in ordinary febrile catarrh. There is discharge from the nostrils, quick breathing, heightened colour of the mucous membranes, discharge of tears from the eyes, loss of appetite, cessation of rumination, general dulness of aspect, and a tendency, which is always observed among sick animals, to avoid association with others. When the disease assumes a malignant form the discharges become extremely fetid, diarrhœa occurs, and sometimes extensive ulceration of the surface of the skin. These cases usually terminate fatally.

As in the small-pox of man the virulence of the disease varies considerably in different seasons without any sensible cause. Sheep-pox, when it first appeared in this country, was remarkable for its great fatality, the deaths sometimes amounting to 75 per cent. The outbreak which occurred in Cheshire some years afterwards was attended with comparatively insignificant mortality, the deaths sometimes not amounting to five per cent. of the animals attacked. Sheep-pox is not indigenous to this country. In 1847 the malady was introduced for the first time in this generation along with 56 Merino sheep which were purchased in Smithfield Market on the 20th July, and taken to Datchet near Windsor. The disease shortly appeared among the Merinos, and quickly extended to the Downs with which they had been placed. From this centre of infection sheep-pox rapidly spread until it extended over a considerable part of the country, and its ravages did not cease until 1850. From this time England remained free from the disease until 1862, in the summer of which year it appeared at Allington near Devizes. In this case the origin of the outbreak was never satisfactorily ascertained, but it was presumed that the disease had been brought to the district with refuse matter in which portions of sheep were found, and which was conveyed by means of a boat along the canal, near the field in which the sheep first attacked were feeding. From Wiltshire the sheep-pox extended into Berkshire, and was not completely extinguished until October of the same year.

The third outbreak took place in June 1865 near Newhaven, Sussex. In this instance also the origin of the disease was unknown, but it was suspected that carcasses of diseased sheep which were known to have been thrown up on the shore, close to which the sheep attacked were feeding, had communicated the malady to them. Active measures of repression were at once taken, the diseased flocks were carefully isolated, and day by day, as fresh cases occurred, the diseased animals were killed and buried. Owing to the adoption of these precautionary measures the affection did not extend beyond the flock among which it first appeared.

The fourth outbreak occurred at Long Buckby in Northamptonshire, in January, 1866. In this case the disease was introduced by Dutch sheep, which originally were said to have come from Copenhagen, and were sold in the Metropolitan Market. The affection was not discovered until after the animals had been dressed by the purchaser for a skin disease which he believed to be scab. Some of the animals having died, however, he was led to seek the advice of a veterinary surgeon of the district, who at once decided that the disease was sheep-pox. As soon as information was received at the Veterinary Department an investigation was made, and the local inspector's opinion was at once confirmed. In this case the disease was exterminated by the slaughter and burial of the whole flock, and immediate application of disinfectants to the hurdles and other things with which the sheep had been in contact.

The fifth outbreak occurred in March 1866 in Essex, in the districts of Earl's Colne, Black Notley, and Great Yeldam. No difficulty was found in this instance in tracing the origin of the disease to the introduction of foreign sheep from Belgium. In August of the same year the disease was communicated to sheep on three farms at Beaumont Oakley and St. Osyth, and shortly after its appearance in those places it was detected on seven farms of Cheshire, having been introduced there by foreign sheep which were purchased at Harwich.

In the same month a number of foreign sheep were stopped by the inspector at Harwich, and slaughtered at the landing-place, in consequence of the existence of sheep-pox among them. This was the first instance of the disease having been detected among animals landed at an English port.

The progress of the disease in Cheshire and in most of the districts in which it appeared in Essex was distinguished by a remarkably benign character. All the districts where it appeared were declared infected, but in no case was the stamping-out system applied. In some of the flocks the affection ceased after a small per-centage of the animals had been attacked. In others, where it manifested a tendency to spread, inoculation was had recourse to; in all cases the greatest care was taken to prevent the movement of sheep out of the infected districts or the introduction of healthy animals into it, and the affection finally died out without producing any great amount of mischief.

Since the cessation of the outbreak in 1866 sheep-pox has not appeared among sheep in this country, although foreign sheep infected with the disease have repeatedly since that time been landed at English ports.

In 1868 foreign sheep affected with sheep-pox were landed at English wharves no less than nine times during three months.

August 5th, the "Waterloo" from Rotterdam landed 1314 sheep at Brown's wharf. Sheep-pox was detected in a lamb of the cargo, and the whole of the animals were consequently slaughtered.

August 8th, the "City of Norwich" from Tonning landed 954 sheep at

Victoria Docks. Among these animals seven were found to be affected with sheep-pox.

August 13th, the "Nora" from Harlingen landed 671 sheep at the Dublin wharf. Among these animals five cases of the disease were detected.

August 17th, the "Lion" landed 2366 sheep at the Brunswick wharf. In this cargo there were 25 diseased animals.

August 19th, the "City of Norwich" from Tonning landed 1020 sheep at Brunswick wharf. Among these animals there were 27 diseased.

August 25th, the "Lion" from Harlingen and Nieue Dieppe landed 956 sheep, among which there were two infected with sheep-pox.

August 30th, the "Olga" from Rotterdam landed 572 sheep at Victoria Docks. Among them there were two animals affected with the disease.

September 16th, the "Batavia" from Rotterdam landed 318 sheep at the Brunswick wharf; three of them were affected with sheep-pox.

October 12th, the "Tonning" from Tonning landed 348 sheep at Victoria Docks. One of these animals was found to be a subject of sheep-pox.

In 1869, on April 21st, the "Maas" from Antwerp landed 1815 sheep at Brown's wharf. Five of these animals were found to be affected with sheep-pox.

In 1870, on the 14th October, the "Cosmopolitan" from Hamburg landed 258 sheep at Odam's wharf. One sheep of the cargo was affected with sheep-pox.

In 1871, the "Dragon" from Hamburg landed 435 sheep at Brown's wharf. Among these animals one was found to be affected with sheep-pox.

In every instance of the landing of diseased animals at English ports arrangements were made as quickly as possible for the slaughter of the entire cargo; but owing in many cases to the absence of proper convenience, some time elapsed before the slaughter could be completed. During this time the sheep were subject to daily inspection, and the cases of disease were removed as they occurred day by day, in order that the carcasses of the diseased animals might be effectually destroyed.

As soon as the slaughter of the animals was completed, the landing-places were properly disinfected before it was permitted to land other animals on them. Orders of the Council were passed when the circumstances rendered them necessary, prohibiting the landing of sheep from countries where sheep-pox was known to exist, except for the purpose of immediate slaughter.

During 1872 no case of sheep-pox was detected among the foreign sheep landed at English ports, nor has an outbreak occurred since the passing of the Contagious Diseases (Animals) Act of 1869. Consequently the provisions of the Act in respect of that disease have not yet been tested. They, however, amount in effect to the provisions which were always enacted by order of the Council previously to the passing of the Act, and which were found effectual in preventing the spread of the disease to any great extent, although they exercised no influence on its progress through the flock. The regulations which are now in force would have the effect of making premises on which the disease has appeared infected places, and therefore of preventing the movement of animals into and out of the area of such places. The treatment of the diseased animals and those herded with them is not in any way referred to. The owner is consequently left to adopt any measures which he pleases.

Considering the highly contagious character of sheep-pox and the great fatality which occasionally attends its progress, it appears to be desirable that the stamping-out system should be applied in all cases in which the disease appears among sheep in this country. At least the slaughter of all diseased animals should be insisted on, and it will, under most circumstances, be found economical to destroy those which have been herded with them at the same time.

Where the disease is allowed to take its course unchecked it is commonly the case that a large percentage of deaths occur, and at best the affection which is naturally communicated is never so mild as that produced by inoculation, while the extension of the disease to the whole of the flock occupies a very considerable time, prolonging therefore the risk of the communication of the infection to the neighbouring flocks.

The argument against inoculation is the obvious one, that it keeps up the disease in the infected district for a certain period, but the same statement might be correctly made of the negative course, which consists in allowing the infection to pass naturally to the susceptible animals.

Experience justifies the conclusion that sheep-pox when it appears in a flock will extend gradually to nearly all the animals that have been exposed to its influence, and under these circumstances, if it is determined not to adopt the stamping-out system, it will be desirable to hasten the progress of the disease and moderate its virulence by having recourse to inoculation. The disease thus induced appears usually in a mild form, and is attended with very little loss of life, while the animal is secured from a second attack as completely as it would have been if it had taken the malady in a natural way. Inoculation to be successful must be performed by a skilled person who is well acquainted with the character of lymph which should be employed and the means of introducing it into the animal's system. It has happened on some occasions when inoculation has been improperly performed, and especially when a bad quality of lymph has been used, that very serious effects have resulted. This, however, by no means detracts from the value of the operation when skilfully done.

The inoculated flock will require all the veterinary care which would be given in the case of the animals having taken the disease in the natural way, and in the event of any of the inoculated animals having the disease in a severe form, which, however, is not to be apprehended, it will be desirable to isolate them in order that they may be submitted to medical treatment, which in the case of the rest of the flock will be altogether unnecessary.

The advantageous results of inoculation are thus summed up in a report, which was issued by Mr. Marson and Professor Simonds in June, 1864: "It gives security against a second attack of sheep-pox; it limits the period of the existence of the disease in the flock; it mitigates the severity of the malady; it saves the lives of many animals which, otherwise, would be sacrificed; and it controls the extension of the disease, as one confluent natural case does more to diffuse the poison than probably 50 ordinary inoculated cases would do." The mortality from the inoculated disease, when compared with the natural, is, on the average, as three per cent. in the one case is to 50 per cent. in the other.

Sheep-Scab.

Although this disease is included in the contagious and infectious diseases enumerated in the 6th section of the Act, it is not a contagious malady in the ordinary acceptation of the term. Sheep-scab is in reality a local disease, consisting chiefly of irritation followed by exudation on the surface of the skin consequent upon the ravages of a small acarus closely allied to the itch insect of the human subject.

All kinds of farm stock are liable to the invasion of parasites which produce more or less irritation of the surface; the mange of the horse and the ox are of precisely the same character as scab in sheep, but in both these animals they occur to a much less extent. Mange in the horse is generally confined to animals in very poor condition, and which are usually subject to considerable hardship. It is only by accident that the affection appears in a well-managed stable, and its existence is immediately detected in consequence of the symptoms which are exhibited by the animal, and means are taken for its cure. Most forms of skin disease in the horse, when they are considerably advanced, are spoken of under the common term "mange;" and, usually, no pains are taken to discover the cause of the disease, but remedies are immediately applied for its removal; and generally it happens that the measures in common use for the treatment of skin disease in the horse, are sufficiently active to destroy the parasites if they are present.

In the ox the mange acarus occupies certain isolated positions in different parts of the body, and unlike the acarus of sheep-scab, exhibits no desire to wander over the skin. Consequently mange in cattle is comparatively unimportant and very rarely spreads among the herd.

Sheep-scab, however, when it appears in a flock, owing to the transfer of the acari from a diseased animal, spreads very quickly. The disease is sometimes not detected by the shepherd until it has made some progress, for, although the infected animals may show symptoms of the irritation, which they experience in a fortnight after the acari have taken up their residence on their skins, it is probable that no notice will be taken of the circumstance until a number of animals of the flock are seen to rub themselves against trees and posts, and occasionally nibble at the parts of their bodies which they can reach with their mouths.

It appears from experiment, that in 10 days after the transference of the acari to the skin of the healthy sheep, signs of irritation present themselves. At the end of the fortnight there will be discovered moist spots in different parts of the skin, chiefly on the back and breast. Before the expiration of three weeks distinct scabs will be apparent, and by the end of a month the affection will have so far advanced that there will be no difficulty in discovering its true nature.

The acari of sheep scab do not burrow in the manner of the itch insect of man, but they cling to the wool and wound the surface of the skin with their pointed mouths, thus causing irritation, which as it increases day by day in consequence of the development of new broods of parasites, at last affects the animal's constitution. The wool falls off, the animal loses condition, and at last becomes exceedingly emaciated, and if the disease is allowed to run its course unchecked, the sebaceous follicles become filled with secretion and protrude from the surface of the body in small lumps, which have been mistaken for the papulæ of sheep-pox, with which disease scab is not uncommonly confounded by ill-informed persons.

No difference of opinion should ever exist as to the presence or absence of sheep-scab, as, in the event of the disease existing, a little care will suffice for the detection of the parasite which causes it. It is only necessary to take a small quantity of loose scab and wool, place them on a sheet of white paper, and carefully examine them by means of a pocket lens. The presence of the acarus will be indicated by the movement which takes place among minute portions of scab, and if these parts are carefully observed, the insect will be seen to creep from its position, and may then be readily removed on the point of a needle.

If the sheep have been dressed for the cure of the disease previously to the examination, and in consequence no live acari can be detected by the unaided eye or with a pocket lens, it will be necessary to make a microscopic examination of the wool and portions of scab.

This minute examination is absolutely required of a professional man before he arrives at a conclusion, as, under certain circumstances, the skin of the sheep becomes covered with yellow exudations somewhat resembling the product of the disease, and although there are very distinctive symptoms which indicate sheep-scab irrespective of the discovery of the acari, this positive evidence can always be obtained, and should always be sought for, because it places the question in such a position that no dispute can possibly arise.

So important was the estimation in which this disease was held owing to its ready communicability from diseased to healthy sheep when they were pastured together in commons or open grounds of any kind, that in the reign of George III. an Act was passed for the express purpose of preventing the exposure of scabby sheep. The provisions of this Act have been included in the Act of 1869 by the placing of sheep-scab in the list of contagious and infectious maladies, and, in addition to this, an Order of Council has been passed authorising local authorities to insist upon the treatment of affected animals.

As far as can be ascertained, the order referred to has had no influence on the progress of the disease, which is still extensively prevalent in the districts where it is customary to turn sheep into common pastures.

Sheep-scab is communicable from diseased animals to healthy ones in only one way, namely, by the transference of the acarus which produces the disease from the skin of the healthy one. It is by no means necessary, however, that actual contact should take place between the diseased and healthy animals. A tuft of wool, torn off while the animal is passing through a hedge, or carried away in the mouth of a dog, portions of wool which may be left on gateposts or other places against which sheep may rub themselves while they are passing along a public road, or through a field, or when they are standing in the market or lairs, will suffice to convey the disease to other animals.

Very rarely does it occur that the acarus of one variety of animal produces disease in another variety, although there are instances of the transference of the acarus from the cat producing mange in the horse. Other experiments which have been had recourse to for the purpose of testing the extent to which the different acari were capable of being transferred, have usually given negative results. It may be therefore accepted as a rule that each variety of animal is infested by its own peculiar acarus, but the rule is subject to exception, and it may be that further experiments would prove that the exceptions are even more numerous than is at present believed.

Sheep-scab is not a fatal disease; indeed unless the diseased animals are subjected to great hardship and the disease is allowed to take its course entirely unchecked, it is not probable that any fatal case will occur in the flock; but considerable inconvenience and loss are occasioned during the course of the malady. Falling off in condition is a natural consequence of the irritation which is produced, and when the disease occurs among breeding ewes it is rendered more serious by the difficulty of applying the necessary remedies.

The treatment of sheep-scab when properly applied is always successful, and with common care there would be no difficulty in entirely eradicating the disease from the country; and this, notwithstanding that it may be occasionally introduced by foreign sheep which are purchased at stores.

In fact, sheep-scab is one of those maladies which should never exist on a well-managed farm. All newly purchased sheep should be subjected to a process of dipping, which would have the effect of curing the disease if it should be present, the process being applied as a precautionary measure without reference to the condition of the animals at the time.

Remedies for the cure of scab are numerous, and the majority of them are perfectly efficacious. Among the agents used may be mentioned various compounds of mercury, arsenic, and preparations of carbolic acid. All these remedies have been at different times charged with serious consequences which have followed upon their application, but it has generally been found upon inquiry that the injury has resulted not so much from the quality of the preparation as from the want of skill in applying it. Compounds which contain carbolic acid appear to be the least dangerous, and it is said by those who use them that their effect upon the wool and skin of the animal is beneficial, irrespective of their curative influence upon the disease.

Flock-owners who are desirous of avoiding an outbreak of scab among their flocks are in the habit of periodically dipping their sheep in one of the solutions which are in common use, and of also applying the same precautionary measure to all the sheep which they introduce upon their farms before they are allowed to mingle with their own stock.

It cannot be questioned from the results which are obtained by the adoption of this system, that its universal application would have the effect of eradicating the disease.

Glanders.

Glanders is the only disease of an undoubtedly infectious character which occurs among horses in this country. Its characteristics are a peculiar form of ulceration in the membrane of the nostrils, sometimes extending down the trachea, tuberculous deposits in the lungs, and enlargement of the glands under the jaw. Discharge from one or both of the nostrils is an invariable symptom of the disease, and this, taken in connection with the swelling of the sub-maxillary glands, is considered by some to be evidence of its existence. Enlargement of the glands, however, with a discharge from the nostrils, is very common in ordinary catarrhal affections. Ulceration of the membrane of the nostrils also occasionally occurs in catarrhal diseases. Owing to the existence of these symptoms in such a common malady as catarrh, some difference of opinion has occasionally existed among professional men as to the precise indications which should be taken as diagnostic of glanders, and it would appear that there is no symptom which can be accepted as invariably indicative of the presence of that disease, while there are certain signs which, taken together, are always characteristic of it.

The ulceration of the membrane of the nostrils and the colour of the membrane itself are, in many respects, peculiar and distinctive. The character of the enlargement beneath the jaws and glands is unlike the ordinary tumefaction which is observed in the cases of common catarrh, besides which it will generally be found that there is something in the history of the case and the conditions under which the animal is placed which will assist the inquirer in coming to a conclusion.

Glanders occurs among horses which are used for omnibuses and cab work and the rougher kinds of draught work. It is comparatively rare among animals that are properly attended to, regularly fed, and not overworked.

In some instances it is difficult to ascertain the precise origin of the affection among a number of horses in a particular establishment. The horse first attacked may not have been recently purchased and so far as is known may not have been in contact with a diseased animal. But so long as it is the practice to use glandered horses for night work it is not difficult to understand that the contagium of glanders, which is undoubtedly contained in the discharge from the nostrils, may be left on the edge of a drinking trough, or a cart or a passing vehicle, and so be brought in contact with the nostrils of a healthy subject, even if the diseased and healthy animals do not actually touch each other, as they are very likely to do in the traffic of a large town.

One peculiar feature of glanders is the length of its duration in the animal's system without the production of any changes which are destructive to life. In some instances the disease assumes an acute form and advances on rapidly to a fatal termination, but, in the majority of cases, it remains in a sub-acute form, exercising no deleterious effect upon the animal's appetite or his powers of working, and permitting him to live and spread the disease sometimes for years.

This is particularly the case when the disease occurs in young subjects, old and debilitated animals succumb more readily to its influence as would naturally be expected. There is reason to conclude that glanders is propagated only by means of the diseased secretions coming in contact with either an abraded surface or the mucous membrane of another animal. The contagium does not appear to be so easily diffusible as that of cattle plague; and it sometimes happens that a glandered horse will remain for a long time at one end of the stable, and if care is taken to confine the use of the buckets and implements which are used about him to that especial purpose, no extension of the disease takes place; the great risk, however, of such a mode of procedure is at once apparent.

The effects of the virus of glanders are sometimes manifested exclusively on the skin, and especially the skin of the extremities. This form of the disease, which is termed "farcy," generally commences by a swelling of one of the extremities, the development of small knots in the course of the absorbent vessels, and ulceration of the surface.

No doubt can exist of the identity of "farcy" with "glanders" as each form of disease has been produced by inoculation with the virus of the other.

The treatment of glanders, although apparently successful in some cases, is in all respects objectionable. Unless very great precautions are taken there is a risk of the communication of infection to the healthy animals, and it has been found, in stables where glandered horses have been submitted to treatment, that the disease has gone on for years, while it has been quickly exhausted when the practice of slaughtering the diseased animals immediately on the detection of the symptoms of the affection has been adopted instead.

It has been stated that glandered horses are capable of doing ordinary work apparently without any inconvenience to themselves. This fact induces owners of diseased animals to keep them alive in order that they may obtain the benefit of their services quite regardless of the risk which the owners of other animals are thereby compelled to incur.

It is known that in some large horse establishments a special stable is set apart for those animals which have been condemned as glandered by the veterinary surgeon in attendance. These horses, instead of being sent to the slaughter-house in accordance with the recommendation of the professional attendant, have been kept in the "condemned cell" and employed exclusively for night work. Owners of glandered animals will not give notice of the existence of the disease, and unless all the horses in large establishments are placed under supervision, and periodically examined by a competent inspector, it is impossible to ascertain the existence of the malady.

Without this knowledge the application of the provisions of the Act—which after all would only compel the owner to keep the animals on his own premises—cannot be insisted upon.

The effectual control of glanders by legislation would necessitate compulsory slaughter of all animals which are undoubtedly the subjects of the disease, whether they were exposed in a public place or found on the owner's premises, and the placing of the rest of the horses on the same premises under supervision until such time as the risk of the extension of the disease had ceased.

The American Horse Distemper.

Some apprehension was occasioned in the latter part of October in consequence of the report of an outbreak of a new contagious disease among the horses in New York. Shortly afterwards came the still more alarming announcement that three animals affected with the disease had been shipped on board the "Egypt" at New York to this country.

The animals referred to actually arrived on November 6th at Liverpool. The veterinary inspector was instructed to examine them on their arrival, and if necessary, to detain them until instructions were sent to him from this department as to their disposal.

From the inspector's report it appeared that one of the animals only was affected with a slight catarrh. The other two, it was ascertained, had suffered from the same disease during the voyage, but were convalescent at the time they arrived at Liverpool.

Before this report was received, however, sufficient evidence of the nature of the disease had appeared in the published accounts of it to lead to the conclusion that the so-called new distemper was merely the catarrhal fever or influenza which is so common in this country.

Under these circumstances it was not thought necessary to place any restrictions upon the importation of horses from America, as influenza was at that time existing among horses in our own country; and there was no reason to apprehend that the disease, if it were imported, would spread, with the remarkable rapidity which characterized its progress in America, unless the climatic conditions were identical in the two countries. No restrictions are imposed on the movement of horses suffering from influenza in this kingdom, nor is it thought necessary that any special regulations should be made in reference to a malady which is usually benign in its character, and does not spread extensively unless under peculiar states of the atmosphere.

In the last 30 years several outbreaks of influenza have occurred in London and other large towns, and periodically the affection exists to a greater or less degree in different parts of the country, principally during spring and autumn. It may be fairly asserted at any rate that we have always a sufficient number of centres of disease to account for its extensive spread if the necessary conditions of climate should be present.

Whether or not influenza is strictly speaking a contagious disease has not been absolutely determined. In some instances it proceeds rapidly through a stud, while in others it only attacks a certain number of horses which are standing in one stable, and then goes on to some other part of the district.

Frequently when diseased animals have been brought into places where healthy ones were standing and have remained for a considerable time, in fact until their recovery, no extension of the disease has occurred; while at other times healthy animals have been sent into a stable out of which diseased ones have been taken, without suffering in consequence.

It cannot, however, be affirmed in the present state of our knowledge that influenza is not contagious, and it is certainly prudent, during its prevalence, to isolate sick animals, and to employ disinfectants, in short to deal with the malady as if it were known to be infectious.

The history of the progress of influenza in America is quite opposed to the theory of its propagation by contagion. The rapidity of its advance in the States was such that hundreds of animals appeared to be simultaneously attacked. Frequently the occurrence of the first symptoms in one or two animals in a large establishment in the morning was followed by the appearance of similar symptoms in nearly the whole of them in the course of a few hours. This rapid and extensive diffusion of the disease is not characteristic of propagation by contagion.

It appears from the accounts which have been received from America relating to the origin and distribution of the disease that it occurred first in Toronto, whence it rapidly spread through the towns of the Canadian frontier until it reached New York in the beginning of the last week in October. Its progress in that city was so rapid that 40,000 horses were attacked in a fortnight, and the greatest difficulty was found in carrying on the traffic.

Sick animals were worked until in some instances they died in the streets, and so much cruelty was inflicted that it was found necessary for the authorities to interpose.

The malady swept rapidly through the sates of the Dominion, reaching Philadelphia on October 26th, thence it travelled southward to Baltimore, diverging to Ohio and Illinois, and finally reached New Orleans. The last reports from Baltimore are to the effect that the disease is still travelling southward.

All the accounts which have been received at the Veterinary Department refer to the generally benign character of the disease when animals are placed under proper treatment, and only record any serious fatality when the sick horses were improperly treated and badly managed.

As in this country, the disease was found to yield to the stimulant system of treatment, assisted by good nursing; and as might be expected serious results followed the use of depletive measures, and exposure of animals to changes of temperature.

The traffic requirements in the several States seem to have necessitated the employment of sick animals, but it was always found that this injudicious proceeding had the effect of increasing the severity of the disease and considerably adding to the number of deaths.

The distemper seems to have subsided almost as rapidly as it extended in the various States, and all the authorities who have investigated the subject agree in the conclusion that the affection did not spread in consequence of the presence of any specific virus or contagium, but rather under the influence of an "abnormal atmospheric wave."

VIII.—*Report on the Farm Prize Competition*, 1873. By Hugh Stephenson, of Dene House, Newcastle-on-Tyne.

For the two prizes of 100*l.* each, offered by the Royal Agricultural Society for the best managed farm in the districts of Holderness and the Wolds, the latter failed to bring forward a sufficient number of entries to warrant the Society to continue the competition.

For the former district there was an entry of four, a very great contrast to last year's competition in Wales; but though the number of competitors was small, their farms were all well managed, and all were worthy of the prize.

Name of Tenant.	Name and Situation of Farm.	No. of Acres.	Nature of Soil.	Proprietor.
William G. Walgate	West Hill, Aldborough, Hull	460	Chiefly strong	St. Thomas's Hospital.
George England ..	Carlton, Coniston, Hull	410	All strong except 20 acres of sand ..	W. F. Bethel, Esq.
Charles Lambert ..	Sunk Island, Hull ..	596	Strong salt water warp	The Crown.
Peter Dunn	Pasture House, Sigglesthorne	295	Chiefly heavy	W. F. Bethel, Esq.

The conditions attached to the offer of the prize were as follows:—

1. That the farm is not less than 200 acres in extent.
2. That it is held by a tenant-farmer, paying a *bonâ fide* rent for not less than three-fourths of the land in his occupation.
3. That the whole of the land in the occupation of the competitor within the area of competition is entered.

Our first inspection took place in the end of February, the second in the second week in July. It impressed us so favourably that we felt it our duty to go over the whole again in July.

Our instructions were to judge the farms with reference to their superiority under the following heads:—

1. General management with view to profit.
2. Productiveness of crops.
3. Goodness and suitability of live stock.
4. Management of grass land.
5. State of gates, fences, roads, and general neatness.

Awards.

Prize of 100*l.* to William Graves Walgate, of West Hill Farm, Aldborough.

Highly commended:—Mr. Charles Lambert, of Sunk Island; Peter Dunn, Pasture House, Sigglesthorne; George England, Carlton, Coniston, Holderness. For general good management, especially for excellence in gates and fences.

Prize Farm.

West Hill is situated about 2 miles from the small town of Aldborough and 13 miles north-east from Hull, which is the market-town; the produce is carted 4 miles to Whitedale Station. The farm contains 320 acres of arable and 140 of grass land, and with the exception of about 50 acres of light land is all strong, with a clay marl subsoil. The whole of the strong land has been under-drained at a depth of 3 feet and width of 24 feet.

Mr. Walgate holds the land from year to year from the trustees of St. Thomas's Hospital. He has now been tenant for 26 years, and though having neither lease nor tenant-right, feels every confidence in his landlords. The land is managed as a rule on the five-course system. Mr. Walgate has the power to deviate from this; but from long experience he has found it most profitable. The cropping is as follows:—

1. Turnips or fallow.
2. Barley, oats, and wheat, with seeds sown.
3. Seeds, grazed.
4. Wheat.
5. Oats, beans, and peas.

The crops will be described more fully when they are taken separately. The grass land is not of a superior nature, but very useful; with the help of a little cake it produces some very fine bullocks. It is all grazed, with the exception of about 8 acres of land, which is mown for hay.

Horses.—Twelve farm horses are kept, which are generally worked in pairs; they are all useful animals, and seem as if they both did and could do a great quantity of work. In summer they are generally turned out to grass after the turnip season, and remain out until after harvest, when they are brought up into stables, and every man takes his pair; they are fed on a mixture of oats and split beans, with sometimes a little Indian corn, of course with the addition of chopped hay and straw; during the harvest part of the year the quantity of corn amounts to about 21 lbs. per day.

Mr. Walgate does not usually breed horses, but fills up from the fairs and markets. He also keeps two or three hackneys.

Cattle.—Mr. Walgate, though not keeping a pedigree herd, has perhaps as fine a lot of shorthorns as will be seen on any farm for quality and meat-producing value.

About 20 calves are reared every year; most of them are 10 days old when purchased, and known to be well bred.

A lot of bullocks are bought in the autumn for winter feeding, and again in the spring for grazing.

On the 27th February there were 74 head of cattle on the farm, including 3 or 4 cows. Since that time Mr. Walgate has sold upwards of 20 at 36*l.* per head. We saw them grazing, certainly a very pleasant sight.

In winter the bullocks are put into large courts with plenty of hovel accommodation, and fed on swedes, chopped straw, and from 4 to 8 lbs. of linseed cake, with an addition of 2 to 3 lbs. of corn-meal, either Indian, bean, pea, or barley. As the animals move off to the butcher a fresh lot is brought in.

The feeding bullocks, on grass, all receive from 4 to 5 lbs. of linseed cake per day, this in some instances may be increased to 7 lbs.

Mr. Walgate finds that it is necessary to use a large amount of cake on his grass, as it is not of sufficient quality to feed a bullock without. It is rather remarkable that he uses entirely linseed-cake, especially on the grass land; and he contends that it is most profitable, but this subject will be referred to again.

Sheep.—The breed kept on this farm is a cross between the Lincoln and Leicester; it is found through most of the district of Holderness that this cross suits the land and climate best; certainly the sheep retain the quality of the Leicester and benefit by the extra size and the heavier fleece of the Lincoln.

Mr. Walgate's stock consists of 150 ewes and their lambs, the latter being all fed on the farm and sold at about 12 months old; in some seasons a lot of hoggs are bought in the spring, and are also fed off during the summer; but this depends entirely on the sort of crop and the prospect for seeds.

On the 10th of July the number of sheep were 101 ewes with 147 lambs following them, and 99 hoggs ready for the butcher. Mr. Walgate explained why his number of ewes was reduced—from some cause, for which he could not account, nearly 50 of his ewes proved not in lamb, and hence, being fat, were sold.

We do not think it necessary to enter into details as to the management of the ewes, as there does not seem to be any remarkable feature in it beyond that they are undoubtedly well kept and cared for.

The lambs are weaned about the end of July, and for a few weeks are put on to a grass-field (which has purposely been unstocked for some time), and given about $\frac{1}{4}$ lb. of cake per day, which they readily eat, having been taught while with their mothers; the quantity of cake is gradually increased, and they are put on turnips about the middle of October, and generally kept on the turnip-break until there is sufficient grass in the spring. A little corn is also given, which makes the quantity up to about 1 lb. per day. These sheep are all clipped in April, and generally sold, weighing from 20 to 25 lbs. a quarter. This year they realised 70*s.* per head, without their wool.

Pigs.—From 20 to 30 are bred every year, of the medium-sized white breed; about one-half of these are sold fat, the others as gilts. There is no speciality in Mr. Walgate's pigs, though they seem to be of the right sort for farmyard pigs.

They are fed principally on Indian meal, with the addition of a little barley or peas.

Fallow and Roots.—In all comprising about 75 acres; namely, 60 acres of roots and 15 acres of fallow. The whole of this land is manured at the rate of about 20 tons of good dung to the acre, with the addition of a mixture of superphosphate and guano, to the extent of from 5 to 6 cwts. with the roots. Mr. Walgate does not as a rule grow mangold, and never more than a few acres. He finds he can get a more profitable return from swedes, of which he grows about two-thirds; making up with two or three kinds of soft turnips.

The roots, as a whole, though rather late, were nearly a full plant and promised well.

Mr. Walgate has partially patronised steam-cultivation, having had his land for roots dug in the autumn and cultivated this spring. We feel certain that steam will come into more general use in Holderness, as the land being strong, and generally free from stones, is well fitted for the operation.

About one-half of the roots are carted off for the cattle, and the others are eaten on the land with hoggs; the land being so strong it is found difficult to keep the sheep on all winter; but Mr. Walgate perseveres as much as possible to do this.

We did not see a piece of brush or couch over the whole of the roots, and it was difficult even to find a weed of any description. Mr. Walgate is a very painstaking farmer, and great credit is due to him for the cultivation of this crop.

The roots are principally drilled on the flat.

Seeds, which are all grazed, extend to about 50 acres; the mixture sown is as follows:—

White clover, 14 lbs.; red clover, 7 lbs.; trefoil, 2 lbs.; rib-grass, 2 lbs.; in all, about 25 lbs. per acre. We recommend Mr. Walgate's management of his sheep on seeds. The great fault in grazing seeds arises from allowing them to grow too long, and hence to be trampled and wasted. Mr. Walgate never allows his seeds to grow longer than will give a bite to a sheep. Some, no doubt, will say this cannot always be done; but Mr. Walgate has proved it. He believes in the old adage, "Two sheep will starve where three will feed."

Wheat is grown to a large extent on West Hill Farm; this year a breadth of 98 acres, grown after the following crops:—

Mustard and rape, 24 acres; roots, 16 acres; seeds, 43 acres; grazed tares, 15 acres; total, 98 acres.

With the exception of three or four acres, which had perished through the continued rainfall in winter, we could not have inspected a better crop of wheat.

The land was undoubtedly well tilled, the crop all hoed and very free from weeds. Being in full bloom, we had a good opportunity of judging as to the result.

Barley, sown after roots, fed off with sheep, was very promising; and, in fact, there seemed a danger of its being too heavy. The turnip-land was ploughed as the sheep were moved forward, cultivated, and then barley drilled 8 inches apart; this was sown down with seeds, mixture as above.

Oats (White Tartarian) after wheat-stubble, 22 acres were exceedingly good, with the exception of two or three acres. Mr. Walgate frequently grows oats on a wheat-stubble, after grazed seeds, which of course is followed by fallow or a green crop.

Beans and *Peas* were looking healthy, free from all disease, and podding well; there were 19 acres of beans and 15 acres of peas, both after wheat.

Buildings, which are almost entirely built of brick, with tile roofs, have been put up at intervals during the term of Mr. Walgate's tenancy, at his own expense, with the exception of 250*l.* allowed by the landlords. He computes his outlay at a little over 1000*l.* The whole of the buildings are kept in repair by the tenant, and also insured by him.

A great drawback to this farm is the want of three or four cottages adjoining the buildings, the workmen employed having all to walk a distance of two miles, from Aldborough. We have noticed very much the want of cottage accommodation in connection with farms in this district.

Mr. Walgate's buildings, though good and complete as far as they go, require additions, as feeding-boxes, &c.; for it is well known the immense loss sustained both in food and value of manure, through feeding in open courts. We believe that one-third less food in a box or small covered yard will produce the same result as the larger quantity in an open court.

The rickyard is walled round, and kept very free from loose litter. The ricks are generally made long, and built on stands, and neatly finished off. Thrashing is done by hire.

The fences, though not fancy ones, are good and well cared for, and of a useful description; 168 chains' length of quickwood has been planted at the tenant's own expense, and also fenced for protection. This Mr. Walgate estimates at 40*s.* per chain, or 338*l.*; of course, this includes the stubbing up of old and crooked fences.

The gates and posts are all found by the tenant and kept in repair; they are all of a useful character, strong and well made.

Draining.—As we have mentioned before, the farm is entirely drained, with the exception of about 50 acres of light land; 168 acres were drained by the tenant, the landlords giving the tiles; and about 80 acres were drained entirely at the tenant's own expense, he finding tiles, at a cost of about 50*s.* per acre. All the work seems to be well done; the outlets and ditches are kept in good and efficient order.

Artificial Manure or Tillage.—This is generally a mixture of guano and superphosphate. We are able, through the kindness of Mr. Walgate, to give the cost for the last seven years, which amounts to 1415*l.*, or an average of (in round numbers) 200*l.* per annum. This is principally applied to the root-crops, though frequently a weakly corn-crop is top-dressed.

Feeding Stuffs.—With the exception of the corn used, this is entirely linseed-cake. The quantity of the latter consumed on the farm during the last seven years was 222 tons, at a cost of 2554*l.*—an average of 32 tons, or 365*l.* per year. We find that Mr. Walgate's cake account is increasing very largely, as in the year 1866 only 18 tons were used; in 1871, 40 tons were used. We may legitimately draw from this fact the conclusion that the judicious consumption of cake remunerates the tenant.

Mr. Walgate estimates the consumption of corn yearly at 200 quarters, which he values at 30*s*. per quarter, or 300*l*. This shows as follows:—

Tillages	£200	a year.
Cake	365	,,
Corn	300	,,
Total	£865	,,

or over the entire farm of 460 acres we get on each acre 37*s*. 6*d*. spent per annum in food consumed or manures bought. We shall refer to this subject again in the latter part of our Report.

Labour.—The ordinary workmen on the farm receive 3*s*. per day; but for five weeks in harvest, 26*s*. per week and their meat. Mr. Walgate does very little piece-work, having generally a sufficient number of hands to do it by day-work. He also prefers to have his men by the day, for he justly says, though it may cost him more, the work is done to much greater perfection. The corn is cut by his own reaping-machine.

For the small piece of meadow, which is cut every year, a mowing-machine is hired.

The poor-rate and highway-rate amount to 1*s*. 6*d*. in the pound per annum.

In concluding the description of West Hill Farm, we cannot refrain from speaking of Mr. Walgate in high terms as a thoroughly practical farmer, one who takes a business-view of all his transactions; and when we take into account the miserable state the land was in when he became tenant, twenty-six years ago, the small amount of money spent by the landlords in draining and buildings, it is evident that a great deal of credit is due to him for the excellent state of cultivation in which we found the farm. Mr. Walgate does not pretend to cope in neatness with some model farms, but he shows neatness sufficient to be practicable with making a profit. We feel extreme pleasure in awarding the prize of 100*l*. to Mr. Walgate; no man could have shown more practical knowledge of his business.

Carlton Farm.

The farm, in the occupation of Mr. George England, is situated near Coniston, about 12 miles north-east from Hull, which is the market town. Carlton Farm is within a mile of West Hill, to the south. The principal part of the farm lies to the south and west; the buildings, which are new, standing almost at the north-eastern point of the farm. The extent is 410 acres, viz., 301 acres arable, and 101 acres in grass. It consists entirely of strong land with a clay marl subsoil, with the exception of about 20 acres of light sand. It is held by Mr. England on a yearly tenancy, with a fair good tenant-right under W. F. Bethel, Esq., of Rise Park, who is highly spoken of as a most liberal landlord.

Mr. England has only occupied the farm four years; he is a young man starting in the world, and one who seems to thoroughly understand his business, and will in a short time be not easily put aside.

The farm has been all drained at the expense of the landlord, with the exception of 60 acres, which was done by the tenant, the landlord finding tiles.

The system of cropping is generally six course:—

1. Seeds.
2. Seeds; two years.
3. Wheat.
4. Beans and turnips.
5. Fallow. Barley or oats.
6. Wheat. Seeds.

Horses.—Ten farm horses are kept on the farm, and are worked in pairs; they are chiefly young and useful animals. As no hay is grown on the farm, they are fed on a mixture of oats, beans, Indian corn, and chaff in winter, the corn being increased in busy times. In summer, after the turnip season is finished, they are turned out, and two or three acres of tares are grown to feed them when required for work during the summer.

Mr. England is adopting the principle of breeding one or two horses every year, by this means he will always have a good stock of useful animals.

A harness-horse, and one that can act as a hackney, and hunter occasionally, is also kept.

Cattle.—Mr. England adopts almost the same system as Mr. Walgate, and buys the same class of shorthorn bullocks; he keeps about thirty during the winter, and grazes about twenty in summer; in all, he sells to the butcher nearly forty every year. About eight or ten calves are brought up, two or three good cows being always kept. Mr. England prefers feeding with a mixture of linseed and cotton-cake—about two-thirds of the former to one-third of the latter: especially is this adopted in early summer. The cattle for feeding have cake given on the grass, varying from 4 lbs. to 8 lbs., according to circumstances. In winter they are fed with roots, chaff, and cake; the latter we thought used rather too extravagantly to return a profit.

Sheep.—120 ewes are kept—a cross between the Lincoln and Leicester—and their produce are fed on the farm. The management is similar to Mr. Walgate's, with the exception that gimmers are brought in to keep up the flock. The number of fat sheep sold in 1872 was 180.

Pigs.—Three breeding-sows, of the medium sized white, are kept. The hoggs are fed; the gilts are sold when in pig. In winter these pigs seem to do well in the courtyards as scavengers; feed, and thrive eating what the cattle leave.

Wheat.—To the extent of about 86 acres, as follows: After two years seeds broken up at midsummer, 40 acres; after roots, 20 acres; and after grazed seeds, 26 acres.

Mr. England's wheat in some places suffered very severely from the wet winter and spring, but we were much pleased with the improvement from our February visit to July; with the exception of a few acres it was all a fair crop. Certainly the land was very clean, considering the short time the present tenant has been the occupier.

Barley.—There would not have been any on the farm, if some wheat perishing had not been ploughed and sown with this crop to the extent of about 9 acres. The soil on this farm is not suitable for this crop.

Oats.—Twenty-five acres of this grain were growing after roots, and looked to be too heavy by fully one-half. They were white Tartarian, and, being late, were just coming into ear; still a large portion of the field was lodged, and we are afraid never would mature. Another field of 9 acres, on wheat stubble, looked extremely well for a yielding crop.

Beans and Peas.—Consisting of 25 acres, after oat stubble; in about equal proportions. The great part of the field promised well, but portions were thin, combined with a quantity of weeds.

Buildings.—As before mentioned, the buildings are almost entirely new, being put up at the expense of the landlord, the tenant doing the carting. They are on the whole very compact, and suitable to the nature of the farm.

Fences.—Almost all young; but they are nicely kept, and promise well for the future. About 200 chains have been planted during the last four years; the landlord finding quicks and fencing, the tenant the labour. The latter has also stubbed up about 90 chains of old fences.

Artificial Manure, or tillage, consisting principally of a mixture of guano and superphosphate, has been used on an increasing scale by Mr. England; in 1869 a little over 100*l.* being expended, but in 1872 over 220*l.*

Feeding Stuffs.—Mr. England has materially increased his expenditure in cakes, &c.—from 250*l.* in 1869 to upwards of 500*l.* in 1872, or 25*s.* per acre over the whole farm. This cost includes beans, peas, barley, &c., which have been consumed by the stock; but not food for the horses, which latter Mr. England estimates at something over 300*l.* a year.

No doubt a large amount of linseed-cake is beneficial on this farm, but we are of opinion that waste and loss may occur through its too liberal use, especially in the quantity given to bullocks in yards.

Labour.—We have pleasure, through Mr. England's good bookkeeping, in giving the cost of labour during the past 12 months:—

	£	*s.*	*d.*
For ordinary labour	449	3	0
For keep of men in the house, at 8*s.* 6*d.* per week ..	126	8	6
	£575	11	6

or about 30*s.* per acre over the farm. This does not include 140*l.* paid for steam cultivating 130 acres of land. The rate of wages differs from that of Mr. Walgate.

The corn is thrashed by hire, and cut by machinery, consisting of a self-delivery and a manual-delivery machine.

The men have 1½ miles to walk, with the exception of a few boys kept in the house. This is another instance of the lack of cottages.

This farm is free from highway rate, the roads being repaired by the tenant. The poor rate is also only 1*s.* in the pound.

Mr. England has every prospect of doing well. He has taken the bull by the horns, and certainly is working a wonderful improvement on his farm, considering the short time he has occupied it.

Pasture House, Sigglesthorne.

This farm, occupied by Mr. Peter Dunn, is situated about 13 miles north-west from Hull, which is the market-town, and about 5 miles from Hornsea. It consists chiefly of heavy soil, and contains about 295 acres. The owner is W. F. Bethel, Esq., of Rise Park.

Pasture House, which has been in the occupation of the present tenant for upwards of 40 years, "to the eye" is to all intents and purposes a model farm; everything is as neat as it can be made, beginning at the house and garden, and extending through all departments of the farm.

The proportion of tillage land on Mr. Dunn's farm amounts to about 212 acres, and the rotation of crops is rather peculiar, being an eight course: 1. Wheat; 2. Oats; 3. Bare fallow; 4. Wheat; 5. Peas and beans; 6. Wheat; 7. Turnips; 8. Oats, or barley and seeds.

This rotation no doubt gives a large acreage of corn, but a very small one of green crops. Though Mr. Dunn has his farm in splendid order, we think he does not produce the amount of beef and mutton which should be expected from a farm of this description.

Horses.—From 8 to 9 are usually employed, worked in pairs. Young ones are reared, and most of Mr. Dunn's horses are sold at from 7 to 8 years old. They are a good class of horse, and well cared for; usually fed on about 14 lbs. of bruised oats per day, with the addition of a few split beans when worked hard, with chaff, &c.

Cattle.—Mr. Dunn breeds from 15 to 20 calves yearly, which he keeps and feeds. We had the pleasure of seeing 6 or 7 very fine specimens of cattle in July, some of which were worth 40*l.* a head.

There are also from 20 to 30 Irish heifers bought in and fed yearly, making on the whole about 50 cattle sold to the butcher.

Mr. Dunn uses both linseed and cotton-cake in feeding, but his accommodation is very second-rate for winter. The cows are fair specimens of shorthorns, but not pedigree animals, though Mr. Dunn sometimes has a fancy animal.

Sheep.—The sheep on this farm are, as a rule, a flying stock, none being bred. Mr. Dunn, a few years ago, kept a breeding stock, but from experience prefers his present course—generally buying in lambs or shearlings, according to circumstances, and feeding about 200 fat yearly; principally the cross between Leicester and Lincoln.

They are bought in at all seasons of the year.

They are fed with a certain amount of cake and turnips, but principally on the grass land.

Pigs.—The medium-sized white breed are kept. About 100*l.* worth are sold in the year, all having been bred on the farm; also about 200 stones of bacon are cured. They are either sold out as pork, or kept and sold when fit for bacon. They are fed principally on Indian corn, ground in a mill, which Mr. Dunn has on the farm.

Fallow and Roots.—With the course of husbandry adopted on this farm, a small proportion of roots is grown—not more than from 25 to 30 acres, principally mangolds and swedes, with a few common turnips.

Mr. Dunn's prospect for a root crop did not look at all promising, though the land was clean, and had been well done. The first sown swedes had been taken by the fly, and the second lot had barely made an appearance. For mangolds and swedes about 10 tons of manure are given, with the addition of about 4 cwt. of a mixture of guano and dissolved bones; the roots are drilled on the flat.

The fallow, consisting of 20 acres, was being worked ; it was very clean, and in good order.

Seeds, consisting of about 27 acres, were very good, and were being grazed. The usual quantity sown is as follows :—

White clover, 12 lbs. ; red clover, 3 lbs. ; cow grass, 2 lbs. ; alsike, 2 lbs. ; parsley, 1 lb. ; rib-grass 1 lb. In all, about 21 lbs., without any rye-grass.

We thought that Mr. Dunn failed a little in the management of his grazed seeds, for we found the sheep wandering amongst clover fully 8 inches high, and very thick. The clover was almost at perfection, and hence had not the feeding quality it would have possessed if it had not been allowed to bloom.

Wheat.—Comprising upwards of 70 acres, promised to be a large crop, with the exception of a few acres spring sown, which were certainly poor.

A field of Creeping wheat, which Mr. Dunn insisted we should ride through, was something tremendous, and looked very like 7 quarters per acre.

Mr. Dunn grows red wheat as a rule, finding the fine white sorts do not produce nearly so much either in straw or corn as the red. The sorts usually grown are Spalding, Berwick, and Creeping ; sometimes a little Rivett—mixed with a little white—is tried, but as a rule the red is best.

The wheat is all drilled and hoed. On the whole, it was very free from weeds, especially twitch.

Barley.—21 acres after turnips and 7 acres after wheat stubble, all looked as if promising not to be a very heavy crop of straw, but well headed and like yielding well in grain. The portion after turnips was seeded down, and looked very promising.

Oats.—To the extent of 30 acres, and were very good indeed ; in fact we rarely, if ever, saw a finer lot ; they consisted of 25 acres after wheat-stubble, the remainder being after lea: white tartarian.

Beans and Peas.—Having failed for so many years, Mr. Dunn has discontinued growing them.

Buildings.—On the whole well built ; consisting of three hovels, with good yards, and stalls to tie up about 16 cattle ; they have been built entirely by the landlord.

Fences.—Better fences could not be found in the country ; if they have a fault, it is that too much labour has been expended on them for a tenant farmer. This is very unusual amongst agriculturists. The fences are trimmed generally twice during the year, and all weeds are removed from the roots. General height about 4 feet, but the width is about 7 feet, which struck us, though looking beautiful to the eye, as being a waste of land.

Draining.—The principal part of the farm has been drained during the course of the tenancy at the sole cost of the tenant, amounting to an outlay of about 1300*l.* An average of 24 feet in width and 3 feet deep.

Artificial Manures.—Mr. Dunn calculates his expense from 150*l.* to 200*l.* a year, consisting chiefly of guano and superphosphate, with the addition of a little nitrate of soda; the grassland being dressed every four years with guano, superphosphate, and nitrate of soda at the cost of about 30*s.* per acre.

Feeding Stuffs.—Amounting to nearly 20 tons in the year, and consisting of a mixture of linseed, cotton, and Matthew's compound cake. The latter we inspected, and, it seemed in outward appearance, a clean good mixture of different descriptions of corn. Mr. Dunn's estimated cost of cakes is about 200*l.* a year.

Labour.—Mr. Dunn seems to have gone into the cost of this expensive item very minutely; he calculates, over the whole farm, the labour to amount to about 26*s.* an acre, and over the tillage land to 36*s.* an acre; this we think worthy of notice.

Day labourers receive 18*s.* per week usually, with beer; extra wages in harvest, amounting for five weeks to about 40*s.* per week. The labourers on this farm also have some distance to walk to their work.

Rates, &c.—Poor's-rate amounts to about 1*s.* in the pound for the year.

There is no highway rate, though a great mileage of road. Mr. Dunn has been surveyor for a great number of years, and through his excellent management the highways in the district have become self-supporting, even though there are no toll-gates. It is done in this way—the roads are wide, so the sides have been manured, &c., and now yield more hay than pays for the repairs. We should not wonder soon to hear of Mr. Dunn declaring a large bonus. All credit is due to him for the good management in this department, which to farmers in some districts is now becoming a very serious item of expenditure.

Sunk Island.

The farm occupied by Mr. Charles Lambert has no distinctive name, except being Sunk Island. Of course it is well known that this land was reclaimed from the sea, the landlord being the Crown. The whole extent of the farm consists of a strong salt warp soil, with a peculiar subsoil of salt sand. Mr. Lambert's farm extends to 596 acres, about 75 acres of which are in grass. The farm is held from the Crown under a lease of 20 years, which expires in 1878; there is no tenant-right, but the tenant seems to have implicit faith that he will not be disturbed. Though Mr. Lambert's farm is in the district of

Holderness, it has very little in common with the generality of farms in that district. The cropping of the land is intended by the lease, we understood, to be five-course, but Mr. Lambert has the power to cross crop a little, and hence generally goes on the six-course rotation, which is as follows :—

1. Bare fallow. 2. Wheat. 3. Seeds. 4. Wheat. 5. Beans. 6. Oats or barley, with the intervention of a few roots or mangolds.

The grass land is not good as a rule ; and part of it is hayed at intervals.

We may notice here the great lack of trees, hence that of shelter for stock ; this is substituted to a partial extent by large stacks of straw, which are well built, thatched, &c., and then gutted to allow the stock to get inside. As a rule the straw is very plentiful, and at one time it was so much so, that the greater part was burnt.

Mr. Lambert has at his own cost planted upwards of 1000 trees in clumps, which are doing very well considering, and in time will yield a fair shelter for stock on the grass land.

Horses.—From eighteen to twenty are generally worked, principally big-boned useful horses ; none are bred on the farm ; they are fed chiefly on old beans, bruised oats, and a little Indian corn, with chaff ; they are out at grass the principal part of the summer months.

About six years ago Mr. Lambert was so unfortunate as to lose his entire stock of twenty-three horses, from glanders ; this, of course, has entirely lost him his class of horses, besides interfering materially in the general management of his land, as the veterinary authorities would not allow any horses on the farm for twelve months after.

Cattle.—All are bred on the farm, as pure shorthorns as possible, with the exception sometimes of a few calves bought. They are all sold off as stores, the bullocks at a year and a half to two years old, and the heifers in calving rising three years old. There is nothing great to note in the cattle on Sunk Island, though the cows were very good specimens, and also a young bull.

We feel it our privilege to note here, from the information we gathered from Mr. Lambert, who was most willing to give us the benefit of his experience, that it is almost impossible to graze even store stock on this farm to profit. Mr. Lambert most emphatically stated that if he put so many two year old cattle on to his best grass in May, they would not be nearly so good in October, caused, as he says, by the superabundance of salt water, and lack of fresh ; this is an immense drawback to farming on Sunk Island. We do not see our way clear to devise a distinct remedy, but we hope some one reading this report may be able to do so.

The cattle are generally fed during the winter on a mixture of linseed and cotton-cake and pulped mangolds. It will be easily seen that the cropping on this farm yields a large amount of straw, and it is impossible for the small quantity of cattle to make it into good manure. Hence Mr. Lambert is adopting the plan of keeping a large lot of ewes (about 300 he had in February) in a small yard enclosed with hurdles, about 50 yards long and 10 yards wide. Down the centre of this was an ingenious feeding-trough, which was filled from the top; and as the sheep ate, the food gradually came down; this trough was constructed with rails at the top, so as to allow a tram or small waggon to run along, which waggon was filled with the mixture required for the sheep, being constructed with a worm screw inside and a handle outside. As the man pushed it along the top of the trough or feeding-place, he turned this handle and the screw delivered the food regularly the whole length, with very little labour. We were struck with the short time in which the sheep could be fed,—in about five minutes the whole was done and the waggon back to its place to be again filled.

The ewes, on our first inspection, looked on the whole very well. They consisted almost entirely of Leicesters; but, on our second inspection, we found Mr. Lambert had had a great loss, and a very large percentage of both ewes and lambs lamed. Of course this is only an experiment of Mr. Lambert's; he seems sanguine of the result. We recommended the covering in of this yard for the ewes in the winter; and we certainly think, with great care, good may be done in this way. Mr. Lambert is a highly intelligent man, and is wishful, if possible, to adopt some means so as to increase his stock.

The lambs are all sold as stores, making generally large prices when weaned. Mr. Lambert has generally kept ewes the cross between Leicester and Lincoln; but he prefers the Leicester, and, instead of keeping a flying stock, intends to breed his own, if possible.

The ewes in winter are fed chiefly on pulped mangold, with the addition of chaff, a little cake, and bruised corn.

Mr. Lambert informs us that the same difficulty is to be contended with in keeping sheep all the year round as cattle.

Pigs.—Three or four sows and a boar of the Berkshire breed are usually kept; about 100 young pigs are bought in at harvest, and fed on the rakings, either being sold as pork or large stores.

Fallow and Roots.—About 70 acres are fallowed after beans, and seemed in good order.

Eight acres were planted with mangold, looking very promising for a crop, and another 8 acres were intended for rape or common turnips. It will be seen that a very small proportion of roots are grown on this farm. Mr. Lambert informs us that it is not practicable to grow many roots. The land being of a tenacious character, the future crops are much injured by either paddling with sheep, or carting the roots off. Mangolds as a rule do well, and the small quantity planted, which is not often exceeded, is utilised for the cattle and the 300 ewes in winter. This shows the large amount of stock that can be kept on a few roots, with good management.

Seeds.—About 44 acres of two-years and 36 acres of one-year, which were being grazed by ewes and lambs. The two-year seeds were exceedingly good, a very thick strong plant. The one-year seeds were a little patchy, and seemed as if they had perished in places. The mixture usually sown is as follows, for grazing:—Red clover, 14 lbs.; white ditto, 7 lbs.; alsike ditto, 7 lbs. Total 28 lbs. per acre. For mowing, 21 lbs. red clover only.

Wheat.—This is the staple crop on the farm, and in extent amounts to about 143 acres, as follows:—After fallow, 53 acres; seeds, 42 acres; oats, 28 acres; beans, 20 acres. Total, 143 acres.

With the exception of one field, the wheat looked extremely well. This field had been very late sown in the spring, and was not shot out at all, and we are afraid without an exceptional season never would ripen. This crop, Mr. Lambert states, was all twice hoed, at a cost of from 8*s.* to 11*s.* per acre. In walking through, the ground seemed very free from twitch and other weeds.

Barley.—Extending over 60 acres, principally growing after wheat-stubble. The soil on this farm does not seem suitable to the growth of this crop, though the barley looked very well, and promised a fair yield.

Oats.—Only a small quantity grown, about 20 acres, after wheat-stubble, which did not look at all well. We were under the impression that Mr. Lambert had carried cross-cropping a little too far, as the land was in anything but a good state.

Beans and Peas.—In all 110 acres; 78 acres of the former, which were the most extraordinary we ever saw. We made an attempt to walk a short distance into one field, but were thankful to retreat; they stood from 6 to 7 feet high, and fully one-half too thick. Certainly the land was very clean, but we doubted much if Mr. Lambert would obtain more than the seed at harvest. In fact, we quite thought the crop would not pay the expenses of reaping, though it was doubtless a splendid preparation for wheat.

The bean crop is generally manured at the rate of about 20 tons of good dung to the acre. The 32-acre field in peas looked extremely promising for a crop of straw, but did not seem to be podding well; this crop was after oat-stubble.

Buildings, built chiefly of brick; they do not afford a large accommodation for stock.

The tenant has during his lease spent about 1350*l.* in buildings, the Crown rebuilding the house, which is certainly a good one. Mr. Lambert has erected a shed, which holds a large portion of his wheat crop; this is used for storing roots in winter. There is a horse-thrashing machine fixed, which is used sometimes; but the chief part is done by hire. Mr. Lambert had a portable machine of his own, but found it cheaper to hire, as the injury done to the boiler from the salt-water was very great. A root pulper, a chaff-cutter, and a corn-mill are used, all driven by horse-power.

Fences and Gates.—Certainly all credit is due to the tenant for his excellent management in this department. Gates are all made on the farm, painted, and kept in good order by the tenant. About 290 chains of quickwood have been planted by him, and fenced at his sole cost during his lease. These fences were all looking splendidly; they are dug at each side every year, and neatly cropped; 100 chains of road have been made, and are now kept in repair, at the cost of the tenant.

Draining.—The whole farm has been drained by the tenant, with the exception of about 50 acres, during the present lease, at a cost of from 1500*l.* to 2000*l.*

About 650 chains of banks have been carted away, and creeks, &c., been filled up. All the watercourses, &c., seemed in good order.

Artificial Manures are only used for forcing the roots. It is rather curious to note here Mr. Lambert's experience, that, though the soil is naturally very salt, yet the addition of salt as a top-dressing is invariably beneficial to the growing crops.

Feeding Stuffs.—From 15 to 20 tons of a mixture of linseed and cotton cake are consumed yearly, with the addition of a quantity of crushed beans and other corn.

Labour.—Very scarce indeed; men having, as a rule, 3 or 4 miles to walk.

Mr. Lambert adopts the system of boarding a lot of lads with the foreman, who has a house, he receiving 9*s.* per week per head, and the lads from 14*l.* to 18*l.* a year. Ordinary labourers get from 3*s.* to 4*s.* 6*d.* per day. All the harvesting is let, costing for the taking-up after the reaper from 8*s.* to 12*s.* per acre. The crops are cut generally by two self-delivery sheafing machines.

Manure filling, cutting hedges, cleaning, &c., all done by piece-work.

The poor and highway rates amount to about 2*s.* 6*d.* in the pound in the year. Also a rate is levied to protect the Humber bank, but is limited to 1*s.* per acre on the tenant.

Mr. Lambert is, as we before mentioned, an ingenious man, and has brought out some clever patents. One which we noticed was a lamb-trough, and we have no doubt that, if well known, it would be highly appreciated.

We will now proceed to take the heads laid down for our guidance by the Royal Agricultural Society.

1. *General Management, with a View to Profit.*—It does not require much thought to understand that under this heading lies the whole secret of carrying on any business. We never heard of any one, though "farming for pleasure," but who liked to have the balance on the right side of the ledger. Allowing that every one wishes and strives to make a profit—this profit varies very considerably with the amount of talent and industry brought to bear on the general management of a farm. Hence one farmer thrives and does well, while the man he succeeded could not live at all. The whole district of Holderness is above an average in farm management, though many improvements are yet to be made. A great loss is felt through the want of cottage accommodation, which we think it would be to the interest of the landowners to rectify. We noticed very much the lack of suitable accommodation for cattle in winter. It is beyond all doubt that the large open courts found in Holderness entail a great waste of food. It is almost unnecessary to remark that an animal, before it will fatten, requires to assimilate a certain amount of food to keep the body warm. Now, if covered yards, boxes, or feeding-stalls were adopted, instead of open courts, the warmth being obtained artificially (though with proper ventilation to ensure health), the food required for this purpose would be a clear profit.

Again, the waste of straw and the inferior quality of the manure tell greatly against the large open courts. We do not think any farmer in Holderness would object to pay good interest for buildings of the description just recommended.

2. *Productiveness of Crops.*—Holderness struck us as being a great corn-growing district, especially of wheat, which almost everywhere, notwithstanding the wet winter, looked splendid. A great deal of care is taken in producing this crop, all being drilled and hoed once or twice during the season. We were informed that seven quarters per acre is a very common quantity, and sometimes eight is grown.

Barley and oats are not grown to the same extent; the former is taken chiefly on land where turnips are fed on with sheep; the latter generally follows a wheat stubble.

Splendid crops of beans and peas are to be seen, the soil being suitable for pulse.

The difficulty in growing roots seems to be to get the plant forward into the broad leaf; after that the crop is comparatively safe. The principal part of Holderness is strong land; hence the amount of bare fallow to be found.

Seeds, clover, &c., do well, and, generally speaking, yield a large amount of produce. Very little hay is grown in the district.

3. *Suitability of Live Stock.*—It is found that to get good shorthorns is most profitable, but large numbers of Irish cattle are imported to feed. Nearly every farmer rears a certain number of calves yearly, which keep him partly independent of markets. The sheep are generally a cross between Leicester and Lincoln; the pure Leicester has been frequently tried, but on this strong land was found much too tender, and required too much nursing and attention.

Though the sheep stock is a cross, great care is taken in procuring rams from good and pure flocks.

4. *Management of Grass-land.*—Almost the entire area is grazed yearly with cattle, with the exception of small pieces, which are hayed. We do not see how a better system of improving it can be adopted than the present, namely, the use of cake, and also every four or five years a top-dressing of farmyard manure, or a mixture of bones and guano. The grass is not generally of first-rate quality, but must improve under this treatment.

5. *State of Gates, Fences, Roads, and General Neatness.*—We cannot pass too high an eulogium on the whole of the competitors under this head, and we had great pleasure in highly commending them, especially in this department.

We might here note that through the whole estate of W. F. Bethel, Esq., the gates, fences, &c., are all very neat. With very few exceptions, the whole of Holderness is far above an average.

We feel that it has been a great pleasure to visit the competitors for this prize, and we thank them most cordially for their great kindness, and their readiness to furnish us with any information connected with their farms.

(signed) R. H. Pearson.
John Thompson.
Hugh Stephenson.

IX.—*Report on the Parasitic Lung Disease of Lambs.* By Professor J. B. Simonds, Principal of the Royal Veterinary College.

Since the issuing of the list of questions to the members of the Lincolnshire Agricultural Society, on the subject of the lung-worm disease of lambs—a copy of which is attached hereto—various experiments have been had recourse to for the purpose of throwing further light on the development of the worm or rather worms which are the cause of the malady.

These experiments cannot be said, however, to have been very successful, and it is not improbable that even years may pass without much additional knowledge being obtained on so intricate a subject as the successive stages of development of these and other nematoid parasites, when located within or when external to the organism of animals. Although this is so, still knowledge of this kind should be continually sought for, as it lies at the foundation of the means to be adopted to limit the extension of parasitic diseases, and also of those means on which their cure chiefly depends.

It is now satisfactorily ascertained that more than one variety of thread-worm finds its way into, and inhabits for a time, the air passages of sheep and lambs. Attention was called to this circumstance several years ago by Continental investigators, and from time to time specimens of both worms have been seen by British helminthologists. Referring to this subject Dr. Cobbold—the Professor in the Royal Veterinary College, on whom the investigation of parasitic diseases devolves,—says that "the well-known lamb disease, though generally supposed to be due to the presence of a single species of worm, called the common lung-strongle, or *Strongylus filaria*, is in reality due to the occurrence of at least two different parasites belonging to the same group."

"For years past it has been known to Continental helminthologists that a second species of nematode worm is usually associated with the above-named parasite, the form in question having been originally described by Professor Leuckart, under the title of *Strongylus rufescens*."

"I am the more desirous," he adds, "of calling attention to this fact, since Dr. Crisp, an earnest worker in the cause of parasitology, believes that he has discovered a new worm in the lungs of lambs and sheep, which he calls a *Gordius*." "I entertain no doubt that Dr. Crisp's gordian worm is the adult representative of the immature worm found by Professor Brown, some years ago; fresh specimens having also recently been examined by Mr. Axe and myself." "This so-yclept gordian worm is a large species of strongle, which, in contradistinction to the common lung-strongle, I am in the habit of speaking of as the long strongle, and I think this description is particularly convenient, because the parasite, in its full-grown state, acquires a length of from six to seven inches, or, as Leuckart affirms, it may be a span long."

With reference to the natural history and development of this "long strongle" of Dr. Cobbold, it may perhaps be affirmed that even less is known than of the *Strongylus filaria*, or common lung-worm. Both species are believed to undergo important developmental stages out of the body of the sheep, dwelling probably during this time either in the soil, or in the plants of ordinary pasturage, or in the cultivated clovers and grasses.

Parasitic affections in general, as well as that known as the "lamb disease," have been largely on the increase of late years; and once introduced on to a farm, as is shown in the experience of all the members of the Lincolnshire Agricultural Society who have replied to the list of questions with reference to the "lamb disease," they cause not only serious losses of animals, but apparently resist all ordinary means of prevention, and often also of cure.

Doubtless, some systems of sheep husbandry (and such I believe to exist in Lincolnshire) are calculated rather to promote the spread of the "lamb disease" than to keep it in check; but how far some of the preventive means, founded on our present amount of knowledge of the natural history of the lung-worm, can be practically applied is a question to be determined by agriculturists themselves. On farms on which the disease exists, the greatest care ought to be constantly exercised in keeping lambs from pastures and from clover and other layers which had been fed with sheep at an earlier part of the year. It is a noteworthy fact, and one yearly confirmed by experience, that lambs dropped on turnips, and allowed to run before the ewes, and later on in the season fed on tares and similar green food, and on cabbages specially cultivated to come in about weaning-time, are comparatively free from attacks of the lung-worm.

It has also been observed that the disease, when once it has obtained a footing on a farm, is kept active if the system of renewing the flock of ewes from lambs bred and reared on the land be adopted—the selected lambs being those which had suffered but little, or apparently not at all, from an attack of the parasites. Such a plan obtains in Lincolnshire, and is described in no less than thirty out of the thirty-two returns which have been received. The system adopted in the rearing of the lambs is also the very opposite to that which we advocate as giving the greatest amount of security. Thus, during the summer the ewes are fed on permanent pasture and *new* seeds, and after harvest on the stubbles, clover, and other eddishes, up to the time of breaking these up for wheat, when they go to turnips, following the hoggets. In many instances the tups are put to the ewes while they are being fed on the new seeds. Lambing often commences when the ewes are on turnips; but if so, both ewes and lambs are soon removed to the *new* seeds and pastures, cake and corn being given according to circumstances. Here they remain until weaning-time, when the lambs are turned on the pastures until they become settled, after which they are removed to the clover eddishes, or to the clovers grazed previously with the ewes and lambs, or occasionally, in some instances, to white clover grazed two years in succession.

Thus we see that the young animals are, during the most dangerous period of their lives, kept on land and on food the most likely to infect them with parasites, which had, either in the form of ova or embryotic worms, been coughed up by infected sheep, and undergone a further development, out of the body of the animals, to fit them in due time for also dwelling within the respiratory organs, the habitat in which they become sexually mature and give rise by their enormous multiplication to organic diseases of the lungs and often to death. It also appears that lambs which are diseased to a serious extent, are frequently changed from pasture to pasture, both natural and artificial, thus distributing broadcast myriads of ova and immature worms over the whole farm, to become in due course the cause of disease in lambs yet unborn.

The true explanation of the serious losses which are sustained in Lincolnshire is, we believe, to be found in the facts relating to sheep husbandry as carried out in that county, and to which attention is called in this report.

List of Queries prepared by Professor Simonds.

1. How long has the farm been in present occupation?
2. What is the general character of the soil and subsoil?
3. What are the relative proportions of meadow and arable land?
4. Is the farm wet or dry; partially or wholly drained?
5. State the system of husbandry with regard to the rotation of crops.
6. Is the meadow land liable to flood?
7. Are the meadows mown and fed in alternate years, or mown yearly and the after grass fed with sheep?
8. Do sheep contract rot on the farm?
9. For how many years have you been familiar with the "lung-worm disease" on your farm?

10. How many breeding ewes are kept?

11. What is the general management of the ewes, especially as to varieties of food supplied to them, from the time they are put to the ram to the period of lambing?

12. State the system which is adopted with regard to the other sheep on the farm, and especially with reference to the lambs being sold either fat or as store stock.

13. What custom prevails with regard to stocking the farm with sheep either for breeding or feeding?

14. At what dates are the lambs dropped and weaned, as a rule?

15. After lambing, how are the ewes and lambs fed and managed until weaning time?

16. Have the lambs ever been known to be diseased if after being weaned they have been kept *exclusively* on permanent pasture down to the end of the year?

17. If affected on permanent pasture, has the custom been to mow such pasture and feed the after grass, or to feed throughout the summer?

18. At what period of the year have the first indications of the lambs being unhealthy been observed?

19. Has the state of the weather influenced the attacks, and, if so, in what manner?

20. Has the disease prevailed more or less every year, or have there been years of freedom from it?

21. If the disease has been on the increase of late years, to what cause is it attributed?

22. When the lambs have gone apparently healthy from permanent pasture to rape, mustard, or other green crop of that year's produce, have they suffered from the disease?

23. On what evidence has reliance been chiefly placed that the lambs, which subsequently showed symptoms of the disease, were in a perfectly healthy condition when removed from permanent pasture to crops not previously fed with sheep?

24. Supposing layers are fed with sheep and allowed to stand over for feeding again in the following year, have the lambs pastured thereon been early attacked or not?

25. Has it been observed that lambs which are grazed during the summer on seeds, that had not been previously stocked with sheep, contract the disease?

26. When the lambs are unmistakably diseased, on what part of the farm and on what food in particular, have they been afterwards kept?

27. What symptoms do you deem to be characteristic of the disease?

28. How long a time usually elapses between the first indications of disease and death?

29. Does scouring—diarrhœa—exist in all cases before death?

30. What are the percentages of death over recoveries, or *vice versâ?*

31. Have you found any means by which the disease is kept in check or even partially prevented?

32. Are any calves reared on the farm, and, if so, do they suffer from the disease called "hoose" or "husk"?

33. Have apparently healthy lambs, which had been reared with those that were diseased, been kept as stock-sheep for use during the following or succeeding years?

X.—*Report of the Health of Animals of the Farm.* By Professor J. B. SIMONDS, Principal of the Royal Veterinary College.

THE chief occurrence of importance which has taken place since my last Report, in relation to diseases of "the Animals of the Farm," has been the outbreak of some remarkable cases of blood-poisoning, on three farms in particular, in the Western Counties of England. The first of these cases to which the attention of the College was called, and subsequently published in the *Veterinarian*, occurred at Stoke-under-Ham, Somerset. It appears that, as far back as August last, several sheep which exhibited symptoms of blood-poisoning died, in rapid succession, after a very short illness, on a farm in the occupation of Mr. Darby. The animals are said to have become suddenly prostrated, and to be unable to walk with a steady gait. Their throats rapidly swelled, and their breathing became much impeded; death took place in the course of a few hours, even in those which survived the longest.

The carcases of these sheep were skinned and opened in the "Home Field"—a meadow adjacent to the premises—and a considerable portion of the flesh, which had been preserved for the dogs, was subsequently eaten on this same meadow. In close proximity to this field, and also to the farmstead, is a pond of stagnant water, which receives the drainage of the stables and straw-yards, as well as the surface-water from the meadow in question. At this time Mr. Darby had eleven horses on the farm, which were daily used more or less for agricultural work. On August 23rd, a four-year-old horse at pasture in the Home Field was taken suddenly ill, and died in about twenty-four hours from the attack. He was opened in the straw-yard, about thirty feet only from the pond, and the intestines and other viscera were buried close by, and on a higher level, thus favouring the gravitation of the animal matter towards the pond.

On October 3rd, a five-year-old horse was attacked, and died in about three hours. The viscera of this animal were dealt with in a similar manner to that of horse No. 1. This death was quickly followed by others, so that by October 27th, the day on which the matter was brought to the notice of the College, four horses were already dead, and others were reported by the veterinary surgeon, Mr. Ware, of Martock—who came to town, bringing with him some of the diseased viscera—to be rapidly sinking. Mr. Ware also reported that two pigs, a dog, a cat, and two ferrets, which had eaten of the raw flesh of this horse, were dead; and that a labourer, who had removed the carcase of the horse which died on October 3rd to an adjacent village to be boiled down for pigs' food, had died, under circumstances so peculiar as to lead his medical attendant to believe that his death was a consequence of this proceeding.

The visit of Mr. Ware led to Assistant Professor Axe being at once despatched to the place, and to his investigation I am indebted for the chief facts of the case. By November 1st, seven horses had died, and on this day Mr. Axe was enabled to make a *post-mortem* examination of one of them, the last which died, the result of which showed unmistakably that death had resulted from blood-poisoning. All the horses which had died had drunk regularly of the pond water; but only one of those which escaped. The pond water was stagnant, black in colour, offensive, and largely impregnated with animal and vegetable matter. The other sources of water supply to the premises were the home-pump and a small running stream. These waters were clear, tasteless, and free from smell. Their supply was constant, and free from any source of pollution.

The facts of the case all pointed to the pond water as the source of the mischief. Steps were therefore at once taken to prevent any further injury being done, and it is hoped successfully, as up to the date of this report no more cases have occurred.

No. 1 of the following tables shows the age, date of death, duration of illness, character of food, and source of the water supply, of the seven horses which died, and also the manner their carcases were disposed of. No. 2, the age, character of food, and water supply, of the four which escaped.

TABLE I.—TABLE showing the AGE, date of DEATH, duration of ILLNESS, character of FOOD, source of WATER SUPPLY, of the HORSES which DIED.

No.	Age.	Date of Death.	Duration of Illness.	Character of Food.	Source of Water Supply.	How disposed of.
1	4 yrs.	Aug. 24	24 hours ..	Pastured in Home Field	Pond.	Opened near the pond. Carcase sent away.
2	5 yrs.	Oct. 3	3 hours ..	Pastured in Church Field at night ..	Pond.	Opened near the pond. Carcase sent away.
3	4 yrs.	Oct. 16	3 hours ..	Pastured in Church Field at night ..	Pond.	Skinned and buried in the Home Field.
4	Aged	Oct. 25	Not known.*	Pastured in Church Field at night ..	Pond.	Skinned and buried in the Home Field.
5	2 yrs.	Oct. 28	17 hours ..	Pastured in Church and Home Fields	Pond.	Skinned and buried in the Home Field.
6	Aged	Oct. 31	16 hours ..	Pastured in Church Field	Pond.	Not buried in the Home Field.
7	Aged	Nov. 1	8 hours ..	Pastured in Home Field	Pond.	Buried in the Home Field.

* Died during night.

TABLE II.—TABLE showing the AGE, character of FOOD, source of WATER SUPPLY, of the HORSES still living.

No.	Description.	Age.	Character of Food.	Source of Water Supply.
1	Chestnut mare ..	3 years	Pastured in Home Field. Had beans, barley, and clover-hay in addition	Pump.
2	Bay mare ..	Aged	Pastured in Home Field. Had beans, barley, and clover-hay	Pond.
3	Black mare ..	Aged	Pastured in Church Field. Had beans, barley, and clover-hay	Running stream, and very occasionally pond water.
4	Black gelding	Aged	Pastured at Rison. Had beans, barley, and clover-hay	Running stream, and very occasionally pond water.

By reference to Table I. it will be observed that, between the death of the first and second horse, a period of more than five weeks elapsed; but between that of the second and third, thirteen days only, and between the third and fourth, nine days; and that subsequently to this the interval became shorter in each case.

In the course of the investigation it was also elicited that for some time after the death of the first horse continuous fine weather prevailed. This was followed, however, by heavy showers of rain, which had the effect of washing the blood, and other animal matters, from the straw-yard, and the pasture, into the pond, thus increasing the original source of mischief.

EXPERIMENTS.

For the purpose of further elucidation of this disease, the following experiments were had recourse to:—

October 27th.—Two rabbits were inoculated with a needle *soiled only* with the blood of the viscera brought to the College by Mr. Ware. *One puncture* was made in each case on the inner part of the thigh.

28*th.*—Both rabbits are unwell. They refuse food, and are remarkably dispirited. The breathing also is much accelerated. By night these symptoms were much increased.

29*th.*—One rabbit died at noon to-day, *forty-eight hours* after inoculation. The other is sinking. It died in the evening, *fifty-six hours* after inoculation. On post-mortem examination the blood was found black in all the vessels, and only slightly clotted. No organic lesions were met with, but slight effusions of serum had taken place in the upper region of the neck and throat. A microscopic examination of the blood showed the existence of enormous quantities of white cells—leucocytes—but no bacteria were detected.

A third rabbit was inoculated at 3·45 P.M., with the blood of rabbit (No. 1). One needle puncture.

October 30th.—Rabbit apparently unaffected.

31st.—Rabbit somewhat dispirited. Takes food very sparingly.

November 1st.—No change.

2nd.—Constitutional disturbance subsiding. An examination of the inoculated puncture showed considerable local effects, tending to the death of the surrounding parts. A few days subsequently a small slough separated from the inoculated spot, after which the animal soon regained its usual health.

Case 2.—Blood-Poisoning.

This case was reported—Nov. 12th—by Mr. Dwyer, veterinary surgeon, who was temporarily in charge of the practice of Mr. Hussey, of Devizes.

The animal attacked was one of a number of cows which were being fattened by Mr. Farmer, a butcher. They were all fed and managed alike; their food consisting of meal, oil-cake, bran, chaff, and mangel-wurzel. Their drinking-water was from the same source, and believed to be pure. The cow in question was found dead on the morning of November 4th, no previous illness having been observed. In this instance, as in the preceding one, the flesh and entrails were given to some pigs, and also to some dogs and cats, all of which are reported to have died within two or three days afterwards. Seven sows died in all, and in each of them it was observed that death was preceded by extensive swelling of the neck and throat. On *post-mortem* examination this swelling was found to be due to serous effusion into the areolar tissue of the part; the blood was black and very imperfectly clotted. No organic lesions existed.

Mr. Dwyer forwarded to the College for examination a small piece of the rumen and of the flesh of the cow, weighing together only a few ounces. These parts were all he could find by searching the dung-heap on which the entrails and portions of the carcase had been thrown, and where they had lain for a week exposed to the weather, he not being called upon, until this time, to investigate the case. The parts did not present any abnormal appearances.

Means were taken, by the free use of antiseptic and other medicinal agents, to prevent the occurrence of other cases in the herd, which proved completely effective.

Experiments.

Nov. 14th.—The piece of flesh was given to a cat. The animal ate it very reluctantly, and only after being kept without other food for a night.

No ill effects followed.

Two rabbits were inoculated on the same day with watery fluid squeezed from out of the piece of flesh, but as in the case of the cat, no ill effects were produced.

These negative results probably depended on the parts having been so long exposed to wet and stormy weather; but taken in connection with the subject of blood-poisoning of animals, they are not without their value.

Case 3.

I am indebted to Mr. Heath, veterinary surgeon, Exeter, for the particulars of this case. Mr. Heath reports that in the evening of November 14th, he was called upon to see a fat heifer which had been taken suddenly ill, and which he found to be dying. Considerable swelling existed around the throat from serous effusion, and all the other ordinary indications of blood-poisoning were present. The animal only lived two hours. The *post-mortem* examination showed that all the organs of the body were free from structural disease, the blood only by its colour and altered condition affording evidence of morbific changes.

The owner of the animal informed Mr. Heath, that occasionally he had lost animals from a similar cause, as he believed; but that no death had recently occurred. In this case none of the structures infiltrated with the serum of the blood, nor other parts of the body, were sent to the College.

Case 4.

This case, which has proved to be one of great interest, as forming the basis for a number of experimental researches relating to blood-poisoning, was also reported by Mr. Heath.

The animal—a three-year-old fat steer, was found dead in the pasture on the morning of November 15th, no previous illness having been observed. It was one of a herd of eight, at pasture on a field which had been dressed with *manure from sties in which some pigs had died.*

During the past summer and autumn four or five animals had died suddenly on the farm; but not having been seen by a veterinary surgeon, the cause of death was not ascertained. Little doubt can, however, be entertained of their death having resulted from one of the several forms of blood-disease, as some pigs which ate of the flesh are said to have died shortly afterwards. It was from the sties in which these animals had been kept that the manure was carted on to the pasture.

The *post-mortem* appearances differed in some respects from those of the other animals named in this report, as in this case the spleen was found to be greatly enlarged, and loaded with spoilt blood; bloody exudations were also met with in the intestinal canal; petechial spots in the mesentery and in the heart; and large patches of congestion both in the chest and abdomen,—lesions which mark the existence of that form of blood-disease ordinarily known as *splenic apoplexy*. Mr. Heath having forwarded a portion of the intestine and its contents to the College, advantage was taken of it to test the poisonous qualities of the diseased blood in cases of splenic apoplexy.

Experiments.

November 19*th*.—Inoculated a guinea-pig (No. 1), one puncture with small lancet soiled with the spoilt blood from the intestine. Death followed in *eighteen hours*.

Examination of the blood of the guinea-pig showed it to be loaded with bacterides to an enormous extent. These bodies were remarkable for their large size; but unlike bacteria, were perfectly motionless.

Inoculated at the same time as the guinea-pig a fine healthy rabbit—two punctures.

20*th*.—Rabbit apparently unaffected.

21*st*.—Rabbit refuses food, and is greatly depressed.

22*nd*.—Died at noon; *sixty-eight hours* after inoculation.

No bacterides were seen in the blood, but a large number of white cells—leucocytes.

24*th*.—Inoculated two guinea-pigs, one from guinea-pig (No. 1), and the other from the rabbit. Both died in about *thirty-six hours* after the inoculation. When seen for the last time in the evening, only a few hours before their death, no indications of ill health were observed in either of them.

In each of these cases the blood was examined at very short intervals during life, but no bacteria or bacterides were detected. An increase, however, in the relative number of the white cells was observed to take place very soon after the inoculation, which continued up to the time of the last examination. After death, bacterides were abundant in the blood of each animal.

26*th*.—Inoculated a rabbit (No. 2) with blood of one of the guinea-pigs. Two needle punctures. Animal died in *twenty-eight hours*.

No evidence of ill health was noticed until about an hour before death, when symptoms identical with those present in the other cases declared themselves.

This animal was the first experimental one which had been seen to die. Death was accompanied with convulsions, and was exceedingly rapid.

An examination of the blood was made immediately after death, which showed it to contain bacterides in immense numbers.

27*th.*—Inoculated a fine healthy goat, a year old, with blood of the rabbit while still warm. Two punctures; one on the inner part of each thigh.

28*th.*—Goat unaffected.

Inoculated with the blood of the rabbit, at the time of examining the goat this morning, a young cat. Two punctures.

Same day (29*th*).—Cat apparently unaffected constitutionally; but an examination of its blood, both in the morning and evening of this day, showed the existence within it of a large number of white cells—leucocytes. These bodies were present, apparently with little variation as to number, down to Dec. 2nd, when a marked diminution of them took place. Throughout, no *bacteria* were detected.

Same day (29*th*).—Goat dull and much dispirited. Refuses food. Towards noon the animal obstinately maintained a recumbent position. Its breathing had now become very rapid —numbering 110 in the minute—and the pulse greatly increased. Died at 3 P. M., *forty-seven hours* after inoculation. Shortly before death the inoculated spots assumed a livid hue. The blood was found to be loaded with bacterides.

Two cats and two dogs were fed with the flesh of the goat on Dec. 1st to the 5th, inclusive, but no ill effects were produced in any of the animals. The flesh was bright in appearance and firm in texture, and gave no naked-eye indications of the animal having died from blood-poisoning.

On the day of the death of the goat, a donkey was inoculated with its blood. Two punctures.

30*th.*—Donkey apparently well.

December 1*st.*—Marked indications of ill health in the donkey. The animal loathes food; is disinclined to move; breathes quickly and has a very anxious expression. The pulse is quick and weak, and tremors show themselves at irregular intervals. Temperature $101\frac{5}{10}$ths.

Examination of the blood revealed the presence of large numbers of white cells—leucocytes; but no bacteria or bacterides were seen.

2*nd.*—Symptoms unchanged until the evening, when some abatement of their severity took place.

3rd. Improvement maintained. Animal's appetite returning. Blood less loaded with leucocytes.

Dec. 2nd.—Inoculated a guinea-pig with blood of the goat, *which previously to being used was subjected to a moist-heat of 212° Fahr.*

3rd and 4th.—No apparent effect.

5th.—Animal died suddenly *sixty-eight hours* after inoculation. The blood was examined immediately after death, and found to contain bacterides in enormous quantities.

As a counter-experiment another guinea-pig was inoculated at the same time with some of the blood of the goat, which had been rendered solid by exposure to *dry-heat.* No effects followed.

Dec. 3rd.—A third guinea-pig was inoculated with blood of the goat in its ordinary condition—one puncture. The animal died about *thirty hours* after inoculation. In this case bacterides were present in large numbers in the blood.

To these experiments I add two others which were had recourse to for the purpose of ascertaining the length of time diseased blood would retain its malignant properties.

Dec. 30th.—A guinea-pig was inoculated—*one puncture*—with the blood of the rabbit, which died Nov. 27th, and from which the goat had been inoculated. During the interval the blood had been kept in a phial, the mouth of which was closed with cotton-wool. It was examined previously to being used, and no bacteria were detected.

No constitutional symptoms followed, but the site of the inoculation became inflamed in the course of a few days, and ultimately a small slough separated from the part.

Jan. 2nd, 1874.—A second guinea-pig was inoculated with some of the same blood. In this case *two punctures* were made, as had been the practice in the greater number of the experiments, but no effects excepting local were produced.

The local effects corresponded with those observed in the guinea-pig inoculated Dec. 30th, and terminated as in that instance with the detachment of sloughs.

Further experiments are in contemplation. At present no conclusions beyond those of the deadly nature and the easy transmissibility of blood-diseases from animal to animal, of different species, can be safely arrived at.

XI.—*Annual Report of the Consulting Chemist for* 1873.

The appended summary of the analytical work done for members of the Royal Agricultural Society in 1873, shows that it was fully as extensive as in the preceding year. From December 1872 to December 1873 as many as 670 analyses were furnished to members, whilst 657 analyses were made in the preceding year, thus showing an increase of 13 during the past year.

Previous to the publication of the periodical reports of the Chemical Committee, the number of analyses on the average amounted to about 330 per annum. The analytical work now done for members is thus double what it was before the issue of the quarterly reports of the committee.

A marked improvement has taken place during the past season in cake transactions. Pure linseed-cake is no longer confined to a few mills, but is now made by many oil-crushers who formerly manufactured exclusively mixed cakes. Although most of the 181 samples of cakes examined in 1873 were pure, and in all respects excellent feeding cakes, and only a few were found purposely adulterated and of inferior quality, the custom still prevails to some extent of selling, as genuine, linseed-cakes which are made from imperfectly screened linseed.

As it is impossible to determine with precision the percentage of foreign matters in a linseed-cake made from more or less foul linseed, but as no difficulty is experienced in ascertaining whether a cake has been made from well-screened linseed or from dirty seed which may have been perfectly genuine as imported, it is strongly recommended to purchasers to insist upon being supplied with pure linseed-cake in good condition and made from well-screened, sound linseed only; and, as a further guarantee, I would suggest the stipulation that such cake should not contain more than 1½ per cent. of sand.

Occasionally foreign linseed-cake, equal in all respects to the best pure English, can be bought in the open market at considerably less cost than the latter; but, as a rule, foreign linseed-cake is not so fresh as the best English-made cake; and as the condition affects so much the practical value of feeding materials, it is well worth while to spend from 10*s.* to 15*s.* more per ton for a first-class fresh cake, than for a cake which may have been originally made from equally pure linseed, but which in the course of time has become stale, and, it may be, somewhat mouldy.

Several samples of mouldy decorticated cotton-cake have been found on examination to be quite unfit for feeding purposes. Most of the samples analysed during the past year were fine, light-yellow coloured, first-class decorticated cotton-cake. This kind of cake has lately risen in price; but, considering its high manurial value, which may be assumed to be worth fully 5*l.* 10*s.* on an average, and the good use to which it may be turned when it is given to stock in conjunction with Indian-corn, locust-meal, and feeding meals abounding in starch and other non-nitrogenous constituents, to supplement the nitrogenous materials in which decorticated cotton-cake abounds, it is still one of the most useful and economical articles of purchased food, of which the farmer can avail himself.

Green German rape-cake of good quality has become scarce in England. Only a few samples of really good feeding rape-cake were received for analysis last year. These were made from green German rape or Rübsen seed, whilst the cakes which were made from East Indian rape-seed were found, as in former years, too much contaminated with wild mustard, and, in consequence, too pungent to be a safe food for stock.

A new feeding cake, comparatively speaking, is cocoa-nut cake, of which several samples were sent for examination.

The following analysis shows the composition of a good specimen of cocoa-nut cake:—

Moisture	7·50
Oil	10·56
*Albuminous compounds (flesh-forming matters)	18·94
Mucilage, sugar, and digestible fibre	43·17
Woody fibre (cellulose)	13·17
Mineral matter (ash)	6·66
	100·00
* Containing nitrogen	3·03

Cocoa-nut cake resembles palm-nut kernel-cake in its general character, and no doubt is a useful auxiliary food, but being much poorer in oil than best English palm-nut meal, it is less valuable than the latter for feeding purposes. The supply of best palm-nut cake has not been equal to the demand, and, in consequence, inferior samples of foreign palm-nut cake, poor in oil, have found their way into England.

Another press-cake, useful for feeding purposes, is olive-cake, a sample of which on analysis yielded the following results:—

Moisture	6·80
Oil	20·33
*Albuminous compounds (flesh-forming matters)	7·75
Mucilage and digestible fibre	27·01
Woody fibre (cellulose)	34·65
Mineral matter (ash)	3·46
	100·00
* Containing nitrogen	1·24

Olive-cake, the residue left in the presses in extracting secondary qualities of oil from olives, contains a large proportion of indigestible woody fibre, rather little albuminous matter, and proportions of oil (to which it owes its chief feeding value), which vary considerably in different samples. It rarely contains as much oil as is shown in the preceding analysis.

The attention of the stock-feeder is directed to the subjoined analysis of a sample of locust-bean meal, lately sent to the Laboratory by a member of the Society.

The meal contained in 100 parts:—

Moisture	16·57
Oil	2·80
*Albuminous compounds (flesh-forming matters) ..	5·19
Sugar, mucilage, and digestible fibre (chiefly sugar)	64·34
Woody fibre	7·60
Mineral matter (ash)	3·50
	100·00
* Containing nitrogen	·83

Direct determinations of the amount of sugar in locust-bean meal have shown me that good locust-meal on an average contains fully one-half its weight of sugar. It is much relished by all farm-stock; and, in virtue of the large proportion of sugar which it contains, is very fattening. Locust-meal at present can be purchased in Hull at about 6*l.* 10*s.* a ton, and in my judgment is one of the cheapest fattening compounds in the market; it may be turned to excellent account if it be blended with other feeding stuffs, by selecting especially materials rich in nitrogenous compounds, of which locust-meal is deficient.

The gentleman who sent me the sample of locust-meal for analysis informs me that he gives, with much advantage, to his feeding cattle, which have been put up for fattening purposes for a few weeks,—

3 lbs. of locust-meal.
3 lbs. of best decorticated cotton-cake.
3 lbs. of Indian corn.

9 lbs.

each feed mixed with pulped turnips and cut straw and hay. He reduces the cotton-cake to powder, and also grinds the Indian corn at home into meal, and obtains the mixed meal at a cost of about 8*l.* 10*s.* a ton; and I have no doubt that he makes more money by his fattening stock than he would if, instead of this mixture, he gave them linseed-cake.

A larger number of artificial manures, belonging to the class of phosphatic manures represented by superphosphate, were analysed in 1873 than in any preceding year; and most were found of good quality and worth the money at which they were sold.

Dissolved bones are held deservedly in high repute by farmers. Unfortunately genuine dissolved bones, that is, a manure consisting entirely of bone-dust, treated with sulphuric acid, cannot be prepared in sufficient quantity to meet the demand, on account of the scarcity of bones; and, in consequence, the term "dissolved bone" is now frequently applied by manure-dealers to mixtures of mineral superphosphates with small quantities of bone-dust.

Dissolved bone as sold at present rarely contains more than 20 per cent. of bone-dust, and often as little as 10 or 12 per cent. On account of the difficulty of procuring genuine dissolved bones, some farmers are in the habit of buying separately bone-dust and oil of vitriol, and of preparing dissolved bones themselves. If bone-dust can be bought in a particular locality at an exceptionally low price, and the acid necessary to dissolve it is obtainable at a moderate cost of carriage, the practice of preparing dissolved bones at home is no doubt commendable; but, generally speaking, the railway charges for the conveyance of oil of vitriol in glass carboys is so great, that the home manufacture of dissolved bones entails an expense which a manure manufacturer who makes his own acid has not to incur. Moreover, soluble phosphate of lime is much more economically obtained from coprolites, Spanish phosphorite, and a great variety of other phosphatic minerals than from bone-dust; and although there is a great difference in the practical value and efficacy of insoluble phosphates occurring in an artificial manure in the form of bone and in the shape of mineral phosphates, soluble phosphate of lime, being a definite chemical compound, is equally valuable from whatever source it may have been obtained.

It is therefore, as a rule, no advantage to the farmer to make his own dissolved bone-manure. If, however, experience should have taught him that his turnip crops are much benefited by manures which contain more or less undissolved bone, the best plan he can pursue of procuring the kind of artificial manure which is specially suited to his requirements, is to buy separately bone-dust and mineral superphosphate of a guaranteed strength a month before the turnip crop is sown, and to proceed as follows:—In the first place the bone-dust should be thoroughly wetted with water; if boiling water can be used, so much the better. If the bone-dust is rather dry and impregnated with a good deal of greasy matter, like that made from green bones, it takes some time before the water is absorbed. It is desirable, therefore, to pour at once upon the bone-dust about half its weight of water, and after a lapse of six or eight hours to turn over the heap, and to add some more water, if necessary, at the same time. According to the state of dryness of the bone-dust it will absorb in the course of eight or twelve hours from one-half to two-thirds its own weight of water. On the following day the wetted bone-dust may be mixed with mineral superphosphate in the proportion of one of bone-dust to two or three of mineral superphosphate. By putting up the mixed manures in as compact a heap as possible, in about twenty-four hours the wetted bone-dust will ferment and set up a considerable amount of heat in the heap; and, attracting the acid from the mineral superphosphate, it will become still further broken up, or, at all events, softened and rendered more efficacious as a manure. The compost of bone and superphosphate may be turned over after having been kept undisturbed for about a fortnight; but, if time permits, it is better to allow three or four weeks before the heap is turned over; for by keeping the compost during the longer period, the bone is more thoroughly reduced to a fine state, and the bone superphosphate is obtained in a drier condition than is the case if the bone compost is turned over after it has been put up for only a fortnight.

There is no difficulty in ascertaining, by simple inspection, whether $\frac{1}{2}$ or $\frac{1}{4}$ inch bones are genuine or not. The superphosphate should be bought merely as a source of soluble phosphate, on the strength of a guarantee which secures to the purchaser a superphosphate containing, say, 25 per cent. of soluble, at a fixed price, for each unit per cent. At 3*s.* 6*d.* per unit of superphosphate, a superphosphate guaranteed to contain 25 per cent. of soluble phosphate would be worth—25 × 3*s.* 6*d.*, 4*l.* 7*s.* 6*d.* a ton. At that rate soluble phosphate may be bought in most places; but it is impossible for a farmer to obtain it at so cheap a rate from bone-dust. It is therefore good economy to buy soluble phosphate in the shape of mineral superphosphate; and by mixing with it a certain proportion of bone-dust, previously wetted by water, a dry, fine home-made bone superphosphate, which, unlike purchased bone superphosphate, leaves no uncertainty whether the insoluble phosphates are contained in the manure as bone or as mineral phosphate, can be prepared on the farm without much trouble. In this way a better turnip-manure may be obtained at a less expense than when "dissolved bones" or bone superphosphate are bought from manure-dealers.

The samples of nitrate of soda, sulphate of ammonia, bone dust, and guano, which were sent for analysis in 1873 were all genuine.

The quality of Peruvian guano in 1873, in comparison with that of the supplies of 1872, has neither improved nor deteriorated. Most samples of Peruvian Government guano, although of good quality, and yielding an average of 11 to 12 per cent. of ammonia, are too wet and lumpy to be distributed uniformly and readily on the land.

Occasionally dark, brown-coloured, sulphate of ammonia, obtained in the purification of coal-gas, finds its way into commerce. Most of these brown-coloured samples, I find, contain appreciable quantities of sulpho-cyanide of ammonium —a salt which exerts a most pernicious influence upon vegetation, even if it is applied to the land in very small quantities. Some preliminary experiments which I have made, with a view of testing practically the effects of sulpho-cyanide of ammonium upon plants, have shown me that it is the most powerful poison to wheat, barley, and cereal crops with which I am acquainted; and I am inclined to think that as little as 10 lbs. per acre of sulpho-cyanide of ammonium, in a top-dressing of sulphate of ammonia, will injuriously affect the young barley or wheat crop. The same and similar poisonous cyanogen compounds occur not unfrequently in gas-lime and other refuse materials obtained from gasworks, and used occasionally for manuring purposes. To my knowledge, great mischief sometimes is done by applying certain refuse materials from gasworks to grass-land; and I am inclined to think that the cause of the mischief may be traced, in perhaps not a few cases, to the cyanogen compounds which occur in some refuse materials from gasworks.

I would therefore recommend great caution in the application to the land of waste products from gasworks, and suggest that such products should be carefully examined for cyanogen compounds before they are used for manuring purposes.

The supply of phosphatic minerals, from which the bulk of artificial manures is prepared, has sustained no check in 1873. New beds of phosphatic minerals are being discovered in all parts of the world, and there is no danger that the manufacture of artificial manures will suffer from want of raw phosphatic materials. One of the more recent discoveries of phosphatic minerals has been made in the South of France, from whence we have obtained, during the last year or two, rich mineral phosphates. The following analysis is mentioned in illustration of the character of the richer samples of French phosphate:—

Composition of a sample of Bordeaux Phosphate.

Moisture	3·28
Water of combination	1·24
*Phosphoric acid	33·72
Lime	44·23
Oxide of iron	2·66
Alumina	6·42
†Carbonic acid	3·26
Magnesia, fluorine, and loss	1·74
Insoluble siliceous matter	3·45
	100·00
* Equal to tribasic phosphate of lime	73·61
† Equal to carbonate of lime	7·40

In the list of analyses of refuse manures are comprehended a number of those prepared by various precipitating agents from town sewage. None of these sewage manures, analysed in 1873, were of sufficient value to repay the cost of their manufacture, or to call for any special remark.

With regard to the communication of Consul Inglis, of Leghorn, respecting the mode of treatment of night-soil and its application to the land in Italy,* I have to report to the Chemical Committee that the said communication confirms the general experience of the Flemish farmers and of Continental agriculturists, who are in the habit of utilising human excreta for agricultural purposes, and that it does not refer to any details of special interest or importance to English agriculturists.

In connection with the utilisation of night-soil, I may mention that I have recently paid a visit to Paris for the purpose of becoming acquainted with the manner in which the contents of the Parisian cesspools are disposed of. The larger proportion of the contents of the cesspools of Paris is carted in air-tight barrels to La Villette, in the outskirts of the city, and received in large reservoirs, where the solid and liquid portion of the excreta are allowed to separate. The liquid portion is then pumped to the sewage works at Bondy, a distance of about eleven miles from Paris, and the solid portion is taken in barrels by canal to the same works.

The solid portion of the night-soil of Paris is then dried with peat charcoal and sulphate of lime, and, with the addition of phosphate of lime and salt of ammonia, manufactured into portable manure.

The liquid portion, or the putrid urine, has hitherto been wasted to a great extent, and been allowed to flow into the Seine. Arrangements are, however, in progress to purify the liquid

* Communicated by the Secretary of State for Foreign Affairs.

portion of the night-soil with lime, and at the same time to extract from it ammonia.

Putrid urine, it is well known, contains an appreciable quantity of carbonate of ammonia. On distillation with quick-lime, it yields caustic ammonia, which, being passed through sulphuric acid, produces sulphate of ammonia. A French engineer, of the name of Kuenze, has recently constructed a distilling apparatus in which the fuel is so effectually economised that liquid which contains not more than two per thousand of ammonia may be profitably distilled for ammonia. This apparatus has been at work for several years at Courbevoie, near Paris, where annually many tons of sulphate of ammonia are produced from the putrid urine of a small district of Paris; and before long the whole of the liquid contents of the cesspools of Paris will be subjected to the same process of distillation which I have lately seen in actual operation at Courbevoie.

A large number (fifty) of drinking waters have again been submitted to me for examination in 1873. Amongst them several were found to be contaminated with drainage products, and unfit for drinking purposes.

Good drinking waters contain hardly any unoxydised organic matter; and, with the exception of hard waters in the chalk-formations, containing sometimes as much as 48 to 50 grains of mineral constituents (chiefly carbonate of lime), they generally contain from 15 to 25 grains of solid constituents in the imperial gallon. The following analysis of a sample of water lately analysed by me, therefore, will give a good idea of the extent to which water is occasionally contaminated with organic and saline impurities.

An imperial gallon of this water contained:—

	Grains.
Oxydisable organic matter	1·17
Oxides of iron and alumina	·70
Carbonate of lime	27·02
Sulphate of lime	20·71
Sulphate of soda	69·02
Chloride of sodium	24·65
Nitrate of soda	9·36
Carbonate of soda	2·21
Soluble silica	·98
Total amount of solid matter per gallon	155·82

About a fortnight ago I received a note from one of the members of the Society, who writes to me: "Last month Lord Rosslyn very kindly informed me that he has been assured that grass not mown or grazed, but allowed to seed, does sometimes form an ergot, which acts on mares, and produces in some cases abortion.

Having some thirty brood mares, I am much interested in this matter, and hope I am not travelling out of the line intended by the Society (of which I am a life-member) in asking you to be good enough to tell me whether your experience has shown you that grass, left, say, for hay, and allowed to seed, but afterwards grazed instead of being mown, is dangerous to brood mares, chemically. I know it is practically dangerous, from the bulk they may eat, if allowed to remain in it more than a limited time. Breeders are liable to cases of slipping foal every year. This year I have three or four cases; but I can account for most of them from accident or otherwise."

The preceding letter reminds me of a case which was referred to me last September. A gentleman residing in Essex sent me some specimens of grass in seed for examination. The grass was Italian rye-grass, and the seeds, I found at a glance, were attacked by ergot, a fungoid growth which not unfrequently affects the grain of rye. Ergot, however, is not confined to rye, for I have found it myself on *Glyceria fluitans;* and rye-grass, and probably other grass-seeds, are liable to become ergotised.

The specimens which were sent to me for examination came from a piece of old turf on fair clay land, on which no rye-grass had been sown in the memory of man. A valuable brood mare cast a foal and died in a few hours, after feeding in the pasture from which the seeded grass was taken. Several other brood mares and foals feeding in the same field sustained no injury.

Several cases of sudden deaths of horses, I am informed, occurred in Essex last autumn, the cause of death being involved in much uncertainty.

There can be no doubt that ergot is not confined to the grain of rye, and that grass-seeds attacked by ergot are poisonous.

Ergot possesses powerful medicinal effects, and is used specially in diseases of the uterus, and is well known to produce abortion. It does not attack the stem or leaves of grass, but only the seed; and hence it would appear desirable not to keep brood mares in fields in which the grass has been allowed to run to seed and become dead ripe.*

In conclusion I have to report to the Committee the results of an analysis to which I submitted a specimen of iron-slag, handed to me by Earl Cathcart.

The slag was very light and porous, and was readily crushed into a fine voluminous powder. It yielded on analysis the following results:—

* The subject of ergot in grass-seeds has been referred to the Consulting Botanist of the Society, whose Report will be published in the next Number of the Journal.—Edit.

Silica	43·50
Alumina and a little oxide of iron	22·95
Lime	31·50
Magnesia and loss in analysis	2·05
	100·00

In a chemical point of view iron-slag is a double silicate of lime and alumina, with a little silicate of magnesia derived from the limestone employed in the iron-furnaces.

By a new and very cheap process iron-slag may be completely disintegrated by being run red-hot into a rapidly revolving wheel and violently agitated in water. This disintegrated material, resembling in appearance pumice-stone, Lord Cathcart informs me, can now be had in any quantity for little more than the cost of carriage.

The results of the preceding analysis show that lime and silica are the two constituents of slag which are capable of rendering good service to vegetation. The proportion of lime in iron-slag is considerable, and there cannot be much doubt about the utility of the fine disintegrated slag for improving moor land or peaty soils.

It is true the lime is combined in the slag with silica, and therefore it is not so readily available to plants as caustic lime. On the other hand, the effects of the lime in iron-slag appear to me likely to be more permanent than the effects of quicklime; and as the slag can be procured for little more than the cost of carriage, it may be applied to all land in much larger quantities than quicklime can be applied, for economical reasons; and when used in large quantities, say five or six tons per acre, I have no hesitation in saying that sufficient lime will be liberated from the silicate of lime of the slag to meet all the requirements of the crops usually grown on the farm.

The artificial disintegration of the slag I believe greatly favours its decomposition in the soil, and fits it to yield both lime and silica to vegetation. Before it can be useful to the plant the slag must undergo decomposition. The carbonic acid produced in the soil by decaying vegetable matter gradually acts also upon the silicate of lime, converting it into carbonate of lime on the one hand, and liberating from it, on the other hand, silica in a gelatinous and readily soluble condition. In peaty soils and such as are rich in vegetable matter, this decomposition will take place with greater rapidity, and hence the greater fitness of iron-slag as an application to such soils.

Silica is necessary, especially to our corn and grass crops, and therefore anything which will supply it to the peat in a soluble form is supposed to possess much virtue as an application to the land. Weakness in straw is generally ascribed to a deficiency of soluble silica in the soil; but whilst this may be the case in exceptional cases, it is well to be reminded that there is not a single experiment on record which shows positively that the direct application of soluble silica has ever had a decidedly beneficial effect upon corn crops.

It is further an unquestionable fact that there are few soils which do not contain an abundance of soluble silica. The weakness in straw in most cases arises not so much from the want of silica as from the deficiency in the soil of available potash, phosphoric acid, lime, or some one or more equally necessary mineral food constituent; and, not unfrequently, weakness in the straw of corn-crops is the result of a general abnormal and unhealthy growth, induced by too copious an application of nitrogenous manures.

I cannot, therefore, help regarding iron-slag as mainly useful as a good and cheap form in which lime can be used in agriculture.

Summary of Analyses made for Members of the Royal Agricultural Society, from 1*st December*, 1872, *to* 1*st December*, 1873.

Guanos	38
Superphosphates, dissolved bones, and similar artificial manures	212
Bone-dust	27
Nitrate of soda and sulphate of ammonia	32
Potash-salts	5
Refuse manures	36
Limestones, ironstones, and other minerals	16
Soils	27
Waters	50
Milk and whey	6
Oilcakes	181
Feeding meals	19
Vegetable productions	11
Examinations for poisons	10
Total	670

XII.—*Quarterly Report of the Chemical Committee for December,* 1873, *and subsequent Correspondence relating thereto.*

THE Committee have to report that in two instances parcels of linseed-cake, sold as "pure" by two members of the Hull Pure Linseed-cake Association to two members of the Society, having been found on analysis by Dr. Voelcker to be of inferior quality, they instructed the Secretary of the Society to communicate with the Chairman or Secretary of that Association.

Accordingly, on January 1st, the Secretary wrote a letter calling attention to the advertisements which had appeared in the 'Mark Lane Express' and 'Bell's Weekly Messenger' of August 19th, 1872, announcing the formation of an Association entitled "The Hull Pure Linseed-cake Association," the members of which had resolved "that from and after this date no other cakes than pure linseed-cakes shall be sold or described as 'Linseed-cakes.'" These and other resolutions were come to at a meeting of seed-crushers and cake-merchants of Hull, on August 14th; and the report of that meeting (taken from the 'Yorkshire Post' of the 16th) was published in the Society's 'Journal' issued to its members—Part 2, of 1872.

Particulars were then given of the two cases in question, showing a departure from these resolutions on the part of the members of the Association referred to.

In one of these cases the following warranty was given by the vendor at the time of purchase:—

WARRANTED PURE LINSEED-CAKES.

Sold

Pure Linseed-cakes, at £11 12*s.* 6*d. per ton, which are made entirely from fine, sound, screened linseed, and free from any adulteration.*

THIS WARRANTY SUBJECT TO THE ANALYSIS OF PROFESSOR ANDERSON.

In the other case the cake was invoiced as "Pure Linseed-cake," at 11*l.* per ton, "nett cash," and each cake was stamped with the word "Pure."

Dr. Voelcker found that both samples of cake were of inferior quality, made from badly-screened linseed, containing many small weed-seeds, much starchy matter, and from 4 to 4½ per cent. of sand. They were also poor in oil and albuminous (flesh-forming) compounds. The following are the analyses of the two samples of cake:—

No. 1. Professor Voelcker's analysis:—

Moisture	13·40
Oil	8·87
*Albuminous compounds	15·87
Mucilage, starch, and digestible fibre	43·04
Woody fibre	9·67
†Mineral matter (ash)	9·15
	100·00
*Containing nitrogen	2·54
†Containing sand	4·45

No. 2. Professor Voelcker's analysis:—

Moisture	8·76
Oil	10·43
*Albuminous compounds	21·94
Mucilage, starch, and digestible fibre	39·91
Woody fibre	9·76
†Mineral matters (ash)	9·20
	100·00
*Containing nitrogen	3·51
†Containing sand	3·97

Professor Anderson's analysis of No. 2 is as follows:—

Water	12·10
Oil	9·15
Albuminous compounds	25·37
Mucilage, gum, &c.	38·68
Fibre	5·80
Ash	8·50
	100·00
Nitrogen	4·06

The ash contains:—

Phosphates	1·70
Phosphoric acid, combined with alkalies	1·49
Sand	3·85

(Signed) James Anderson.

Professor Anderson (Consulting Chemist to the Highland and Agricultural Society) entirely confirmed Dr. Voelcker's opinion in the case which was subject to his guarantee, and which was, therefore, submitted to him; and, finally, the inferior quality of the cake was admitted in both cases. In the first, the parcel was taken back by the vendor; and in the second a reduction in price was submitted to—the vendors in the one case stating that the cake contained the sweepings of the bin before fresh seed was put into it, and in the other that the screen was a little out of order.

The Association were further informed that these cases had been referred by the Council to the Chemical Committee of the Society for investigation prior to publication, and that the Committee were not satisfied with the alleged excuses. They deemed it right, however, before concluding their report to the Council, that the cases be communicated to the Association itself, with a view to such action on their part as would appear to be consistent with the avowed object of its institution.

No acknowledgment of this communication, which was registered, having been received up to January 20th, the Secretary wrote on that date calling attention to his letter of January 1st, and stating that, as it had not come back through the Returned Letter Office, the Committee inferred that it had been duly received. It was further stated that, as the Committee must conclude its report to the Council by February 3rd, a reply was requested previous to that date.

On January 27th, a letter, dated January 26th, was received by the Secretary of the Society, not from the Chairman or Secretary of the Hull Pure Linseed-cake Association, but from one of the members of that Association, whose sale of inferior cake as "Pure Linseed-cake" had been reported by Dr. Voelcker. In that letter it was stated that "at present there is no secretary, or, we believe, chairman, of the Hull Pure Linseed-cake Association, or we would hand over the whole of the correspondence." The writer then gave the same explanation as before—namely, "that, owing to a slight defect in the screen at the time these cakes were making, it was possible he (the purchaser) had some just cause of complaint." They, therefore, made a reduction in the price. They further insisted that the Society would not be justified in publishing the charges against them as the vendors, and concluded by threatening with an action the editor of any publication in which the Society should seek to brand them "before the public as dishonest traders for what was the result of accident more than anything else."

To this communication the Secretary returned the following reply on January 27th :—

"I beg to acknowledge the receipt this morning of your letter of yesterday, and, by direction of the Chemical Committee, to request that you will inform me by whom my letters to the Chairman or Secretary of the Hull Pure Linseed-cake Association were handed to you on Saturday last.

"At present the Society is seeking to deal with that Association, and not with any individual members of it, and cannot recognise your letter as any answer to my letters to its Chairman or Secretary.

"If the Association has no responsible head or executive authority, its existence is in name only; and the public are greatly misled by those who use and publish a trade mark or emblem describing the contrary."

To this letter the following answer, dated January 28th, was made :—

"In reply to your favour, we think you would have no difficulty in getting the information you ask from the Post-Office officials, the letter being registered. We would rather not mention names, for this reason :—it was brought to our office on Saturday night by a boy, and, as no letter accompanied it, you will easily understand we have no positive evidence where it did come from.

"In our opinion it is a fine point if the Association really does, or does not, exist."

This communication arrived on January 29th, and on the following day the Secretary received a registered packet containing his letters of the 1st and 20th of January, which had been addressed by him to the Chairman or Secretary of the Hull Pure Linseed-cake Association. He therefore wrote as follows :—

"I beg to acknowledge the receipt yesterday of your letter of the 28th instant; and this morning, in a registered envelope—not through the Returned Letter Office, but obviously through yourselves, and in a well-thumbed condition—that of my two registered letters of the 1st and 20th instant, to the Chairman or Secretary of the Hull Pure Linseed-cake Association.

"I beg also to acquaint you that I have been informed by the Post-Office officials, to whom by your letter of the 28th instant you referred me for that information, that the former of those two letters was taken in by [quoting the names given], and by them delivered to you as Secretaries of the Hull Pure Linseed-cake Association. I therefore assume that my letter of the 20th reached you in the same manner, and through the same channel, as they were both delivered to you at the same time, and have been returned to me in the same envelope.

"In your letter to me of the 26th you say that there is neither Chairman nor Secretary of the Hull Pure Linseed-cake Association; and in yours of the 28th you say that, in your opinion, it is a fine question if that Association really does or does not exist, although you, amongst others, continue to publish its existence as a fact, and to trade under cover of its implied guarantee.

"Under such circumstances it is idle to attempt further correspondence with a body that has no real existence. I did not ask personal correspondence with yourselves, and I shall now submit the correspondence that has taken place to the Chemical Committee of the Society, in order that they may deal with it as they may think proper."

The foregoing Report of the attempted correspondence with the "Hull Pure Linseed-cake Association," by means of registered letters addressed to the Chairman or Secretary of that body, was published as part of the Proceedings of the February Council-meeting in the Agricultural newspapers; and the following additional correspondence has since taken place in reference thereto.

"Azov Buildings, 5, High Street, Hull,
"February 19th, 1874.

"Sir,—My attention has this morning been called to a report of a meeting of the Royal Agricultural Society, whereat the Chairman read a correspondence which is published in the 'Mark Lane Express' of the 9th inst., which has been carried on with reference to the Hull Pure Linseed-cake Association, and in the absence from home of the chairman, I hasten to inform you that none of the letters referred to have ever reached him or myself, or, as far as we know, any official of the Association. I consider it, however, a matter of such grave importance that I shall call a meeting of the Committee at an early date, when the affair shall be most thoroughly investigated.

"In the meantime I will thank you at once to send me the letters referred to, which the correspondence states have been returned to you.

"I am, Sir, your obedient servant,
"H. W. Chambers,
"Vice-Chairman to the Hull Pure Linseed-cake Association.

"To the Secretary of the Royal Agricultural Society.

"P.S.—I send a copy of this letter to the 'Mark Lane Express.'"

The Secretary replied as follows :—

"12, Hanover Square, W.,
"February 20th, 1874.

"SIR,—I beg to acknowledge the receipt of your letter dated yesterday in reference to extracts from a correspondence relating to the Hull Pure Linseed-cake Association, which was read by the Chairman of the Chemical Committee at the meeting of the Council of this Society on the 4th inst., and published with the other minutes of that meeting in the 'Mark Lane Express' of the 9th.

"You inform me that none of the letters thus referred to reached either the Chairman of the Association, yourself as the Vice-Chairman, or, so far as you know, any official of the Association; and you request me to send you the letters (as they have been returned to me) prior to a meeting of the Committee of the Association, which you propose to summon for the purpose of considering them.

"In reply to your letter, I beg to state that I have twice attempted to communicate directly with the Association by means of registered letters addressed to its Chairman or Secretary, and that I have been informed that at present there is no Secretary, nor, it is believed, Chairman of the Association, and even that it is a fine point whether the Association itself really does or does not exist.

"These statements differ so greatly from those contained in your letter of yesterday, that I must request you to furnish me with a list of the Members of the alleged Association and the names of the Chairman, the Members of the Committee, and other officers; also that you will inform me when and how the Committee and officers were appointed, and by what authority you write on behalf of the Association.

"I am, Sir, your obedient servant,
"H. M. JENKINS, Secretary.

"H. W. CHAMBERS, Esq., Hull."

At the same time the Secretary addressed the following letter to the firm who had given him the information published by the Committee in their last Quarterly Report :—

"12, Hanover Square, W.,
"February 20th, 1874.

"GENTLEMEN,—With reference to our recent correspondence relating to the Hull Pure Linseed-cake Association, and to the sale by yourselves and another Member of that Association of inferior linseed-cake as 'Pure' linseed-cake to two members of this Society, notwithstanding that the Members of the Hull Pure Linseed-cake Association had resolved that 'no other cakes than pure linseed-cake shall be sold or described as linseed-cake,' I beg to call your attention to the enclosed copy of a letter* which I have received this morning.

"In your letter to me of January 26th you informed me that 'at present there is no Secretary, or, we believe, Chairman, of the Hull Pure Linseed-cake Association, or we would hand over the whole of the correspondence;' and in your letter of the 28th of January you state that, in your opinion, 'it is a fine point if the Association really does or does not exist.'

"On the other hand, the writer of the letter, of which I enclose you a copy, states that the Chairman is absent from home, signs himself as Vice-Chairman, and asserts his right to act on behalf of the Association by stating his intention of calling a meeting of the Committee at an early date.

* Namely, that dated February 19th, given on p. 291, and signed "H. W. Chambers, Vice-Chairman of the Hull Pure Linseed-cake Association."

"I am therefore directed to request that you will explain the apparent discrepancies in the two statements.

"I remain, Gentlemen, your obedient servant,

"H. M. Jenkins, Secretary."

To this letter the following reply was received in due course :—

"Hull, 23rd February, 1874.

"Dear Sir,—In reply to yours of the 20th, we would draw your attention to the following resolution passed by the Hull Pure Linseed-cake Association : —September 18th, 1872. 'It was resolved that the officers be elected annually ;'—and on September 25th, 1872, we have seen a minute in the book, 'That meetings be held the first Monday in every month.'

"In confirmation of what we have previously stated, we know the Secretary has resigned, for his letter of resignation bears date 26th February, 1873, and the gentleman who occupied the position of Chairman told us himself that he had resigned, and his letter of resignation, if we mistake not, bears date 2nd June, 1873.

"And now, with regard to the Association itself, we may say it has not elected its officers annually, it has not held its meetings the first Monday in every month, and, so far as we know, it has not held any meeting at all for twelve months ; and this could not be for lack of business, because the Chairman and Secretary's written resignation had been sent in, and, if there was any management at all, surely it was somebody's duty to call a meeting to elect fresh officers. We may, moreover, state that the expenses incurred in the formation of the Association in August, 1872, amounting to about 44*l*., have not yet been paid—this does not speak much of the financial department. After this explanation we think your Society will admit that we have previously written nothing but what is strictly the truth.

"We may add that we shall cease to use the badge of the Association ; we never attached very much importance to it, and we do not wish it to be supposed we have ever done so with a view of deceiving our customers.

"We are, yours respectfully,

"H. M. Jenkins, Esq., ————*

"Secretary of the Royal Agricultural Society."

The following acknowledgment of the Secretary's letter of February 20th, addressed to Mr. Chambers, was also received on the 24th, from that gentleman :—

"Azov Buildings, 5, High Street, Hull,

"23rd February, 1874.

"Sir,—I beg to acknowledge the receipt of your letter dated 20th inst. A Committee of the Association have been called for Wednesday next, when your letter shall be officially attended to.

"I am, Sir, your obedient servant,

"H. W. Chambers,

"Vice-Chairman of the Hull Pure Linseed-cake Association."

"H. M. Jenkins, Esq.,

"Secretary of the Royal Agricultural Society, London."

* These and other names, with some addresses, have been omitted, as it is unnecessary to specify private individuals in this correspondence, which refers to the alleged existence of the Hull Pure Linseed-cake Association.

The result of the Meeting referred to in the foregoing communication is contained in the following letter, and accompanying resolutions:—

"*Hull Pure Linseed-cake Association, Hull,*
Robert Blyth, Hon. Secretary.

"February 25th, 1874.

"SIR,—Your letter of the 20th of February has been placed before the Committee of the Hull Pure Linseed-cake Association at a meeting held this day, and at foot we beg to hand you copy of the resolutions passed in reference thereto.

"Your registered letters dated January 1st, and 20th, appear to have been received by . . . . and signed for by one of their clerks, and that they, on or about the 25th of January, sent the same in a parcel to . . . . of the firm of . . . . an ex-Secretary of the Association, but acting until the appointment of his successor, who, for reasons best known to himself, returned the same to you, without acquainting any Member of the Association of his having done so, or of the existence of any such documents.

"Until the appearance of the report in the 'Mark Lane Express,' no Member of the Committee was in any way acquainted with the matter referred to.

"We remain, your obedient Servants,
"H. H. AYRE, Chairman.
"H. W. CHAMBERS, Vice-Chairman.
"ROBERT BLYTH, Hon. Secretary (*pro tem.*).

"H. M. JENKINS, Esq.,
"Secretary of the Royal Agricultural Society."

COPY OF RESOLUTIONS.

"RESOLVED :—

"'That the letter dated 20th of February, received from the Secretary of the Royal Agricultural Society, addressed to the Vice-Chairman, be acknowledged, and that on the former's compliance with the latter's request, contained in his letter of the 19th inst.—viz., to send the correspondence referred to, the Committee will furnish the Secretary of the Royal Agricultural Society with the list of members of this Association if still required.'"

"RESOLVED :—

"'That the letter embodying the foregoing Resolution be signed by the Chairman, Vice-Chairman, and Secretary.'"

The Secretary replied as follows:—

"12, Hanover Square, February 26th, 1874.

"SIR,—I beg to acknowledge the receipt of a letter dated the 25th inst., headed 'Hull Pure Linseed-cake Association,' and signed by yourself as Chairman, Mr. H. W. Chambers as Vice-Chairman, and Mr. Robert Blyth as Hon. Secretary (*pro tem.*) of a body apparently using that title.

"This communication refers to my letter of February 20th, addressed to Mr. H. W. Chambers, which was a reply to his request for my letters dated the 1st and 20th of January, addressed to the Chairman or Secretary of the Hull Pure Linseed-cake Association; that is to say, to his request for my attempted correspondence with an institution adopting precisely the same name as that at the head of the letter which I received this morning, but using a distinctive badge or emblem which is not stamped on the latter.

"My letters of the 1st and 20th of January had, however, been returned to me with a statement, dated from the same address as the letter received this morning, to the effect that there was no Secretary of the Association, it was believed that there was no Chairman, and, in fact, it was a fine point whether there was any Association.

"Under these circumstances, and to enable me to bring officially before the Chemical Committee of the Society the letter received this morning and the accompanying Resolutions, I must renew my request for the information asked for in my letter of the 19th, addressed to Mr. Chambers, together with a copy of the Rules of the Association, so that the Chemical Committee may assure itself that the body which is now styled the 'Hull Pure Linseed-cake Association,' is the same body as that with which I unsuccessfully attempted to correspond on January 1st.

"I am, Sir, your obedient Servant,

"H. M. Jenkins, Secretary.

"H. H. Ayre, Esq."

To this letter the following reply and copy of resolutions were received from Mr. Blyth:—

"Hull Pure Linseed-cake Association,

"23, High Street, Hull, March 4th, 1874.

"Sir,—I beg to acknowledge receipt of your letter of the 25th of February, addressed to the Chairman of this Association, and, in reply, beg to hand you subjoined extract from the minutes and copy of Resolutions passed at a Meeting of the Committee held this day.

"I may just mention that the office of the Association is at the Chamber of Commerce rooms in the Hull Exchange, and that a brass plate about 20 inches by 10 inches, with the name of the Association, has, since its formation, been affixed to the entrance. The former Secretary had, as a matter of convenience, letters addressed to his office— . . . . hence the address given hereon. Members of the Association, and no others, are entitled to use the badge you refer to.

"I am, Sir, your obedient Servant,

"Robert Blyth, Hon. Secretary (*pro tem.*)."

COPY OF RESOLUTIONS.

"A letter from the Secretary of the Royal Agricultural Society declining to forward the letters alleged to have been addressed by him to this Association, but which, he states, were returned to him without reaching it, having been read, it was resolved:—

"'That it appearing evident to this Committee that the Secretary of the Royal Agricultural Society now wishes to withhold from this Association the letters above referred to, this Committee declines further correspondence upon the subject.'

"'That the Secretary be instructed to forward to the Secretary of the Royal Agricultural Society an extract from the minutes of this Meeting embodying the foregoing Resolutions.'"

The Secretary acknowledged the receipt of this communication as follows:—

"12, Hanover Square, W., March 5th, 1874.

"Sir,—I beg to acknowledge the receipt of your letter of yesterday's date, and the accompanying Resolutions, which I will submit to the Chemical Committee of the Society, together with the remainder of the correspondence, of which they form the conclusion, with a view to their publication as the sequel to the last Quarterly Report of the Committee.

"I am, Sir, your obedient Servant,

"H. M. Jenkins, Secretary.

"Robert Blyth, Esq."

Of the two registered letters referred to in the above "Copy of Resolutions" as having been purposely withheld, the first, dated January 1st, was, as will have been gathered from the preceding correspondence, delivered to a firm in the linseed-cake trade, one of whose clerks signed the receipt for it. That firm, on ascertaining that the letter was not intended for them, did not, however, return it to the Secretary of the Royal Agricultural Society, or communicate with him in reference to it at the time. A second registered letter, similarly addressed by the Secretary on January 20th, was delivered to the same firm, and apparently opened by them. On January 21st, however, it is alleged that they addressed to him a communication, of which the following is an extract:—

> "We received your communication of the 1st January and also of the 20th, addressed to the Secretary of the Hull Pure Linseed-cake Association, and will endeavour to find out who occupies that position so that we can hand him documents.
>
> "We do not know anything of the constitution of this Association, or whether it exists only in name, but we do know that cakes are being sent out branded 'pure' that ought not to be so branded, proving to our minds that the only means for the consumer, who, in order to be certain that he gets justice done, should connect himself with people whom he knows to be respectable, and not begrudge a proper price for a good article."

This communication did not reach the Secretary; but a copy of it reached him through the post more than a month afterwards, on February 25th, having been posted in Hull the previous day. The writer of the letter, on being asked for an explanation, stated that the copy was intended for another person; and that the non-receipt of the original letter by the Secretary in due course was "Evidently a miscarriage of the 'post,' to the officials of which we have written for an investigation, and on receipt of their reply we will further communicate with you." No further explanation has been received up to the present time.

A sample of "Economical Manure," a compound to which attention has been more than once directed in the quarterly reports of the committee, was sent by Mr. John Parkin, of Goldthorpe, Worksop, on behalf of Mr. G. Webster, of Whitwell, near Chesterfield, who bought it at 12*l.* per ton, from Mr. W. Jenkinson, Stanfell, near Bolsover, the maker being, as on a previous occasion, reported to be Mr. B. Coveney, of 17, Devonshire Square, Bishopsgate Street, London.

This manure had the following composition:—

Water	21·66
Sulphate of iron (green vitriol)	15·77
Oxide of iron and alumina	3·75
Alkaline salts, chiefly sulphate of soda, and common salt	31·85
Sulphate of lime (gypsum)	23·92
Insoluble matter (sand)	3·05
	100·00

Nitrogen, ·20, equal to ammonia, ·24.

This "Economical Manure" contained no phosphoric acid whatever, and mere traces of ammonia; and, as shown by the preceding analytical results, it consists of a mixture of green vitriol, gypsum, salt-cake, and other substances of no intrinsic value as manure.

Mr. Parkin wrote as follows:—"The sample of so-called tillage I sent you was taken out of a 1-ton lot purchased by a friend of mine, Mr. G. Webster, of Whitwell, who had heard such wonderful accounts of it, that he was wishful for me to try it as well, but I did not like the look of it. He tried it both upon grass and turnips, and neither he nor I could see the slightest result, so I requested him to let me have a sample to forward to you for my own satisfaction. Mr. Webster refused to pay for it until he had seen the results; and they are now putting him into the county court for the money."

In reply to further inquiries the Committee have received copies of letters written by the solicitors on both sides, as well as a copy of the case and opinion of counsel on behalf of Mr. Webster, the purchaser. It appears that Mr. Webster's solicitors wrote to the vendor's solicitors stating that they had been instructed to defend the action which Mr. Coveney had brought against their client, and added, "At the same time we beg to apprise you that our client has caused the stuff sold to him as tillage to be analysed by Dr. Voelcker, who reports that it is not worth anything as a manure, and is injurious rather than beneficial to vegetation." In reply, Mr. Coveney's solicitors stated—

"Our client does not sell his manure subject to the approval of the analysis and report of Dr. Voelcker or any other professional chemist, but on the truth of his prospectus, a copy of which we beg to enclose you, and we are in a position to assure you that our client is quite able to prove the entire truth of everything contained in that prospectus, which was settled by one of our ablest lawyers (now on the Bench). It has been known and acknowledged from the first that the opinions of professional analytical chemists have been opposed to our client's manure, but the existence of so many reports in its favour, from actual use and practical experience, cannot be gainsaid or got rid of, and as regards the publication of the analysis which you threaten, that has already been done, and if your client will refer to the Royal Society's 'Journal' of 1870, published about July of that year, Dr. Voelcker's opinion and analysis will be found set forth in full, so that our client does not fear publicity."

The prospectus, after setting forth the superiority of the manure, states, in the first paragraph on the second page, as follows :—

Complete reliance may be placed on its uniform quality and on the genuineness of the testimonials, but the proprietor does not undertake that in every case an equally satisfactory result will attend its use, and any disappointment felt in respect to it shall not be a cause for non-payment or for compensation.

After further description of the qualities of the "Economical Manure," statement as to its discovery, directions as to its use, &c., follow a large number of testimonials selected from nearly 4000.

This prospectus, and the other necessary documents, were forwarded by Mr. Webster's solicitor to counsel, who gave his opinion as follows :—

> "The plaintiff seems to have guarded himself by a passage in his prospectus (page 2). 'He does not undertake that in every case an equally satisfactory result will attend its use, and any disappointment felt in respect to it shall not be a cause for non-payment or for compensation.' I think, therefore, that the manure is not warranted, and it was the buyer's business to satisfy himself as to the quality, and I recommend him to pay."

The Committee wish to point out to purchasers of manures the necessity for insisting upon a guarantee that they contain those fertilising properties, without which, as is well known, all substances are valueless as manures. They also recommend purchasers who rely upon testimonials to ascertain that they contain comparative statements of trials made under identical conditions. The testimonials, to be of any real value as a guide to purchasers, should also give the results obtained by the use of the material employed as contrasted with those obtained without its use, or with some other material in the place of it.

This report was adopted, and on the motion of Mr. W. Wells, seconded by Mr. E. Bowly, it was ordered to be printed in the usual agricultural newspapers.

ADDITIONS TO THE LIBRARY.

I.—PERIODICALS PRESENTED TO THE SOCIETY'S LIBRARY DURING 1873.

Presented by the respective Societies and Editors.

A.—English, American, and Colonial Periodicals.

Agricultural Economist. Vol. IV. 1873.
American Agriculturist. Vol. XXXII. 1873.
Athenæum (Journal). Nos. 2358–2409. 1873.

Bath and West of England Society, Journal of the. Vol. V. 1873.
Bell's Weekly Messenger. Nos. 3969–4020. 1873.
Bristol Mercury. Vol. LXXXIV. 1873.

Chamber of Agriculture Journal. Vol. IX. 1873.
Country Gentlemen's Magazine. Vol. X. 1873.

Economist. Vol. XXXI. 1873.
Essex Standard. Vol. XLIII. 1873.

Farmer. Vol. XXI. 1873.
Farmer's Herald. Vol. XX. 1873.
Field. Vol. XLII. 1873.
Flax Supply Association of Ireland, Sixth Annual Report. 1873.
Food Journal. Vol. XLVI. 1873.

Gardener's Chronicle and Agricultural Gazette. Nos. 1–52. 1873.
Geological Society, Journal of the. Vol. XXIX. Nos. 113–116. 1873.

Highland and Agricultural Society of Scotland, Transactions of the. Vol. V. 1873.

Indiana, Third and Fourth Annual Reports (with Maps) of the Geological Survey of, 1872.
Institution of Civil Engineers, Proceedings of the. Vol. XXXV. Parts I. and II. 1872–3.
————————, List of Members of the. 1873.
Institution of Mechanical Engineers, Proceedings of the, from 1861 to 1873.
Institution of Surveyors, Transactions of the. Vols. I.–V. 1868–73.
Investor's Monthly Manual. Vol. III. 1873.
Irish Farmer's Gazette. Vol. XXXII. 1873.

Maine Board of Agriculture, Seventeenth Annual Report for 1872.
Mark Lane Express and Agricultural Journal. Vol. XLII. 1873.
Midland Counties Herald. Vol. XXXVII. 1873.

Nature. Vols. VII. and VIII. 1873.

New Haven. American Journal of Science and Arts. Vol. V. 1873.

New York. Thirty-second and Thirty-third Annual Reports of the American Institute for the years 1870-2.

North British Agriculturist. Vol. XXV. 1873.

North of England Farmer. Vol. VII. 1873.

Ohio. Twenty-sixth Annual Report of the State Board of Agriculture for the year 1871.

Royal Geographical Society, Journal of the. Vol. XLII. 1872.

———————, Proceedings of the. Vol. XVII. Nos. 1–6. 1873.

Royal Horticultural Society, Journal of the. Vol. III. Parts XI. and XII.

Royal Institution of Great Britain, Proceedings of the. Nos. 57 and 58. 1873.

Royal United Service Institution, Journal of the. Vol. XVII. Nos. 70–74. 1873.

Society of Arts, Journal of the. Vol. XXI. 1873.

Statistical Society, Journal of the. Vol. XXXVI. Parts I.–IV. 1873.

Tasmania, Statistics of the Colony for the year 1872.

United States. Monthly Reports of the Department of Agriculture for the year 1872.

United States. Report of the Commissioners of Agriculture for the year 1871.

——————. Patent Office Reports. Vols. I., II., III. 1869. Vols. I and II. 1870. And Vols. I. and II. 1871.

Veterinarian, The. Vol. XLVI. Nos. 541–552. 1873.

Victoria, Report of the Secretary for Agriculture. 1873.

Washington, U.S., Smithsonian Contributions to Knowledge. Vol. XVIII. 1873. *Presented by the Smithsonian Institution.*

Wisconsin State Agricultural Society, Transactions of the. Vol. IX. 1870.

B.—Foreign Periodicals.

Agen. Société d'Agriculture, Sciences, et Arts. Recueil des Travaux. 2me Série. Vol. II. 1873.

Brussels. Société Centrale d'Agriculture de Belgique. Journal. 20me Année, Janvier et Février. 1873.

Buenos Aires. Añales de la Sociedad Rural Argentina. Vol. VI. 1872.

Christiania. Norges Officielle Statistik. Udgiven i Aaret 1872. Beretning om den höiere Landbrugsskole i Aas i Aaret fra 1 April, 1870, til 1 April, 1871. 1872.

——. ——. Beretning om den höiere Landbrugsskole i Aas i Tiden fra 1 April, 1871, til 1 Juli, 1872. 1873.

——. ——. Anden Beretning om Ladegaardsöens Hovedgaard. 1te Hefte. 1872.

Göttingen. Journal für Landwirthschaft. 18ter Jahrgang. 2te Folge. 5ter Band. Hefte 1–4. 1870.

——. ——. 19ter Jahrgang. 2te Folge. 6ter Band. Hefte 1–4. 1871.

——. ——. 20ter Jahrgang. Hefte 1–4. 1872.

Leipzig. Centralblatt für Agriculturchemie, und rationellen Wirthschafts-Betrieb. II. Jahrgang. Heft 1. Januar, 1873.

Lisboa. Academia Real das Sciencias de Lisboa. Jornal de Sciencias Mathematicas, Physicas e Naturaes. Vol. I. 1868.

——. ——. ——. Vol. II. 1870.

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——. Revista Agricola. Jornal da Real Associação Central da Agricultura Portugueza. 7° anno. 1873.

Milan. Annali del Ministero di Agricoltura, Industria, e Commercio. Vol. XLV. 1871. Quarto Trimestre. 1872.

Munich. Landwirthschaftliche Verein in Bayern. Zeitschrift. 26ter Jahrgang. 1872.

.. ..Haus- und Landwirthschafts-Kalender. Auf das gemeine Jahr 1873.

Padua. Rassegna di Agricoltura, Industria et Commercio. Anno 1. Num. 1 e 2. 1873.

Paris. Journal d'Agriculture Pratique. 37e Année. 1873.

——. Journal de l'Agriculture. Vol. IV. 1873.

——. Société des Agriculteurs de France. Bulletin Mensuel. 5e Année. 1873.

——. Société des Agriculteurs de France. Comptes-rendus des Travaux. Vol. IV. 1873.

——. ——. Liste générale des Membres. 1873.

Perpignan. Societé Agricole, Scientifique, et Littéraire des Pyrénées-Orientales. Vol. XX. 1873.

Prato and Florence. Annali del Ministero di Agricoltura, Industria, e Commercio. 1870. Primo Trimestre. Parts I.–III.

.. ..1870. Secondo Trimestre. Parts I.–III.

Turin. Annali del Ministero di Agricoltura, Industria e Commercio. I Comizi Agrari del Regno d'Italia. Parte I.–III. 1870.

Valenciennes. Société d'Agriculture, Sciences, et Arts de l'Arrondissement de Valenciennes. Revue Agricole, Industrielle, Littéraire et Artistique. 25e Année. 1873.

Verviers. Société Agricole de l'Est de la Belgique (Section Verviétoise) Journal Agricole. 25e Année. 1873.

II.—BOOKS PRESENTED TO THE SOCIETY'S LIBRARY DURING 1873.

Names of Donors in Italics.

A.—English, American, and Colonial Books.

Bruce, Alexander. The present System of Judging Stock, its Faults, and their Remedy. 1873.

Caird, James, C.B. English Agriculture in 1850–51. 2nd edition. 1852.

Dun, Finlay. Veterinary Medicines, their Actions and Uses. 1873.

Goodale, S. L. A brief Sketch of Gail Borden, and his relations to some forms of Concentrated Food. 1872.

Grouven, Dr. H. On the question of a Substitute for Peruvian Guano. 1873.

Johnson, Samuel, W., M.A. How Crops Feed. A Treatise on the Atmosphere and the Soil as related to the Nutrition of Agricultural Plants. With Illustrations. 1870.

Shirreff, Patrick. Improvement of the Cereals, and an Essay on the Wheat-Fly. 1873.

B.—Foreign Books.

Classen, C. Getreidepreis-Rechner nach metrischem Mass und Gewicht in süddeutscher Währung. Ansbach, 1871.

Coutinho, J. J. da Cunha de Azeredo. Ensaio Economico sobre o Commercio de Portugal e suas Colonias. Lisbon, 1828. *Presented by the Royal Academy of Sciences of Lisbon.*

Goetz, M. Procédés de Culture. Paris, 1871.

Hetting, M. C. Beretning am hvad der til Ferskvandsfiskeriernes Fremme er udført i Tidsrummet fra 1ste Oktober, 1871, til 1ste Oktober, 1872. Christiania, 1873. *Presented by the Royal Norwegian University.*

Lapa, J. I. F. Technologia Rural, ou Artes Chimicas, Agricolas e Florestaes. 3 vols. Lisbon, 1865–1871. *Presented by the Royal Academy of Sciences of Lisbon.*

Redier, frères. Compagnies Agricoles des Grande et Petite Cultures réunies. Paris, 1866. *Presented by W. H. Delano, Esq.*

Ribeiro, J. S. Historia dos Estabelecimentos Scientificos, Litterarios, e Artisticos de Portugal. 3 vols. Lisbon, 1871–1873. *Presented by the Royal Academy of Sciences of Lisbon.*

Romão, de Villarinha de S. Manual Pratico da Cultura das Batatas. Lisbon, 1845. *Presented by the Royal Academy of Sciences of Lisbon.*

Schübeler, F. C. Die Pflanzenwelt Norwegens. Christiania, 1873. *Presented by the Royal Norwegian University.*

Varnhagen, F. L. G. de. Manual de Instrucções Praticas. Lisbon, 1836. *Presented by the Royal Academy of Sciences of Lisbon.*

Villa-Maior. Tratado de Vinificação para Vinhos genuinos. 2 parts. Lisbon, 1868 and 1869. *Presented by the Royal Academy of Sciences of Lisbon.*

Ville, G. L'École des Engrais Chimiques. 2e édition. Paris, 1869.

III.—BOOKS PURCHASED FOR THE LIBRARY.

A.—English Books.

Chaveau, A. The Comparative Anatomy of the Domesticated Animals. Translated and edited by George Fleming, F.R.G.S. 1873.

Cobbold, Professor T. Spencer, F.R.S. The Internal Parasites of our Domesticated Animals. 1873.

Fleming, George, F.R.G.S. Animal Plagues, their History, Nature, and Prevention. 1871.

Reid, Henry, C.E. A Practical Treatise on Concrete, and how to make it. 1873.

Stephens, Henry, F.R.S.E. The Book of the Farm. 2 vols. 3rd edition. 1871.

——. Book of Farm Implements and Machines. 1858.

Ure, Dr. Andrew. Dictionary of Arts, Manufactures, and Mines. Edited by Robert Hunt, F.R.S. 3 vols. 6th edition. 1872.

Watts, Henry, B.A. Dictionary of Chemistry. 5 vols. 2nd edition. 1872.

.. .. Supplement to Dictionary of Chemistry. 1872.

Woods, Henry. A Lecture on the Diseases of Sheep. 1873.

B.—Foreign Books and Pamphlets.

Bouchardat, M., et T. A. Quevenne. Du Lait. Paris, 1857.

Laveleye, E. de. Essai sur l'Économie rurale de la Belgique. Deuxième édition. Paris, 1863.

.. .. Études d'Économie rurale. La Néerlande. Paris, 1865.

Lavergne, L. de. Économie rurale de la France depuis 1789. Troisième édition. Paris, 1866.

.. .. Essai sur l'Économie rurale de l'Angleterre, de l'Écosse et de l'Irlande. Quatrième édition. Paris, 1863.

.. .. L'Agriculture et la Population. 2e édition. Paris, 1865.

Lucas, N. J. Englisch-Deutsches und Deutsch-Englisches Wörterbuch (A Dictionary of the English and German and German and English Languages). 4 vols. Bremen, 1854–1868.

Moll, L., et E. Gayot. La Connaissance général du Bœuf. 1 vol., and Plates. Paris, 1860.

Pouriau, A. F. La Laiterie. Paris, 1872.

Spiers, A. Dictionnaire général Anglais-Français. 22e édition. 1872.

Thomas, E. Le Marché aux Bestiaux de la Villette et les Abattoirs de la Ville de Paris. Paris, 1873.

Wurstemberger, L. von. Die gegenwärtigen Agrarverhältnisse Russlands. Leipzig, 1873.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

XIII.—*Report on the Agriculture of the Austro-Hungarian Empire.* By JOHN WRIGHTSON, F.C.S., Professor of Agriculture in the Royal Agricultural College, Cirencester.

AN empire extending from Lake Constance and the Tyrol on the west to Russia on the east, and from Turkey on the south to Prussian Silesia and Saxony on the north; and further exhibiting an extraordinary diversity of soil, climate, and population, must needs be the theatre of many systems of agriculture.

A ten weeks' tour through this vast empire, in a large part of which a knowledge of the German, Hungarian, and Slavonian languages is essential, was inadequate for more than the reception of the most general ideas.

Of the ten weeks I was absent from England, three were spent at Vienna in studying the agricultural features of the Exhibition (see former Report) and in making calls upon large landed proprietors and other gentlemen. I wish particularly to mention the kindness and hospitality of Sir Andrew Buchanan, the British Ambassador, and the valuable assistance of Baron Schwarz, Baron Kübeck, and the English Commissioner, Mr. Cunliffe Owen. Letters from Lord Granville, Lord Bloomfield (late British Ambassador at Vienna), the Secretary of the Royal Agricultural Society, and other gentlemen, procured me favourable receptions from many of the highest nobles of the empire, and I was pressed to inspect and report upon many estates which, from want of time, I was unable to visit. With funds at my disposal, more introductions than I could use, and an efficient guide and interpreter in the person of Mr. G. T. Yull, who from long residence in those countries was familiar with the ground and the people, I was well provided with all that I required.

Of the remaining seven weeks, one was spent partly in the journeys between England and Austro-Hungary, and partly in

Pesth, where I was obliged to stay for three days. There were then six clear weeks, four of which I spent in Hungary and two in Upper and Lower Austria, Moravia, Silesia, and Bohemia.

During this time I visited upwards of sixty estates and obtained particulars as to the cultivation of each. I also took notice of peasant cultivation and the state of the population, as well as of the various branches of industry both in the towns and country.

Happily neither I nor my faithful and energetic guide suffered a day's illness; and after working, on an average, from six in the morning to nine and ten at night, often tiring five and even six pairs of horses in a day, we finished our journey with the pleasant and thankful feeling that our programme had been fulfilled.

Very slow trains, and only two of them a day, render railway travelling through Hungary alike safe and wearying. At the station you are met by a pair of horses yoked to a long four-wheeled waggon without springs, and you are then jolted along, for ten or twenty miles, over "roads" that require you to hold yourself on your seat tightly with both hands; while you are pervaded by a lively and constant fear that the waggon itself will upset. The Hungarians drive well and quickly, and even the peasants trot their pair of light horses and peculiar basket-waggon along the parched road, surrounded with a dense cloud of dust.

We journeyed some 1500 English miles by waggons during those six weeks, and on one occasion drove 80 English miles in one day to Essegg through the Archduke Albrecht's estates.

Let me at once disclaim the idea of giving a complete view of the agriculture of the Austro-Hungarian domains. If I can give a tolerably clear idea of the agriculture of Hungary, and a glimpse into the rural economy of Austria proper, Moravia, Silesia, and Bohemia, I must rest satisfied. The empire of Austro-Hungary also comprises Styria, Salzburg, Carinthia, Dalmatia, Vorarlberg, Galicia, Bucovina, Transylvania, Croatia, and other less important provinces into which I never set foot. There is, therefore, abundance of work yet to be done, if it is thought desirable to prosecute further the study of the agriculture of these countries. In the mean time I must be content to chronicle the results of a first journey through some of the richest and most beautiful portions of the empire.

HUNGARY.

Those who wish to study the geography of Hungary can consult books and maps on the subject. For the purposes of this report a more general treatment seems advisable, and I therefore introduce my reader to Hungary by asking him to accompany me, by means of the railway from Vienna to Presburg, across the river March; at that instant he will be in Hungary, and twenty minutes more will find him at Presburg.

A pleasant but steep walk leads to the top of a high hill, on which stands the castle of Presburg, dismantled in 1848 and never since restored. It was from the summit of this eminence that I obtained my first view of the plains of Upper Hungary, stretching to the east and north and south, and shut in by the Carpathians. It is a magnificent view over flat country, extending as far as the eye can reach without interruption eastwards, but bounded westward and fringed on the north and south by the smaller Carpathians.

From another point—the summit of Bebersburg, an old stronghold of the Palffy family—situated high up in the Carpathians north of Bösing—a magnificent view over the plains of Upper Hungary is obtained. From the top of a round tower of this castle I gazed over the smooth plains southwards and eastwards, and I shall not easily forget the grand effect of that limitless expanse. Below the fearful precipice of that old castle wall was a beautiful forest glade, with its cottages and its saw-mills, happily placed on a mountain stream. Here, then, was the introduction to my labours, and descending from the old castle we drove for hours far out into that flat expanse of plain, and it was dark long before our destination was reached.

I have driven forty and fifty miles a day for ten days together over this plain of Upper Hungary, surrounded by a horizon which met the earth on all sides round, and uninterrupted by a hill.

Still more extensive and wilder is the great Alföld or plain of Lower Hungary. The whole expanse of the Alföld forms a long rectangle, bounded on the north, north-east, and east by the Carpathian mountains, on the west by the outliers of the Alps, and on the south by the rivers Drave and Danube. The river Theiss almost divides it in the middle from north to south. The mean width of this plain is 140 miles, and the mean length 280 miles, while the entire area comprises 37,400 square miles.

These two plains comprise the whole of the Hungarian *Tiefland*, or deep land. The soil throughout is black and rich, and is for the most part underlain by water-worn gravel. It is apparently an alluvial deposit, formed by the rivers Danube, Theiss, Drave, and their tributaries. In both plains the natural fertility of the soil is frequently injured by the efflorescence of soda-salts upon its surface, and this is especially observable in Lower Hungary, where immense tracts of flat land are thus rendered unproductive, forming the plains of natron between

Arad and Debriczin. The plains are almost surrounded by the mountain systems of the Alps and Carpathians, which form a strong natural boundary to Hungary, and constitute the picturesque parts of the country devoted to forests and vineyards.

In neither plain are there any hedges or visible divisions of land save the long rows of acacias which usually mark the limits of some nobleman's estate. With the exception of these the eye finds no relief, frequently not even a tree breaking the ring of sky which forms the horizon—peasant land and large estates, large estates and peasant land, alternating in apparently endless succession. At intervals villages are passed through, bearing, however, no resemblance to English villages either in appearance or constitution. The village is, indeed, an institution of deep interest—a distinct community surrounded by its own land, and consisting of a population of free proprietors. Each house is detached and exactly resembles the next, and having seen one village you know the general features of hundreds. It is in the villages that the peasants reside, each man owning and farming a portion of the common *gemeinde*, grazing his stock on what is still properly the "common," surrounding the arable part of the township, and gathering his stock and crop around him at his homestead.* On driving through the village during the day there are few signs of life or activity, though the scene may be enlivened by some peasant, with his family, trotting briskly past with his pair of horses and long, characteristic basket-waggon. He is off to one of his fields to work, and as the distance is considerable, he must not waste time on the road. Towards evening you meet herds of cows returning from the pastures to the village; also herds of long-haired goats and woolly swine. The live stock enters the village in a body, but at once begins to sort itself, each animal, be it cow, goat, or hog, turning in at the accustomed gate. Each, in fact, returns home, and only turns out again when the herd's horn echoes through the village in the early morning.

It is difficult to give an idea of the Hungarian village to one who has not seen it. It is ushered in by a pond, evidently formed by excavating for clay to build the houses. The road runs through the little town; but no attempt appears to have been made to improve its general rough and furrowed character. It becomes, however, wider, for in a road of this description there must be plenty of room to choose your course, and if it is impassable on the right you deviate a little to the left. The consequence is, that the entire space between the two rows of detached white

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* See Morier's 'Account of the Teutonic Gemeinde in Systems of Land Tenure in Various Countries,' published by the Cobden Club.

thatched cottages, which form the village, is used as a road. Once through the village, which ends as it began, with a shapeless pond, you are in the open unenclosed country; it may be passing through pasture, but more commonly arable land in a more or less imperfect state of cultivation. Wheat and rye stretch away on all sides, and, standing up in the waggon to survey the strange scene, the idea of the observer is best conveyed by the expression, often forced from me, "a sea of grain!" Probably the whole of this tract of grain belongs to the village just left. The next feature which will probably attract attention is a belt of single trees extending in an unbroken line on the horizon. It is the boundary of a large estate. You come up to and pass the boundary, and have then left the peasant land for a while and are travelling over a domain where systematic agriculture is carried on, and where, in place of peasants, are the stewards and labourers of the Count, controlled from a central office by a resident Director. A deserted or unoccupied mansion, houses for the officials, and offices for the transaction of business, to be afterwards described, will all in due time be reached.

Supposing that you are driving through without staying to visit the Count or his Director, you will journey onwards for an hour or two, and after passing another belt of acacias, will be once more in the domain of the peasants. The estate usually is better cultivated and carries better crops than the peasant land, and it is generally laid off into square fields of from 25 to 40 acres each, defined by grass drives, bounded on either side by trees. These general features of the plains of Hungary are diversified and relieved by a variety of novel objects. The costumes of the peasants and labourers are often exceedingly picturesque and even rich: the fine teams of long-horned oxen yoked to the waggons peculiar to Hungary, or majestically and slowly ploughing the land—the flocks and herds on the pastures, attended by their faithful keepers—all help to give a character to the scenery; while the occurrence now and again of sugar-factories and distilleries shows that agriculture is not in undisputed possession of the country. Hungary is, however, not by any means all flat, but much of it is mountainous and hilly. It is in such districts that the famous Hungarian wines are grown, and in passing from Tokay to Pesth, and Pesth to Presburg, the traveller forgets the dreary expanse of plain, and refreshes his eye once more with bold mountain scenery, rushing rivers, and uprising forests.

The position of Hungary is somewhat isolated. She has no outlet to the sea save by crossing Croatia to Fiume. Her rivers (with trifling exceptions) all merge into the Danube, which flows southwards and eastwards into the Black Sea. The river Saar, which forms the boundary between Turkey and the dominions of the Hungarian Crown, is navigable from Belgrade to Szissik, which is, however, still far from Fiume. The steamers ply upon the Drave to Barcs, where is a railway station. Besides these rivers, no other stream is navigable upon the entire west of the Danube. It is true there is the Platten See, but it is useless to expect much traffic upon waters whose shores are so thinly populated. Also on the north-east side of the Danube the rivers, with the exception of the lower portion of the Theiss up to Tokay, are not navigable. The railway, therefore, forms the best means of communication with western activity.

A line extends from Pesth all round the Alföld, but the centre of that vast level, where roads are in a deplorably bad condition, is cut off from the influences of European civilisation to an extent difficult to realise by those who have not visited it. Want of coast and of good navigable rivers are serious drawbacks to a country which has not a sufficient home market for its products, and they have no doubt exerted a powerful effect in keeping Hungary back in the race with other nations.

The Soil and Country.

If we restrict ourselves to the vast plains of Hungary, the extent and position of which have already been pointed out, we shall have no difficulty in describing the character of the soil. These plains are almost throughout composed of alluvium brought down from the mountains by the Danube, the Theiss, the Save, the Drave, and other rivers, and spread over the plains through which they flow. The alluvial deposit thus formed is exceedingly rich in quality, and is almost always underlain by a fine water-worn gravel. The soil is often black and "greasy," from the accumulation of vegetable matter; and in many places in Lower Hungary is capable of growing any number of crops consecutively without dung. The value of land in Hungary is rising and must rise. It is of fine quality, but neither skill nor capital has yet been brought to bear upon by far the greater part. The old price of 3*l.* 10*s.* to 4*l.* 4*s.* per acre is now seldom heard of. It is only occasionally that an acre can be purchased at 7*l.* The price more commonly ranges at from 14*l.* to 28*l.*, according to quality and situation; and it is let at from 21*s.* to 28*s.*, and even 35*s.* per acre.

The first district traversed was that of the Schütt, a flat tract stretching from Presburg to Komorn. Some of the soil is of the rich character so generally met with on the Hungarian plains, and especially noticeable at Talos and Tarnok. In other parts it is exceedingly light, and all of it is underlain by water-worn gravel. Marsh and waste land also occupy much space around Nad-Megyer.

From Altenburg, where there is much good land, towards Œdenburg, the soil gradually becomes worse, until at last it ceases to be cultivated, and finally becomes low and marshy as the road approaches the flat districts of the Neuseidler See. Past Esterhaz the land gradually improves until Zinkendorf is reached. Here the country is beautiful, rich, and undulating, and a fine view is obtained over the plains. From Zinkendorf (Giesing Station) to Steinamanger there is, first, good land bearing good crops, then various, sometimes clay and sometimes light land, and finally a tract of very first-rate black deep soil is entered upon. There is here a fine view of the Gratz and Simmering mountains upon the right.

From Steinamanger to Kanisa the railroad ascends, and the country becomes beautiful. From Kanisa to Kesztheyli, on the Pesth line, the country is hilly and woody, but somewhat desolate, and not well cultivated. After leaving Steinamanger the country improves in scenery, and declines in cultivation. Corn-fields, often scandalously foul, are surrounded by natural forest; and often the stumps of trees are still to be seen scattered over the arable land. From Kanisa the land gradually becomes flatter and of better quality towards Fünfkirchen, where both crops and cultivation are exceedingly poor. After Fünfkirchen, towards Villany, bad agriculture upon good land is the rule. From the railway stations of Monostor and Tarda I noticed good land, which rests upon a high table-land. Here I visited Mr. Elvers, and subsequently descended by a terribly shaky road, through vineyards, down to the plain of the Alföld, where the celebrated Hungarian tiefland becomes the rule. This I crossed to the Archduke's estate Bellye, and here I observed that the splendid soil composing this tract is a few feet higher than a very poor soil which lies in close proximity. The estate was, as usual, surrounded by trees, and was beautifully cultivated. On leaving it and entering the peasant land the scene was most desolate.

A long drive to Essegg took us through a lovely country skirting the Danube on to the pass of the Mohacs, from which we descended into a singularly wild country, described under the head of pasture land (page 353). This district, although wild in the extreme, only requires capital and industry to develop it into a wonderful tract of agricultural land.

From Essegg, *viâ* the Grosswardein-Essegg Railway, I passed through a large extent of flooded land, and crossed the Danube in a boat, which carried the entire train. Between Gombos and Szonta is a splendid tract of land, but it was sad to see the crops under water. After Szonta Railway Station the country improved and became dryer, and after Piglevitza the railway passes through a magnificent plain, with crops of short-strawed wheat with good ears. After Zombor we continued to run over a plain of perfectly flat and wonderfully rich black soil, extending as far as the eye could reach on every side—the commencement of the Banat. Often the crops were miserable, and the cultivation only two and three inches deep. After Militics to Bajmok we ascended a slight incline on to a fine undulating country, stretching for miles, a safer district for agricultural enterprise, as there is no danger from floods. The soil still continued to be black, deep, and apparently of first quality, but miserably cultivated, and bearing foul, wretched crops. Scarcely a tree or house broke the line of the horizon. Vineyards and orchards succeeded as we approached Maria-Theresiopel. At this station a waggon awaited us, and we drove for two hours over a sandy and barren tract without any definite road to Kis-Szalás, a fine estate of 35,000 acres, which is entirely surrounded by a sandy desert, known as the Szabachka, which extends over many miles, and is only good for grazing a few cows and swine. Onwards to Szegedin, Mezöhegyes, and Arad, the traveller passes through the very richest district of the Banat. There is a splendid expanse of country extending for miles, and often growing nothing but thistle-forests. Near the villages cultivation improves. It was near Arad that the late Count Szeleusky attempted to establish an English farmery, but failed owing to difficulties connected with the climate.

I passed Szolnok at half-past four in the morning, after travelling all night, and looked out upon a tremendous flat expanse without a rise. We had been running through similar country all night, and were now in the district of the Theiss. The land here is strong, and cracks into cubes and prisms under the hot sun. There was a considerable proportion of grazing ground, and the country appeared fresh and green while harvest operations progressed upon the arable land. This land will grow wheat year after year without manure. If manured it must not be for wheat, but for rape or Indian corn, and then wheat stands up well; but if dressed with dung, it lodges.

I found tobacco cultivation carried on upon a large scale here, and learnt that sheep do very well upon tobacco in a green state as a forage crop. It is sown in the middle of March in beds: well watered and weeded, and planted out when 4 or 5 inches high, the plants being set as deep as the heart, or to where the leaves branch off from the stem. The field is ploughed in the autumn, and again in the middle of May. It is then well harrowed, and either rolled or bush-harrowed to smooth the surface. The land is then marked out into 3-feet rows; and the young plants are placed one foot apart in the rows, and well watered. When the second pair of leaves rise from the heart, it is time to hoe; when the third pair of leaves are expanded, and the fourth and fifth pairs begin to drive, earth up. Immediately the crown of the flower appears, it is broken out to strengthen the tobacco. This is when the tobacco is grown for cigars, but if for smoking in pipes the seed is allowed to ripen. When light flecks appear on the leaves they are broken off.

A section of the deep soils near Szolnok gives the following succession of strata :—

3 feet of black loamy rich earth.
4 to 6 feet of heavy yellow clay.
30 feet of an ash-grey sandy clay.
2 feet black soil.
2 feet clay.
And then sand containing water is continued to a great depth.

Here much inconvenience is caused from the presence of soda-salts.

From Szolnok to Debreczin is a journey of about three hours by rail. The soil is at first heavy, but it soon gives way to extensive wastes of soda soil. Past Kis-uj-Szállás the line passes through a dead level, with stagnant pools of water, and a few reeds and rushes, but often a perfect waste, without sign of life or cultivation—simply frightful to contemplate. This continues to Püspök-Ladány, where a semi-cultivated tract gradually alters with an ascending gradient, until suddenly a rich, highly-cultivated district is entered, with trees and vineyards reaching up to Debreczin. I left Debreczin at midnight, and next saw light in the mountainous region of Tokay.

The scenery around Tokay is very lovely, and much fine land extends from the flanks of the hills, as is well seen on Mr. Harkanyn's property, which I had the pleasure of inspecting. From Tokay, past Miskocz and Erlau, a splendid country for wine and for scenery is traversed. Next Gyöngyös is reached, surrounded on three sides by a fine flat agricultural district, and on the north by hills. Then through rich black land belonging to the Hungarian crown at Gödöllö, after which a light sandy tract extends to Pesth. Before running into Pesth the traveller passes the celebrated Steinbruck breweries and extensive pig-feeding establishments, where immense numbers of pigs are annually fed for the Viennese and German markets. The whole country around stinks of pigs.

Population and Languages.

The mixed character of the population of Hungary is an interesting feature, and must be looked upon as a practical difficulty in the way of settlers. German was in constant requisition wherever I journeyed, and all the agents correspond and converse in that language. The Magyar is, however, no true lover of the rough German speech ; nobles, stewards, and peasants, all prefer their own native tongue. Latin is still used as a medium of communication among educated men, and I was informed that a generation ago it was very general indeed to hear Latin spoken. English is a great favourite among the upper classes, all the nobility speaking it very fluently. English sports, English literature, and English ideas, are all very popular; much more so, indeed, than French ideas. The traveller may find himself in positions in which he requires a knowledge of Slavonian, and occasionally of Polish and Croatian. The Hungarian is naturally a linguist, and this aptitude is most probably produced by the circumstances by which he is surrounded. A Hungarian count is usually able to converse in French, German, and English; he has, besides, Hungarian as his mother-tongue, and, in order to act as a master or magistrate, he must know Slavonian. If he, further, has acquired Latin—which is by no means an uncommon accomplishment even now—he is able to express himself in six languages. I met a steward who told me he was obliged to give his orders to his work-people in five different languages. The following table shows the varied character of the population, as well as its number:—

	In Hungary.	In Transylvania.	Together.
Hungarian	5,541,123	666,457	6,207,580
Germans	1,592,043	224,044	1,816,087
Roumanians	1,114,044	1,207,862	2,321,906
Slavonians (Slovaks)	1,825,513	210	1,825,834
Servians (Servs)	286,834	..	286,834
Croatians	207,899	630	208,529
Ruthinians	448,048	..	448,048
Greek Jews, Armenians..	102,127	2,524	104,651
	11,117,623	2,101,727	13,219,350

Climate.

When I was advised to procure the heaviest greatcoat I could purchase in preparation for a trip through Hungary during the months of June and July, I was a little surprised. The wisdom of the suggestion was justified by the comfort that this article of clothing proved to be on many occasions.

The climate of Hungary is proverbially uncertain and extreme. Hence I understand that a wise Hungarian never leaves his furs behind him when he is journeying through his own beloved land.

The day is often excessively hot, but half-an-hour after sunset the temperature falls so rapidly as to endanger the health of the traveller. I have frequently been compelled to travel in the lightest clothing possible through the day, and to use an umbrella as a protection from the powerful sun. Shortly after sunset the heavy greatcoat was in requisition to protect me from the consequence of exposure to sudden changes of temperature —Hungarian fever or ague. The extremes of temperature between winter and summer are extraordinary, and range in the mountains of Transylvania from $-30°$ F. to $93°$ F.*

The winter is usually severe, but is very variable in character. In general it commences towards the end of November with frost and snow. The lowest temperature is ordinarily reached in December. The snow is not often more than two or three inches ("a few centimetres") thick, and does not continue long, although it is often renewed by fresh falls. Spring is ushered in by storms of wind and rain, which are dried up about the middle of March. Although this period is occasionally followed by agreeable weather, the spring is very uncertain, and is often stormy and wet. Even May seldom brings the pleasing weather for which it is celebrated. The temperature often reaches 77° and 95° F., and the heat hinders the growth of grass and the expansion of the leaves of trees. Another year cold rains, and even severe frosts, injure the orchards, vineyards, and field crops. Hail is often injurious in early summer, as I have myself witnessed. I shall never forget the complete destruction of crops over a considerable tract of country in the Schütt district of Upper Hungary. The crops over some 800 acres of land were in this case literally *minced* and completely destroyed. The evil ceased as suddenly as it commenced, and within a few yards there was rye completely cut down and broken, and the rest standing almost untouched. The chief characteristics of the summer are its heat, the temperature in the plains rising as high as 95° and 99° F., and its fluctuations of temperature between night and day. The air in summer contains but little moisture and deposits no dew, but severe rain-storms not unfrequently pass over the face of the country, exerting a most beneficial effect upon the vegetation. The most dependable season is autumn. The beginning of September usually brings fine settled weather, which is continued to the end of October or middle of November, when winter is introduced with cloudy skies, dense mists, and gales from the north-east.

* The above temperatures are furnished by Karl Keleti in his *Skizze der Landeskunde Ungarns*, and translated into degrees Fahrenheit according to Hofman and De la Rue.

It is difficult to give a satisfactory average temperature for the entire year, on account of the great differences of climate between the mountains and plains. The average temperature of the Presburg plain is nearly 40° F., and the variation between summer and winter extends from 95° to – 6° F. In the greater Pesth plain or Alföld the average temperature is about 53° F.; and near the surrounding mountains it is as low as 49° F. In the most southern portions of this tract the maximum summer temperature rises as high as 106° F., and in the winter the thermometer registers – 8° F. In Transylvania the average temperature varies between 43° and 50° F., and the extraordinary contrast between the heat of summer and the cold of winter has been already mentioned.

The *rainfall* over the whole of Hungary measures 24 inches in one year, and is distributed over 107 days. The smallest share of rain falls upon the plains, which only receive 19½ inches. The largest rainfall occurs among the mountains, and amounts to 33—35½ inches.

It is not, however, the absolute rainfall which gives a character to the Hungarian climate, but the inequality of its distribution through any particular year or month. The consequence of this inequality is that in many years severe droughts not only hinder the growth of grain and fruit, but burn up the grass. The result is a scarcity of fodder; and famine and sickness follow. At other times the rain is so abundant that inundations occur; and as many tracts in Hungary lie on a lower level than the banks of the rivers which flow through them, the water when once out cannot find its way back. Such localties often remain under water for weeks and months. An extent of from 1300 to 2000 square miles of flat land is thus occasionally submerged. I saw large tracts of splendid land covered with water while travelling through Lower Hungary, and the desolate effect is heightened by the incessant croaking of frogs. The noise these creatures make may be compared to that of hounds at a distance in full cry, or to the sound of bells in the air.

Land Drainage.

The flat character of the Hungarian plains, the fact that they frequently lie at a lower level than the banks of the rivers which drain them, and their liability to inundation, all indicate the importance of an efficient system of drainage. These considerations also point out that drainage, to be effective, must be carried out upon a large scale, and with great engineering skill. It is to be feared that, as yet, Hungary is scarcely in a position to sink the requisite amount of capital in order to effect this thorough drainage of her wet lands. It would involve the deepening and improving of existing watercourses, the formation of canals, the erection of steam-pumps, and other expensive appliances, for which the country is not yet prepared. The subject does not seem to have received much attention as yet; and I was struck with the absence of all models and plans illustrating drainage works when passing through the very excellent museums of the principal Hungarian agricultural colleges.

There is another reason for draining land in Hungary. Immense tracts are rendered worthless by the efflorescence of soda-salts upon the surface. In other localities spots of land so affected are very frequent, and these spots always lie upon a lower level than the neighbouring good land. There is little doubt that the soda is held in solution in the water which underlies the part affected, and that, as it rises by capillarity under the influence of surface-evaporation, the soda is left upon the surface. How far lowering the water-table by an effective system of drainage would free the soil from this injurious substance would be a most important and interesting subject for investigation. For my part, I believe that the lowering of the water-table would be followed by the disappearance of the soda efflorescence.

It is a matter of common observation in Hungary that of late years the Platten See, Neusiedler See, and other less important lakes and swamps, have been drying up. This I was often assured of, although the year 1873, in which my journey was made, was exceedingly wet.

Wearing Action of Water.—In the hill districts forming the flanks of the Carpathians, the agriculturist meets with a serious difficulty in the action of water upon the soft sandy clay composing the soil. The evil commences with a slight wearing of the surface after storms of rain. A watercourse is thus begun, and in a few years a gorge of considerable dimensions is formed, interrupting agricultural operations. I have driven through such a watercourse, near Bösing, where the road itself was interrupted. In this case the chasm was 20 to 24 feet deep. When the evil is first noticed, the surface must be immediately levelled and a few stakes driven into the ground to neutralise the action of the water.

Field-Mice.—Throughout Germany, Austria, and Hungary, the agriculturist is plagued by the depredations of field-mice. These creatures multiply with great rapidity, and in dry seasons literally swarm over the country, destroying the crops over vast areas of land. No one seems able to suggest a cure, for the mice are about as difficult to reduce to reasonable limits as any of those insect plagues which from time to time attack our corn-fields. I first noticed the depredations of mice at Talos, on

Count Esterhazy's estate, where both wheat and lucerne were much injured by them. The ground truly seemed alive with them, and they might be seen darting to and fro by anyone who would walk a few steps into the standing crops. The country from Kanisa to Fünfkirchen and Villány was almost devastated from this cause, the wheat crops being beaten down, and often reduced to a few scattered straws, standing up amid the wreck of a fine wheat crop. M. Elvers, whose farm is noticed on page 328, had suffered much from mice. He had cut trenches 10 inches deep, and 7 to 8 wide, entirely around his corn-fields, to, if possible, keep out the mice. At intervals pots were sunk, so as to form a succession of pit-falls at the bottom of this trench, and then were filled with water. The mice on falling into this trench, as they endeavoured to gain access to the field of grain, ran along the bottom, and fell into these traps in large numbers.

Rural Economy.

The feudal system was abolished in 1848, and "the whole tenure of land throughout the Austro-Hungarian dominions now rests upon the common basis laid down by the Austrian Land Laws of 1848–9." It was by these laws that the serfs became free allodial owners, while the lords of the soil were reimbursed by the Government for the loss of their feudal rights. The valuation of this loss was made by a Commission appointed by the State, but of this valuation * one-third part was disallowed, and one of the remaining two-thirds was raised by a tax which falls upon the great proprietors themselves.

It must be remembered that the bondsmen who were emancipated from feudal obligations were not tenants, but proprietors of their land; so that the reformation of the land laws of the country did not deprive the great landowners of their property, but merely of certain feudal rights over the property of others.

The whole area of Hungary is pretty equally distributed between great proprietors and peasants. According to the latest census there are 2,486,255 owners of land, possessing upon an average 18 acres each of productive land (Keleti). These proprietors have been classified as follows:—

Small peasant proprietors (5—30 jochs)	2,348,110
Larger peasant proprietors (30—300 jochs)	118,981
Properties of from 200 to 1000 jochs	13,748
Estates of from 100 to 10,000 jochs	5,195
Estates over 19,000 acres	221

Further, with respect to the area of available land and

* 'Reports of Her Majesty's Representatives respecting the Tenure of Land in the several Countries of Europe.' Part II. 1869–70, page 2.

proportion to the whole, held by these various classes of proprietors :—

The small peasants possess	15	million jochs or	32	per cent.
The larger peasants possess	6·7	,,	14	,,
The proprietors of from 200 to 1000 jochs possess	6·6	,,	14	,,
The proprietors of from 1000 to 10,000 jochs possess	14·2	,,	32	,,
And the proprietors of over 19,000 jochs* possess	3·9	,,	7·5	,,

The Edelmen.—Besides the great proprietors, who form the aristocracy, and the peasants, whom we cannot compare to any existing class in this country, there are edelmen or hereditary proprietors of free land. They form a class intermediate between the Count and the peasant, and their importance varies with the wealth and extent of land owned by the individual. I had the opportunity of seeing a village in the comitat of Presburg inhabited by edelmen. There are about eight houses, and each edelman owns from 150 to 200 acres of land. Their farming was somewhat brilliant in the sense of being brightly coloured, for I never remember seeing a finer show of blue corn-flowers and other "flowers" among corn. The village is composed, as all villages are in Hungary, of isolated houses; but in this case they are very superior to peasants' houses, and the interior of one I visited was furnished and fitted as became a man of good position and considerable wealth.

The Large Estates.—The figures already quoted show that about half of Hungary is divided into large estates, and half into small estates and peasant properties. In some districts I found that the former predominated in point of area, and in others the latter; but more usually the two classes of properties were stated to divide the district pretty equally between them. Previous to the reformation of the Land Laws in 1848 the peasant-land and the estates of the nobles were perplexingly intermixed. I saw at Bösing the remains of a system which has now happily almost passed away. The long strips of peasant-land so familiar to any one who has travelled on the continent of Europe—each marked with a stone bearing the initials of its owner—were here to be seen. Every now and then such a land-mark might be noticed bearing the initials of G. P. J.,—Graf Palffy Janos (Count John Palffy). The plots thus defined were bounded on either side by strips belonging to peasants, and hence the Count's estate was composed in this instance of a multitude of strips of land scattered among the lands of the peasantry. These

* The Hungarian joch = 1·0667 English acres. (See note, p. 368.)

fragments of the estate are seventy in number, and are all widely separated, running from four to twelve yards broad, and from one-quarter to three-quarters of a mile long. The estates at Pudmeritz, Szuha, and Boleraz are also in the same state. Such circumstances united all the disadvantages of both large and small ownerships, and presented fearful obstacles in the way of scientific agriculture. Previous to 1848 the landlords allowed their estates to remain in this dissected and divided condition, for their neighbours, on either side, were also their bondsmen, and could the more conveniently cultivate their lord's land when it lay in close proximity to their own. When the feudal rights of the landlords were bought up, and the peasants were made free, the nobles and large proprietors were obliged to go into the labour-market, and the fearful inconvenience of an estate broken into a thousand strips, intermixed with the land of a, too often, plundering, pilfering population, was found to be intolerable. A kind of " Enclosure Commission " was therefore formed for the purpose of concentrating scattered estates by fair exchanges with the peasants. By this means a separation was effected between the great estates of the nobles and the peasant-lands, and a system of organised cultivation became possible. This change is still in progress, but it is by no means uncommon even now to find districts in which the Commission has not yet performed its work of centralisation. The changes in the Land Laws before mentioned obliged the landlords to become cultivators. The peasant was relieved from his duty of ploughing and reaping for his feudal chief, and if the Count's fields were to be reaped at all the Count must reap them himself. Letting the land to farmers was not to be thought of, as a sufficient supply of tenants did not exist. An increase therefore of the duties of the stewards upon the estates became necessary, and a remarkable organisation of labour was constituted, enabling the landlords to cultivate the whole of their vast estates by means of a competent staff. A similar state of things appears to have existed in England in the 13th century, before the letting of land became general. Probably a corresponding change in favour of tenancies will take place in Hungary, but there is no prospect of such a change being brought about rapidly. Some landlords informed me that they would be very glad to let portions of their estates to good English and Scotch tenants upon liberal terms. Others have become attached to their faithful stewards, who have, in some cases, served them for generations, and would hesitate before dismissing them in favour of tenants. A pleasant solution of this difficulty would be the letting of good farms to stewards who had secured the good-will of their patrons.

After inspecting a large number of estates thus directly in the hands of their owners, I was not favourably impressed with the system. Agriculturally it has many advantages, as, with a spirited landlord at the head, improvements can be carried out on a grand scale. An estate of 100,000 acres, all farmed by the noble lord who owns it, gives great scope to an efficient organisation. There is the central office, with its inspectors and clerks, its printed statements, its legal department, its periodical reports, and its thorough system of books. There is also the out-door system of stewards, sending in their monthly accounts, and receiving their instructions, both for the cultivated fields and for the forests. Threshing-machines are ordered by the half-dozen, and reaping-machines by the dozen. The central depôt presents the appearance of a factory, with its repairing shops, its carpenter's and blacksmith's shops, saw-mills, &c. I have seen five or six pairs of horses drawn up outside the door of such a head office as has been mentioned, each of which belonged to some steward, who had driven over to consult his chief upon some point or to settle his monthly account. Upon a well-managed estate information upon any point you choose to inquire after is quickly forthcoming. If you ask how much milk a certain race of cows give, a clerk is at once sent for the last month's milk account, in which the daily yield of each cow is registered. Should you wish to know what fatting sheep or oxen are receiving as food, a statement is at once placed before you, giving not only the quantity of meal or cake, but the exact weight of the green fodder each animal receives. If still further you should desire to know the increase of the animals, a table will probably be produced, giving particulars of the weight of each animal taken weekly or fortnightly. Such exactness and system are, of course, necessary where stores and granaries are regularly inspected, and a strict account of produce, as well as of cash, is periodically given up from every department. It, however, presents a striking contrast to English practice, for my experience is that the English farmer is deficient in exact knowledge as to the yield of his crops per acre and per field, of the amounts of artificial or natural food his stock are receiving, or of the state of his stores and granaries.

The general cultivation upon these estates is good, although there is room for improvement. Both landlords and stewards are alive to the importance of progress, but they are cautious of introducing methods which may fail through the great variability of their extreme climate. I feel inclined to give them credit for making the best of the difficult circumstances which surround them, and although it is easy for an English agriculturist to suggest changes and improvements to them, I have often found that the suggestions had been made previously, and, after trial, had been found unsuitable to the exigencies of the country.

The following description of the working of extensive estates in Upper Hungary, owned and cultivated by Count John Palffy, in Presburg Comitat, was furnished from the central office in Presburg, and will give a more exact idea of the actual organisation required in order to carry out the numerous departments :—

1. The entire reclaimed (farmed) land upon these estates consists of 34,000 acres, and this is divided into 17 districts.

2. In each district is a resident steward (*verwalter*), who furnishes a monthly account of all work proposed for the coming month, as well as of all cash he requires, to the central office.

3. The count keeps control over everything, and without his knowledge nothing is bought, sold, built, or done. Thus the count is in this case his own upper director.

4. The central office is arranged as follows :—There are, 1st, a head lawyer (*ober-fiskal*); 2nd, estate inspector; 3rd, two book-keepers; 4th, upper cashier; 5th, expediter; 6th, a book-keeper's assistant; 7th, two clerks.

5. Two, three, or four districts are allotted to each *controller*, and there are altogether five controllers who also manage and inspect the granaries.

6. Nothing is given out from the granaries without an order from the central office.

7. The granaries and cash accounts in the various districts are visited and revised from time to time from the head office without notice.

8. There are 59,360 acres of forests, and these are divided into five districts. Each district has its own head forester, and each district (*waldschaft*) is divided into several sub-districts.

9. There are in all five upper foresters, who have fourteen under foresters, besides five controllers and several assistants under them.

10. The foresters, like the land stewards, send in a monthly prospectus both of what they intend doing and what cash they require.

11. The wood is sold according to a fixed tariff of prices. Large contracts can only be made with the sanction of the Count himself.

Such is a general sketch of the system by which vast estates are managed in Hungary. In other cases you find below the Count, an administrator who relieves him of all trouble. Sometimes, as in the case of the Emperor's and the greatest nobles' estates, this functionary is resident at Vienna. He is often a man of high position and great power, and it was to this dignity under Prince Esterhazy that the late Mr. Smallbones arrived. Next come the directors or inspectors, taking the entire control over such a system as that just described. The Archduke Albrecht employs several directors upon his estates in various parts of the empire, and one administrator, Herr Jessel, is over them all. The director is supreme in his own domain, and has in each large district of it a hofrichter or principal steward, who is himself a practical agriculturist. The hofrichter has in turn verwalters or lower stewards upon each farm of 1000 acres or more in extent. Under the verwalters are *ispans* or *praktikants*, generally young men fresh from some agricultural college, who commence their career as superior bailiffs. Under the ispans are gangers or working-bailiffs, who directly look after the labourers.

The titles as well as the occupations of the numerous officers upon a large estate vary; but I have frequently met with the above gradation. An actual case may be taken from the estate Bellye in Lower Hungary, which constitutes one of the domains of the Archduke Albrecht, and comprises in all 164,200 acres. A large proportion of this vast area is in forest, mere, marsh, natural pasture, and unproductive waste. Still there remain 21,300 acres of arable and 12,064 acres of pasture to manage, and these are divided into ten districts. One director at Lak is responsible for the whole. There are also at Lak, which is the central office, an actuary (*actuar*) under the director, an inspector, an upper and lower engineer, a lawyer and assistant, a medical man, a rent-master, and a forest verwalter. The book-keeping is all done at Ungarisch-Altenburg. Besides this staff of officials at the central office, each of the ten districts is presided over by either a verwalter or an ispan, and these are assisted by an *adjunckt* or *praktikant* and bailiffs or gangers (*haiducken*), according to the size of the district. There is also a schoolmaster provided in each district where it is necessary.

The forests upon this estate comprise 42,600 acres, and are divided into five districts, each of which has its forester and assistants. Further, in order to realise the rural economy of Hungary, the reader must understand that all the breweries, distilleries, sugar factories, corn, hemp, and flax-mills, coal-mines, &c., on the estate belong to it, and are managed by stewards. Also that the estate Bellye is only one of many such estates which belong to the Archduke Albrecht, over which he and his administrator, Herr Jessel, reign supreme. It is as though all the agriculture and all the manufacturing industry of a vast district were carried on by and for the benefit of one

Y 2

individual. Hence the system appeared to me to be anti-national in its character, and to be destructive of the very existence of an independent middle class. This seems to me to be thoroughly brought out when we contrast such a system with the hundreds of tenant farmers, millers, smiths, coal-owners, brewers, &c., which would abound over the same area in England.

From all I could hear, in Upper Hungary the estates usually pay their owners, after all expenses are discharged, 14*s.* to 16*s.* per acre. Some say 10*s.*, 12*s.*, or 14*s.*, others say 12*s.*, 14*s.*, or 16*s.* is a fair profit. The capital required to work one acre is about 4*l.* in Upper Hungary.

The Peasantry.

The general characters of Hungarian villages have already been described. I shall now endeavour to give as full an account of these interesting communities as the limited opportunity afforded for their examination will permit. Their freedom from the feudal burdens to which they were subjected previous to 1848 was certainly a wonderful step in the progress of the country. They are now beginning to profit from the independence of their position, and to realise the advantages of education, and of improved methods of cultivation. Much remains to be done in these directions, but abundant signs of progress are visible. Where the neighbouring great estates are well cultivated, the peasants have evidently watched the introduction of new methods, and adopted those suitable for their small holdings; and frequently, where the great properties are well farmed, the peasant-lands also show signs of improvement. The general rule, however, holds good, that the peasant cannot compete with the prince. The crops are almost invariably lighter and fouler, and the land is not so thoroughly ploughed and cultivated.

The peasant continues to wear his own peculiar costume, and holds to his order in spite of the accumulation of considerable wealth, for in many cases he is the owner of more than 300 acres of good land, besides valuable household goods. More ordinarily 30 acres, and even 15 acres or less, represent his holding.

These proprietors inhabit villages, and their land often lies at an inconvenient distance from the homestead. A faithful description of the constitution of these communities will be found in M. Morier's 'Account of Land Tenure in Prussia,' published in 1870 by the Cobden Club, and much light has been thrown upon their rise and history by this indefatigable investigator. It is an interesting study, and one which might be followed with success in Hungary, where old institutions exist in more than ordinary simplicity.

The peasant-land extends around the village, comprising many thousands of acres of first-rate land, and around the arable portion lies the pasture or common, whither the flocks and herds are daily led. The arable land is, in the most perfect examples of the "gemeinde," divided into three portions, one of which is devoted to bare fallow, a second to winter corn, and the third to summer corn. It is in fact the old three-field course which appears to have obtained over the whole of England in the twelfth century (Rogers). Each peasant proprietor owns land in each of these three divisions, *i.e.*, his little estate is always divided into three parts. The portion which belongs to each individual is defined by land-marks, and each peasant works, sows, and reaps his own plot of land. Still he works in unison with his fellows, so that in the proper season all the land is sown together, and as the crops mature, the whole assumes the appearance of one vast field of wheat or rye. In the same way, although each individual works his own portion of fallow, the fallow portion of the community presents the general appearance of one immense fallow field. Also in the common pasture all the village cattle graze together, and are herded by attendants, and, as already mentioned, the individual cattle find their way at night to their respective homes. In some communes the uniform cropping of the land just described has been discontinued, and each peasant cultivates his own land irrespective of his neighbour. In such cases the long strips of wheat, of hemp, or of bare fallow, so characteristic of peasant farming in other parts of Europe, are to be seen.

The following notes upon the peasantry of Upper Hungary were taken at Talos, in Presburg Comitat, the seat of Count Anton Esterhazy. Here the comparison is in favour of the cultivation upon the Count's estate. The peasant only cultivates 3 inches in depth, while 6 inches is the cultivated depth on the Count's estate. The peasants were ploughing-in dry, strawy-looking dung, and the farming was exceedingly variable. Korkey Egnatz, a very respectable peasant, owns two sessions of 38 acres each. He possesses a live stock of two pairs of oxen, two mares, two two-year-old horses, one foal, three cows, two two-year-old heifers, two calves, twenty-eight geese, besides a good show of fowls, eight good beehives, and a nice kitchen-garden opening into a larger back garden, growing barley and Indian-corn for fodder. There were also poppies for seed, potatoes, and hemp, from which they make their own shirts and light summer trousers. His agricultural land is scattered through the commune, and he employs three men and two girls to assist him in working it.

No. 2 possessed 38 acres of land, and occupied 15 acres as tenant. His stock consisted of two cows, four oxen, two calves, two horses, and about fifty geese. The whole is worked by himself and son, assisted by two men, and his women do not go out to work. At harvest he requires two extra men and two women for three weeks. This man informed me that he could make 160*l.* a year by his corn.

No. 3 owns 76 acres of good land. He told me he could grow nearly 23½ bushels of wheat and 39 bushels of barley per acre.

I called on the *Richter*, or head of the village, a man of considerable power, but a peasant like the rest. He told me that No. 2 is a Jew, who had bought his holding twenty-two years ago, and that his land is worth at the present time 20*l.* the joch, which will be nearly the same amount per acre, including house and homestead. He also told me that while most of the peasants ploughed 3 inches deep he (the Richter) ploughed 5 or 6 inches.

I visited a number of peasants' houses, which are for the most part comfortable and primitive in style. A peasant homestead forms a long strip extending backwards from the village street, and it is bounded on either side by similar strips possessed by the neighbours. Each strip is about 400 yards long. This is merely the homestead and garden, and the main land of the peasant is scattered through the commune as already described.

In the neighbourhood of the Archduke Albrecht's estate at Ungarisch-Altenburg, the peasants drill their corn after the example of the estate, instead of following the ordinary practice of broadcasting. At Kœnigsheiden, the property of Count John Palffy, the peasants are also improving their cultivation in imitation of the good farming on the estate. In other districts the peasant farming is lamentably bad; the beautiful deep soil being merely scratched, and consequently bearing scant crops, intermixed with forests of thistles. I have seen thistles 7 feet high standing like trees among the corn, and it was curious to notice in the neighbourhood of Mezöhegyes these immense thistles left standing after the surrounding corn had been cut, just as though the lazy peasant had not energy enough to strike his scythe through their thick and tough stems.

Tenant Farmers.

Only a small proportion of the land of Hungary is let to tenants. There are, according to a recent census, 2,486,255 owners of land and only 48,000 tenants. The system of letting land does not up to the present time appear to have thriven, and I frequently heard the farmers spoken of disparagingly as cultivators. They are accused of taking all they can get out of the land and leaving it the worse for their occupation. Many farmers are Jews, and the system of exhaustive cultivation pursued by some of these men was from time to time noticed. On the other hand, Mr. Otocska of Giesing, Mr. Elvers of Rer, and Mr. Fabricius, whose farms I visited, were all good managers, the two former gentlemen having been previously trained as stewards upon large estates. The late Mr. Smallbones also occupied a farm at Deutsch-kreuss, under Prince Esterhazy. Many noblemen would gladly welcome good English farmers, and let them portions of their estates at liberal rents, and upon liberal conditions. English capital and energy would be likely to succeed, if they could cope with the difficulties of language, novel surroundings, and climate. German agriculturists can more easily reconcile themselves to a country from which they are less distant, and where their language is in general use.

Few visits were more interesting than that paid to Mr. Otocska, who farms 1800 acres, 1600 acres of which are under the plough, at Giesing, near Zinkendorf Œdenburg, under Count Emerich Szachenyi. This gentleman enjoys a high reputation as an agriculturist, and for many years had the management of Count Karolyi's estate at Tot-Megyer, in Upper Hungary (see page 364). The regular form of the fields, the good crops they bore, and the superior system carried out over the whole farm, combined to give a most favourable impression. Here, too, was to be seen a large assortment of English implements, among which I noticed Samuelson's and Johnson's reapers, Wood's mowing machine, Bentall's pulper, Richmond and Chandler's chaff-cutters, Turner's, and Clayton and Shuttleworth's mills, Priest and Woolnough's drill, Clayton and Shuttleworth's horse-gear and threshing-machine. Mr. Otocska uses Ransome's, Howard's, and Hohenheim ploughs; but the two former are made on native models, as the English form is too long in the mould-board, and four oxen with them can do no more work than two oxen can with the native-made ploughs. Howard's harrows, weighted with oak blocks of 30 lbs. each, Coleman's cultivators, and other English implements, were also noticed. Mr. Otocska told me he could grow from 30 to 34 bushels of wheat; 50 to 68 bushels of Indian corn; 40 to 50 bushels of oats; 34 to 40 bushels of barley per acre. He has also a contract for growing sugar-beet for the Zinkindorf factory, and can produce from 10 to 12½ tons per acre. Since improved pressing machinery has been introduced into sugar factories, the pulp has become very inferior, and Mr. Otocska is of opinion that he could make more of his land by manufacturing meat, than by selling beet and receiving back pulp. He has tried experiments with artificial manures every season for the last ten years, but without any result, until the present season, 1873. I saw an experiment on barley, in which one strip was manured with lime, and one with a manure specially prepared by Liebig, with a strip of unmanured between. The result was most evident; but Mr. Otocska had never seen any effect before, although he has applied manures both in spring, autumn, and winter. This good result was no doubt due to the coldness and wetness of the season; for it is observable that, as you advance northward, artificial manures are more and more esteemed. Mr. Vasgarz, steward on the Zinkendorf estate, told me that he obtained good results from the use of the slimy waste from the sugar factory. The sheep clip on an average $2\frac{1}{2}$ lbs. of wool, which was sold this year (1873) for 13*l.* per cwt., and it has sold as high as 16*l.* per cwt. Mr. Otocska considers that there is great scope for capital, and for English or other good farmers in Hungary, and he told me that double the produce might be got out of the land. The farmers are too often Jews, who have no knowledge of agriculture, but aim too much at sucking the goodness out of the land which they occupy. Mr. Otocska pays 2000*l.* a year as rent for 1800 acres, or close up to 22*s.* per acre.

Another excellent farmer, whose acquaintance I made is Mr. Elvers, of Rer, who farms a tract of 1586 acres, all of which is arable, near Karancz, under Prince Schaumberg-Lippe. The estate is on an elevated table-land, and is an hour and-a-half's drive from the Archduke Albrecht's estate at Lak (p. 323). Mr. Elvers served in the German navy from 1849 to 1851, and subsequently studied agriculture in Westphalia and Hungary, where he held the posts of Verwalter and Hofrichter for above twelve years, and then took a farm. He has a lease which is somewhat oppressive in its terms, as the tenant is compelled to keep half his arable land under forage crops. Seventy oxen and twenty-six horses work the farm, and English drills and threshing-machines, with American reapers, are used.

I visited this farm on the 1st of July, and was much pleased with the good management and crops. Much damage had been done to the wheat by mice, and the rye had suffered severely from frosts in May. The rape had been reaped, and was already threshed out; the land which had carried it was already covered with a plant of young maize, to be used partly as fodder and partly as a corn crop, and wheat would then be drilled over the same area in November or December. The whole of the corn is sown with Garrett's drill, reaped by Wood's and Kirby's reapers, and threshed by Ransome's machines. The average crops are:—

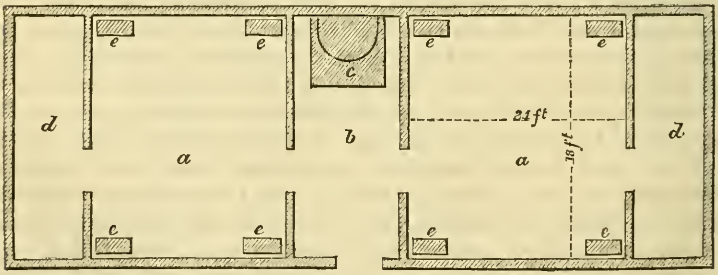
				Per English Acre.		
Wheat	10 metzen of	$89\frac{1}{3}$ lbs.	=	17 bushels of	60·5	lbs.
Rye	15 „	82 „	=	$25\frac{1}{3}$ „	59	„
Barley	18 „	72 „	=	$30\frac{1}{2}$ „	$52\frac{1}{2}$	„
Oats	25 „	50 „	=	$42\frac{1}{3}$ „	37	„
Maize	18 „	„	=	$30\frac{1}{2}$ „		
Rape	12 „	75 „	=	$20\frac{1}{3}$ „	$50\frac{1}{2}$	„
Hay	25 centner		=	25 cwts.		
Mangold	250 to 300 do.		=	$12\frac{1}{2}$ to 15 tons.		
Potatoes	30 to 70 do.		=	$1\frac{1}{2}$ to $3\frac{1}{2}$ tons.		

Labourers and Wages.

In every village there are landless peasants who work in the fields of their more fortunate neighbours. Every estate has also a cottage population which supplies it with a sufficient number of hands. The condition of the labourer was the saddest feature of the rural economy of Hungary; and, viewed in the light of recent agitation and legislation in our own country, it is to an English eye simply appalling. Whether these poor creatures feel the sadness of their lot is a question I cannot answer; but certainly there appears to be little idea among the stewards that their workpeople are neglected. I was told that adults seldom live much longer than forty, and that the mortality among the children is terrific. The people are exposed to an extreme climate, and the water of the plains is confessedly bad. They eat raw fruits and vegetables, and many of them fall victims to the cholera annually. During my journey this fearful disease was exceptionally bad, and at Tokay I found myself face to face with it and the doctor. This gentleman had been dispatched from Pesth by the benevolent owner of the estate, to live in the mansion, and look after the stricken population. The population had to a great extent fled; that is, to the number of "ninety pair of shearers," so that the fields waited in vain to be reaped. The upper classes fear the disease but little. They advise good living, avoiding over-fatigue and beer, and the drinking of good, sound, red wine. The labourer can attend but little to these precautions, but works in the hot sun, drinks water in too large quantities, is careless as to cleanliness, and speedily falls a victim. The doctor told me that when attacked by the fell disorder, the poor ignorant labourer seeks the shelter of some tree, and lays himself down. There he is found, but refuses to be disturbed, refuses to take medicine, and commits himself to the mercy of "the good God." "There he lies," said the doctor, "till he either dies or gets better." I was also informed that to persuade them to take medicine they must be stood over whip in hand.

The poor, meek Hungarian labourer uncovers at the sight of the carriage-and-pair, and remains bare-headed till it is out of sight again. He has not yet felt the effects of emancipation. There is no coroner's inquest in Hungary, which is much to be regretted, as it is difficult to estimate the number of violent deaths that occur annually in those remote plains. Certain it is that accidents with threshing-machines are far too common, and I should be sorry to believe the somewhat irresponsible statements I have heard as to their frequency. A poor fellow was cut to pieces with a reaping-machine on a great estate the day I visited it, but no official inquiry would be made as to the cause of this sad mishap. The people are ignorant and curiously indolent. They move carelessly about the humming drum of the threshing-machine, and too often slip their poor bare feet; and then follows a scene which it is fearful to think of. It is for this reason that in my former Report I particularly recommended self-feeders for threshing-machines. The house accommodation for labourers on the estates of the aristocracy cannot be viewed without indignation by an Englishman. We have been arriving slowly at the conclusion that a number of persons of all ages and both sexes should not occupy one and the same sleeping-room. Also that a cottage should possess at least three rooms. Three rooms for one family! What would the philanthropist say to four families and twenty individuals to one room? And yet this is quite a common occurrence in Hungary. The accompanying plan gives a general and correct idea of many a habitation

Fig. 1.—*Ground-plan of Hungarian Dwelling for Labourers.*



on estates which I visited. *a a* represent living-rooms, in each corner of which is a bed, *e*; *b* is a common lobby; and *c* is a hearth; *d d* are small store-rooms for meal and other necessaries, and work tools. Each bed represents a family share of the mansion. Six or seven bare-footed little wives are either superintending cooking on the large raised hearth, or busying themselves in various kinds of work. The husbands are out at work, the children swarm on all sides. The people sleep out of doors very commonly in the summer, but in winter there must be fearful packing before all the members of this composite household find resting-place. It is very much the custom for the grooms and stock-men to sleep in the stables and byres among their animals, and this of course helps to relieve the houses from the charge of being over-crowded. I saw but little of the dwellers in cellars, but inspected one of those strange habitations at Mezöhegyes. It consisted of a low hovel over an excavation in the ground of some five or six feet in depth, in which human beings found a home.

Wages are paid partly in money and partly in kind. A portion of land is devoted to the labourers under the name of the *convention* field. There is also a peculiar system of paying labourers with a proportion of the produce they have assisted to cultivate or manipulate. In Vienna, Mr. Shuttleworth informed me that the rate of wage was much the same as in England. At Messrs. Sigl's I found that a good fitter would make 2½ fl. (5*s.*) per day by piece-work, and would receive 4*s.* per day by time wages. A turner will have 7*s.* to 8*s.*, a blacksmith 4*s.*; a head blacksmith will make 6*s.* to 7*s.*, and an unskilled labourer 2*s.* to 2*s.* 6*d.* Mr. Topham, an English engineer, who has established works in Berthegasse, Vienna, gave me a similar account of the wages paid in 1873.

Turning to the country, the first case is that of Schwarzwasser, near Presburg, an estate of Count John Palffy's, where I found that payment was made both in money and in kind. Under the former system a man received from 1*s.* 2½*d.* to 1*s.* 10*d.* per day in the field, and 2*s.* 5*d.* to 3*s.* in the vineyards. When paid partly in money and partly in kind, a shepherd received 4*l.* 8*s.* in money, 3·38 bushels of wheat, 33·8 bushels of rye, 3·38 bushels of barley, 1½ klafter (6 ft. × 6 ft. × 3 ft.) of wood, $\frac{7}{10}$ths acre of land, 30 lbs. of salt, and lodging.

This would represent the wages of an ordinary shepherd; but a head shepherd might receive double this amount, or more.

On Tarnok estate, also near Presburg, a man's wage ranges from 1*s.* 0½*d.* to 1*s.* 10*d.*, and a woman's from 7½*d.* to 1*s.* 0½*d.* Shepherds receive 6*l.*, 6¾ bushels of wheat, 33·8 bushels of rye, 6¾ bushels of barley, 3 cord of wood, 36 lbs. of salt, $\frac{7}{10}$ths acre of land, the keep of one cow, run out for two sows, and a cottage. A stock-man receives 4*l.* 12*s.*, 6¾ bushels of wheat, 33·8 bushels of rye, 6¾ bushels of barley, 3 cord of fire-wood, 29 lbs. of salt, $\frac{7}{10}$ths acre of land, run for one sow, and a cottage.

On Nyárosd estate, also near Presburg, the labourers are paid in money alone, and shepherds and teamsmen receive their wages partly in kind. A labourer's wage is 10*d.* in winter, and 1*s.* 8*d.* in summer, and a woman's 7½*d.* to 1*s.* 3*d.* per day. A shepherd's wage is estimated at from 1*s.* 0½*d.* to 1*s.* 3*d.* per day throughout the year, and a herdman's at 1*s.* 3*d.* to 1*s.* 8*d.* These figures are exactly confirmed by the report from the neighbouring farm of Vahnosfaln.

At Kœnigsheiden, Presburg, a labouring man, when paid in money alone, receives 1*s*. 10½*d*. in summer, and 11¼*d*. in winter. A woman receives 11¼*d*. in summer, and 6¼*d*. in winter. A head shepherd has 8*l*. per annum in money, with 6¾ bushels of wheat, 33·8 bushels of rye, 6¾ bushels of barley, 200 faggots of wood, 36 lbs. of salt, $\frac{7}{10}$ths of an acre of land, keep of one cow, and pasture for pigs. Shepherds and cattlemen are paid with trifling variations as at Tarnok. Similar payment is made on the estates of Boleraz, Szuha, Pudmeritz, Szilard, and Bösing. All of these estates are owned by Count John Palffy.

"On Count Esterhazy's estates of Talos and Lanschütz, also in Upper Hungary, a man's average wage is estimated at 1*s*. 2½*d*. per day, and his summer's wage ranges as high as 2*s*. 5*d*. A woman's wage is 10*d*. Shepherds and cattlemen are considered to receive in cash and commodities 20*l*. per annum.

Upon Count Béla Széchenyi's property at Zinkendorf, near Œdenburg, a man's wage is equal to 1*s*. 8*d*. per day, and a woman has 11¼*d*. per day throughout the year. Here also the system of payment in kind obtains, but I did not receive particulars.

Further south, at Wittendorf, half an hour's drive to the east of Steinamanger Railway Station, lie the house and estate of Count Alexander Erdödy. Here a labourer receives 2*s*. per day for mowing, and a woman 1*s*. 2*d*. for light work. Calculating the various perquisites at a money-value, a cattleman was estimated to receive 23*l*. 10*s*., and a shepherd 27*l*. 10*s*., besides lodging, per annum.

Count Heinrich Zichy furnished particulars as to his payment of farm-servants at Nikics, in Œdenburg Comitat, on the slopes of the boundary mountains, and three English miles from the South Railway Station of Zinkendorf. Men in summer receive from 1*s*. 8*d*. to 2*s*. 5*d*., and in winter from 10*d*. to 1*s*. 0½*d*. Women receive 10*d*. to 1*s*. 0½*d*., and 6*d*. to 7½*d*. respectively in summer and winter. All the harvest work, except what a single reaping-machine cuts, is done by labourers for one-twelfth part of the entire crop: that is, every twelfth stock belongs to the harvesters, and is threshed out, the straw remaining for the benefit of the estate. The male harvesters engage themseves to come for day-work whenever wanted, throughout the year, for 10½*d*. per diem. The shepherd and two assistants on the same estate are paid in the following complicated manner:—

£10 in money.	45 lbs. of bacon.
25⅓ bushels of wheat.	180 ,, of salt.
50·7 ,, of rye.	9½ ,, of candles.
10 ,, of barley.	19 gallons of wine.
1·69 ,, of peas or beans.	1·4223 acres of land.
4 cord of wood.	Keep of one cow.
180 lbs. of meat (paid in money).	

A teamsman on the same estate has

4*l*. 12*s*.	·84 bushels of peas.
17 bushels of wheat.	2 cord of wood.
27 ,, of rye.	$\frac{7}{10}$ths acre of land.

M. Otocska, also near Zinkendorf, estimated his wage as follows, including all perquisites:—

	s.	*d.*
Men in winter	1	0½ per day.
,, ,, summer	1	8 ,, ,,
Women in winter	0	7½ ,, ,,
,, ,, summer	1	0½ ,, ,,
Shepherds	1	0½ to 1*s*. 3*d*. per day.
Teamsmen	1	3 to 1*s*. 7*d*. ,, ,,

Upon the Imperial stud farm of Barbolna, situated upon the right side of the Danube, about 17 miles west of Komorn, labourers receive 2*s.* 5*d.* per day in summer, and 1*s.* 3*d.* to 1*s.* 5½*d.* in winter. Shepherds are paid partly in money and partly in kind, and their total remuneration is considered equal to 30*l.* 12*s.* per annum. Teamsmen's wages amount to 20*l.* 15*s.* per annum. Upon Kis-Szalás estate on the Bacser, about 14 miles north of Maria-Theresiopel, wages for labourers vary in summer and winter from 10*d.* to 2*s.*, and shepherds and teamsmen receive 18*l.* and 16*l.* per annum respectively, inclusive of perquisites.

In Lower Hungary I obtained information from several sources as to the wages paid to labourers. Mr. Elvers, of Rer, near Karancs, farms under the Prince Schaumburg-Lippe. Male labourers there receive 2*s.* in summer, 1*s.* 0¼*d.* in winter, and 3*s.* in harvest; females receive 8¾*d.* in summer, 6¼*d.* in winter, and 1*s.* 0½*d.* in harvest. Shepherds and teamsmen are paid in kind, as follows:—3*l.* in money, 39 lbs. of salt, ·35 acre of garden, 6¾ bushels of wheat, 33·8 bushels of mixed wheat and rye (halb-frucht), 1·69 bushel of beans, 4 klafter of wood, 1·42 acre of land, and grazing for pigs.

Another case in Lower Hungary is that of Bellye estate, near Baranyavará-Monoster Railway Station, and not far from Mohacs. Upon this extensive estate of the Archduke Albrecht labourers' wages are high. A shepherd receives 30*l.* per annum, inclusive of everything, and the highest wages quoted is 45*l.* per annum. A teamsman has advantages equal to 1*s.* 7*d.* per day in summer, and 11¼*d.* in winter; and a woman worker has 11¼*d.* in summer, and 8¾*d.* in winter.

Upon the Imperial farm of Mezöhegyes, in the Comitat of Csanad, the shepherds, grooms, and teamsmen, are generally soldiers, and the day-labourers are, for the most part, paid in money only. They receive in

July and August	2*s.* 5*d.* to 3*s.*
September and October	1*s.* 8*d.* to 2*s.*
The remaining months	1*s.* to 1*s.* 5½*d.*

The last case I shall cite is that of Harkányi, in the Tokay district, where day-labourers and monthly servants are employed. In summer men are paid from 1*s.* 8*d.* to 2*s.* 5*d.*, and in winter half these amounts, or less. A teamsman's wage consists of

3*l.* 4*s.* in money.
6¾ bushels of wheat.
40½ ,, of rye.
10 ,, of barley.
48 lbs. of salt.
1¼ acre of land for maize and beans.
One cow kept.
Lodging, firing, medical attendance, and school.
Grazing for a few pigs in summer.

It was in the Schütt district that I first became acquainted with a peculiar system of payment, in which the labourer receives a proportion of the crop which he assists to cultivate.

In the case of Indian corn, the estate undertakes the preparation of the ground and the sowing of the crop. The labourer hoes, harvests, and does everything else connected with the crop, and receives one-third part of the grain as his reward. The work consists in twice hoeing, earthing up, breaking cob from the straw and kibbling it, cutting the straw and binding it in bundles. For winter and summer grain the labourers receive for the cutting, shocking, loading, and harvesting, one-thirteenth and one-twelfth part respectively of the entire crop, both straw and corn; besides, they receive 1·69 bushel of wheat, 1·69 bushel of rye, and 1·69 of barley, per pair of shearers, and this constitutes their entire harvest wage. For mangold, after preparing the land and sowing the seed, the estate gives the labourer, for all work subsequently required for the crop, 2*d.* per cwt. of crop grown.

Agricultural Colleges.

There are four regularly constituted State-supported agricultural colleges in Hungary, three of which were visited by me:—

	Professors and Teachers.	Students.
Ungarisch-Altenburg	18	148
Keszthely	9	72
Debreczin	8	51
Kolosmonostor	12	74

Liberal grants are allowed for the maintenance of these colleges, and the general management of all is entrusted to the Minister of Agriculture in Pesth.

Each college is furnished with ample apparatus for teaching, in the form of laboratories, museums, botanical gardens, experimental farms, and gardens for the practice of vine and fruit culture. There is a director, an effective staff of professors, and a large body of students at each. An *Ackerbauschul*, or lower grade school for the instruction of young men in practical agriculture, is attached to three out of the four colleges. In the colleges manual labour is not encouraged among the students, as their time is taken up with the study of scientific agriculture in all its branches.

Each student, before entering the higher school, must have been engaged in practical agriculture for two years, so that the practical element is not wanting in the education of the higher grade students.

The complete course of study occupies two years, and each year is divided into a winter and a summer session. These four periods are devoted to the study of the following subjects:—

First Year's Winter Session.

	Hours per week devoted to each subject.
Mathematics	4
Physics	2
Mechanics	2
Geology	2
Chemistry	4
Physiology	4
Botany	1
Agronomy	4
Horticulture	2
Drawing	–
Total	25

Second Year's Winter Session.

	Hours per week devoted to each subject.
Rural Economy	4
Political Economy	2
Technology	4
Cattle- and Sheep-breeding	4
Forestry	3
Building	3
Climatology	2
Statistics	2
Drawing	–
Total	24

First Year's Summer Session.

Engineering	3
Zoology	3
Botany	2
Agricultural Chemistry ..	4
Agricultural Mechanics ..	3
Cattle-breeding	3
Wool, study of	1
Vine-culture	1
Plant-culture	3
Total	23

Second Year's Summer Session.

Book-keeping	3
Rural Taxation (valuation)	2
Inventory (?)	1
Technology	3
Forestry	2
Management of Horses and Swine	2
Veterinary	3
Agricultural Law	2
Buildings, Economy of, II.	3
Drawing	–
Total	21

The system in all the colleges is uniform, and is under the immediate control of Herr von Kenessey, secretary to the Minister of Agriculture. I had much conversation with Herr von Kenessey at Pesth, and subsequently in this country during a recent visit which he paid me at Cirencester, to see the working of our own Agricultural College. The students all live in the town, and repair daily to the college for lectures and classes. As seems to be general throughout Germany, little or no control is exercised over their movements when they are outside the walls of the college.

The college at Ungarisch-Altenburg is situated upon the property of the Archduke Albrecht, whose wonderful farm-buildings and advanced agriculture are open to the inspection of the students. This college was founded in 1818, by the then owner of the vast estates of the present Archduke, the Duke Albert von Sachsen-Teschen, and endowed with 700*l.* per annum. His object was the education of stewards and bailiffs for his estates in Hungary, Moravia, and Silesia.

In 1849 the Government further endowed the institution, and placed Dr. Heinrich Wilhelm Pabst at its head in 1850. This distinguished professor held the position until 1861, when it was filled by Dr. Masch, the present director. Both the Archduke's and the Government's foundations are now combined under the direction of Dr. Masch. From 1818 to 1850, 782 students had passed through the Archduke's private college; and from 1850 to 1873, 1831 students had passed through the enlarged institution.

The college at Keszthely is situated upon the estates of Count Festatecs, on the shores of the Platten See. The railway from Kanisa to Pesth passes within a few miles, and a coach runs to Keszthely daily. The following passage occurs in my notes made during the journey: "The railway station at Keszthely looked very primitive and out-of-the-world; and when we mounted our waggon and drove off to Keszthely, rumbling over a terrible road, with nothing on our right but the boggy commencement of the Platten See, it seemed like the road to Nowhere. Masses of rushes, black stagnant pools, and rank grass were bounded far over by the level line of the Platten See, beyond which was the outline of the mountains. On the left was a tolerably cultivated tract, gradually improving, and contrasting very favourably with the view to the right. The country gradually improved, and at length both sides of our road became cultivated, and the Platten See appeared more definitely as a lake bounded by fine mountains. We passed the handsome white homestead and stables of Count Festatecs on the left, and presently after neared Keszthely, a neat town beautifully situated on the shores of the Platten See. Here is the seat of perhaps the oldest agricultural college in Europe, founded and endowed by the Count Festatecs in the year 1784, and now flourishing as a Government institution with nine professors and seventy-two students. The college is the old '*Stadt*' House, and is rather unfortunately situated one hour's walk from the main portion of its farm of above 300 acres."

There are two schools: one a lower farm school for students who work with the farm-servants, and study two hours per day in the winter, and one hour per day in the summer. The other is a higher school, where the pupils give all their time to study. In the latter case the students pay 3*l.* per annum for tuition, and live in the town. No control is exercised over their private life, and the professors are satisfied with their behaviour and progress. The course of study consists of four half-yearly sessions, and the holidays are August and September, with one fortnight at Easter (see programme already given.) The laboratories, lecture-rooms, and museums are good, and well up to the wants of the present day. There is a capital collection of botanical models, illustrating vegetable structures. The college is provided with a vineyard, a good nursery for fruit-trees, a botanical garden, an experimental field, in which I noticed plots of English and foreign wheat, English oats and beans, as well as examples of other cultivated plants. The farm is divided into fields, each of which has its own particular rotation. The students must have spent one year upon a farm studying the practice of agriculture, and be above seventeen years old before they are admitted to the college. After they have completed their course, they seek junior positions upon the large landed estates of the country, and work up gradually to the dignity of head stewards and directors. Farmers, in our sense of the word, do not appreciate the institution. The students pass an examination every session, and at the close of their course undergo no final examination, but a combination of all their previous certificates is presented to them properly signed. Professor Engelbrecht drove me round the college-farm and a portion of the beautiful estate of Count Festatecs. The good agriculture and high class of stock and horses upon the Count's estate are open to the inspection of the students, and must be a great advantage to them. The college receives 40,000 fl. (4000*l.*) per annum from the Government.

Debreczin is also a beautifully situated town, and the agricultural college there is a new but thriving institution. Professor Tormay, since removed to Pesth, was, at the time of my visit, director of this college. He is an enthusiastic teacher, and a most able man. Under his care the botanical gardens were developing most successfully, and I was particularly struck with the fine anatomical and physiological collection in the college museum. The farm is divided into fields by means of pleasant grass drives, and the professors are justly proud of the state of their crops and land. Much attention is also evidently given to the improvement of cattle and sheep. I examined, in company with Professor Tormay, his Mestir-Merino, the result of a cross made thirty years since between the pure Merino and the old spiral-horned Hungarian sheep. This old breed was crossed three or four times forward with the Merino, and subsequently it has been bred *inter se*, and improved by selection. These sheep resemble the Merino, but are longer in the fleece, and clip something more than 5 English lbs. per head. They are also prolific, forty-six ewes in 1870 having produced sixty-four lambs.

After visiting the three principal agricultural colleges, I came to the conclusion that they constituted one of the most encouraging features of the agriculture of Hungary, and of the future prosperity of the nation. Most of the stewards have been educated at one or other of these institutions, and their early training no doubt bears fruit in the accuracy and system observable upon the great estates. I often observed a peculiar expression of wonder when I asked the stewards with whom I came in contact, if their college course had been useful to them. Of course it had, and they evidently could not understand any one doubting it. In England we have still something to learn in this respect.

Government Stud-Farms.

The Government has done much to encourage the breeding of horses by establishing studs at Kis-Bér, Barbolna, and Mezöhegyes. The best blood has been imported from the United Kingdom, Spain, and Arabia; and great pains are being taken to establish a fixed type of saddle-horse which can be relied upon to breed truly. These Government stud-farms are also centres from which stallions are sent to supply the need of all parts of Hungary, with the view of improving the horses of the country. The breeding of horses is one of the most popular branches of rural economy in Hungary. Not only has it been taken up in a most spirited manner by the Government, but also by most of the great landed proprietors, with wonderful results. They still look to England for their supply of thorough-breds and Norfolk trotters; but they hope within a short time to establish races suitable to their own wants and climate; which may then be bred *inter se* without further recourse to foreign blood. In this opinion they are at issue with many English breeders of horses, who look upon the thorough-bred as essential to the supply of half-bred saddle-horses. We have in fact no distinct race of saddle-horses, but in Hungary they think it quite practicable to raise such a race, possessed of the necessary fixity of character.

Kis-Bér.—A run of eight hours from Vienna over the line which connects Bruck, Raab, and Stuhlweissenburg, takes the traveller to the Imperial stud-farm of Kis-Bér on the Backonyer Wald. I had been travelling for days over the dead level of the Upper Hungarian plains, and it was refreshing to find myself in a gently undulating country. The estate comprises a fine and extensive tract on which the soil varies from a poor blowing sand to a fine black humus loam; altogether a fine neighbourhood, but not particularly healthy, as I heard there was much fever abroad. The entire estate is divided into four districts as follows:—

	Acres.
1. Kis-Bér (home farm)	5,505
2. Bathyan	2,695
3. Vasdinye	4,300
4. Tarcs	3,145
	15,645

Of this, 6450 acres are under arable cultivation. There is a steward on each of the three last divisions, and the estate director with his staff resides at the central portion, Kis-Bér proper. The greater portion of the land is worked by Hungarian oxen, but horses are also employed. The system of drilling corn has been introduced over the whole estate, and Samuelson's, Hornsby's, and Johnson's reapers, with Clayton and Shuttleworth's threshing-machines, are all in general use.

On Kis-Bér proper (the home farm) the stabling is extensive; and for arrangement, commodiousness, and quality, it must be allowed to stand first in the whole Austro-Hungarian dominions. The entire-horses occupy a magnificent line of lofty and liberally constructed loose-boxes with covered ways both before and behind, covered riding school, and every possible contrivance for housing a large number of valuable thorough-breds. The brood mares are accommodated in a long succession of paddocks, each of which is furnished with a hovel. The weaned foals and yearlings are housed in spacious sheds when they are not out on the pasture, and are attended to by soldiers, who seem very fond of their charge. The gentleness of the thorough-bred horses, owing no doubt to kind treatment and constant attention, was very remarkable here, and upon the other Imperial stud-farms. I arrived at four o'clock on June 24th, and was met by Colonel Zoest, and Mr. Hackle the English stud-groom, who showed me through the largest collection of thorough-bred and half-bred horses I had ever seen. The next day, from half-past six in the morning, was devoted to driving round the estate, and inspecting horses both on the pasture and in studs and stables. Fine Allgauer cows and Hungarian oxen were also noticed, and a general glimpse of the agriculture of the estate was obtained. If the term "intensive" may be applied to the agriculture of England, that of "extensive" may be used as applicable to that of Hungary. Good crops of grain and beet were seen, and a remarkably vigorous plant of oats and vetches for fodder. The pastures were also rich and abundant, but rough and lumpy, apparently needing rolling. Rye-grass and clover formed a capital, but somewhat neglected-looking pasture, in which a fine herd of young horses grazed, attended by their *csikosen* or mounted guards, who never leave them. Grass was lying in swathe and wanted turning, as it was bleaching below; but labour is not abundant here. The yearlings and two-year-olds are herded on the pastures, and in the heat of the day stand close together, while the picturesque csikosen watch over them, mounted on small but active little horses. Colonel Zoest informed me that there are two objects in maintaining this extensive stud. First the breeding of thorough-bred horses, which are sold into the country as yearlings, and so improve the general horse stock of the country, and spread noble blood throughout the land. Secondly, the breeding of both lighter and heavier half-bred stallions for saddle purposes. These young stallions are at $3\frac{1}{2}$ years old drafted off to depôts which are scattered through the country, for the purpose of improving the native races which abound in the hands of the peasants.

The thorough-bred stallions and mares have, without exception, been obtained from England. The stud furnishes annually, on an average, 26 young stallions for the depôts. The inferior horses are castrated and sold by auction, the worst at from 1 to 2 and the better at 3 to 4 years old. Every year, from 14 to 18 young mares are introduced into the stud, and about an equal number are sold by public auction with the geldings.

This year (1873) four-year-old fillies have averaged 90*l.* each, and the stallions sent out to the depôts realized 120*l.* to 150*l.* each.

Considerable difficulty has recently been experienced in the rearing of half-bred foals, owing to the great prevalence of suppuration in the lungs, the cause of which has not yet been discovered. This has carried off a very large proportion of the foals. For four years past it has destroyed, on an average, 35 out of 85 head, and this year 15 out of 83 half-bred foals have succumbed!

The unhealthiness of the stock is a great cause of anxiety to Colonel Zoest and his staff of veterinary surgeons. The disease which attacks both lungs and liver was attributed, partially at least, to the water, and analysis revealed the absence of both iron and sulphur. It was also thought that the fodder contained too small a proportion of bone constituent. I recommended a little sulphate of iron in the water, and dressings of superphosphate to the pastures; but as yet the true cause of the disease is not known with certainty.

Among the horses at Kis-Bér were many ready for use or for sale, and among these were several very superior saddle and carriage horses, and some well adapted to make weight-carrying hunters. There is a yearly sale, but great dissatisfaction was expressed at the spiritless character of the bidding and the amount of collusion which exists even among gentlemen.

The following English thorough-bred sires, once well known in England, were seen in excellent condition in this somewhat remote locality. Buccaneer was in good form, and is most highly esteemed as a sire; also Cambuscan, Diophantus, Ostreger, Polmoodie, and Tarquin. Highflyer, and Pride of England, two very fine horses, represented the best type of Norfolk trotters, and are greatly admired in their new home for their strength and action. A fine assortment of mares by Alert, Stockwell, Pyrrhus the First, Ivan, Flying Dutchman, Saunterer, Orlando, Lord of the Isles, Kingston, Trumpeter, Rataplan, Chanticleer, Touchstone, and other noted English racers were also seen.

It was indeed with some regret that I witnessed here, as well as in many other places, the transplanted material which becomes year by year rarer in our own country. The Austrian Government buys the best blood in England at any price, which our "individual enterprise" parts with for gold. Might not our own Government enter the market and secure noted sires for the general good of the country?

The horse stock at Kis-Bér consisted in December last of 452 head, comprising 10 stud horses; 32 2-year-old stallions; 26 yearling ditto; 48 weaned foals; 2 suckers; 165 brood mares; 1 4-year-old mare; 20 3-year-old fillies; 22 2-year-old fillies; 29 yearling fillies; 48 weaned fillies; 1 sucking ditto; 2 geldings; 12 work horses; 14 servants' horses, and 17 csikos or mounted herdsmen's horses. The estate of Kis-Bér has furnished an average profit during the last ten years of 2000*l.* or about 4*s.* per acre over the entire domain.

Barbolna.—I was sent on from Kis-Bér behind four fine horses from the Imperial stable, to Barbolna, where I was received by Major Friedrichs, who has charge of this the second Imperial stud visited. Barbolna is situated on the right side of the Danube 10 to 18 miles west of Komorn, and is 10,079 acres in extent, all being in a ring fence, and divided by means of acacia drives. The soil varies from clay to sand and gravel, and good black soil, and is from 1 to 3 feet in depth; 8023 acres are in arable cultivation. Here also oxen and horses are employed in tillage, and the same implements, with the addition of Priest and Woolnough's drill, were to be seen. Major Friedrichs treated me to a rare show of Arabian stallions and brood mares. The stud on the Barbolna estate was established in 1790, and consists of thorough and half-bred Arabians. They appeared small after the fine English thorough-breds of Kis-Bér, but are exceedingly beautiful and very docile. The head is characteristic, and the colour varies from chestnut to dark-brown, iron-grey, and white. I also saw three pure-bred black Arabians, which are considered rarities. The 2-year-olds bred under the management of Major Friedrichs were larger than the 3-year-olds previously bred, and his yearlings and foals were very promising. The fine lofty, wide, and long sheds, both here and at Kis-Bér, for housing young horses, are quite worth inspection. Standing in the centre of a spacious court I had a good opportunity of noticing the fine action and fiery pride of the true Arab horse, as numbers of them were passed around in review. It was a sight which I shall never forget. As at Kis-Bér so here, the young stallions are sent out at four years old to the depôts, and from the depôts they are distributed to the different parts of the country, where the small Hungarian horses of mixed Arabian and Turkish origin, and therefore of allied blood, are to be found. The four or five years old mares are, when good enough, brought into the stud, or sold for breeding purposes to private purchasers. The inferior fillies are disposed of in the market. The Barbolna estate is superintended by a director, 2 stewards, 1 assistant for outdoor work, 2 assistants for the office, and 1 book-keeper. The stud is under Major Friedrichs and his own staff of grooms, csikosen, and military servants.

Mezöhegyes.—This is the last great stud estate of the Crown of Austria. I had taken the train from Zombor to Maria-Theresiopel, over the dead level of the Alföld to Szegedin, crossed the Theiss, and continued over an uninterrupted dead level of rich black soil, known as the Banat, to Oroshaza, where a waggon and pair of good horses awaited to take me forward to Mezöhegyes. I had left Maria-Theresiopel at 10.30 P.M., so that a considerable portion of this country was passed through in darkness; but from early dawn to six o'clock I had watched the uniform continuation of flat rich country, half tilled, and languishing for want of labour and capital. My road now lay through the usual type of a small Hungarian town—unpaved, dirty, and yet picturesque, with its detached peasants' houses and primitive stores. Then through an exceedingly rich district, owned by peasants, and cultivated in slovenly style. The crops, which were now being harvested, often presented the appearance of a mass of thistles, and some of these consequences of the primeval curse raised their heads, as I myself measured, 4 and 5 feet above the level of the standing corn. Often the peasant, in cutting his crop, had gone round the larger thistles rather than undertake the work of knocking them down, and now they stood like little trees among the stubble. The road next led through an estate of Count G. Karolyi, where were some heavy-strawed wheat crops, with only badly filled ears. Again we passed through a tract of peasant-land, and a fox, apparently charmed with the novelty of a carriage and pair, ran parallel with us for a considerable distance. At last we entered the domain of Mezöhegyes, on which the land is all equal and rich, like that which has already been noticed, and which indeed constitutes the true *Tiefland* of the great Alföld or plain of Lower Hungary. Harvest was commencing, but I was not favourably impressed with the agriculture. Labour is scarce, but this seemed hardly enough to account for the slovenly state of the fields, the banks of thistles through which I should have liked to drive a reaping-machine, and the pastures choked with tall weeds of various kinds. I was disappointed to find the agriculture on this vast Imperial estate apparently not superior to that of the surrounding peasants, and in this it offered a contrast to the neatly cultivated estates of Upper Hungary. I was now far south, and the oriental laziness, which has often been observed as belonging to this part of Europe, seemed to be exerting its sway. The domain comprises 39,618 acres, and is managed by 1 director, 6 stewards, 8 assistants, 1 builder, 1 forester, and 1 head-machinist. There is a stock of 800 work-oxen, 330 cows, 26 bulls, above 1000 swine, and young stock in proportion.

Fig. 2.—*Plan of the Imperial Stud Estate at Mezöhegyes.*

1. Schagy stud.
2. Cows.
3. 1-year-old stud.
4. Work oxen.
5. Gidran stud.
6. Almásy cattle herd.
7. Pigs.
8. 2-year-old oxen.
9. Work oxen.
10. 3-year-old stud.
11. 2-year-old stud.
12. First English mare stud.
13. Work oxen.
14. 2-year-old pigs.
15. 1-year-old bulls.
16. Second Nonius stud.
17. Young pigs.
18. Cattle.
19. First Nonius stud.
20. Work oxen.
21. 2-year-old bulls.
22. Lipicza stud.
23. Second English stud.
24. 1-year-old pigs.
25. 3-year-old oxen.
26. Majesto stud.
27. 3-year-old pigs.
28. 1-year-old oxen.
29. Probably barn for corn in sheaves, and hay.
30. 1 and 2-year-old oxen.
31. Csaky (Hungarian improved herd, for which this estate is famous) breed of cattle.
32. Work oxen.
33. Machine and implement depôts.

It is, however, with the stud that we have at present to do, and when I add that there are 650 brood-mares, some idea will be realised of the magnificence and extent of this undertaking. I am glad to be able to assist the reader by the accompanying plan (Fig. 2), which also gives a good idea of the manner in which an Hungarian estate is traversed by roads lined with acacias. The stud is managed by a separate staff of officials, all of whom are soldiers dressed in uniform. Mezöhegyes gives the idea of a military station of some importance, and the grand ranges of stables, offices, and residences is most imposing. At the head of the stud is Colonel Horváth de Szalaber, who received us most hospitably, and took great pains to explain his system of breeding horses, which he has reduced to a science.

I will first quote from a letter, in which Colonel Horváth gives his own account of the origin and present state of his stud, and then narrate what I myself saw at this wonderful place:—

"Dear Mr. Wrightson,— "Mezöhegyes, Nov. 16, 1873.

"You will be very kind in excusing my late answer, but the auction, the Exhibition at Vienna, where I have been with so many horses, and the guests visiting Mezöhegyes, kept me from writing to you sooner. My answers shall follow your inquiries in the same order.

"1st. The stud was constituted in 1785.

"2nd. The race of horses is throughout half-bred. We have had two studs of half-blood Arabian mares (Schagya and Gidran) since the years 1825 and 1827. Two studs of English mares (Furiosa and Abugress) since the years 1841-42. Also the family of Nonius, obtained from France in 1815. Two studs of the ancient blood of Lippicza, which is a mixture of Spanish and Arabian blood, since the year 1807; and lately, within the last ten years, we have begun to form a stud of Norfolk blood with stallions of that race and mares of different indigenous families.

"3rd. We have 650 mares, or thereabouts, namely, 69 Schagya, 67 Gidran, 72 Furiosa, 76 Abugress, 38 Majestosa (Lippicza blood), 75 Conversano, and other imported mares from Lippicza, 220 Nonius mares, and the rest are of Norfolk blood, bred here.

"4th. The sires used in bringing out the Mezöhegyes stud are either thorough-bred English and Arabian stallions, or half-bred stallions belonging to the families already mentioned, and for long established at Mezöhegyes, as explained in paragraph 7.

"In families where there is no possibility of using English or Arabian full-blood horses with advantage, I employ stallions of the same blood, taking care not to breed too closely.

"5th. The original character of the mares which at first composed the stud was a mixture of Arabian and Hungarian blood, but for the last 30 or 40 years it has been gradually transformed by imported sires.

"6th. The object of the stud is to produce stallions of various size and blood for the use of the different parts of the kingdom.

"7th. The principle kept in view in breeding is very simple. It is the gradual improvement of a family by the introduction of nobler and higher blood, while at the same time the type of the family is retained. Where I want more blood I apply full-blood horses according to the previous breeding of the particular family. The produce, when strong enough, is served once more by a thorough-bred, and then I return back to a sire of the original strain of the family. Take, for instance, the Schagya, a half-bred Arabian family. A Schagya mare, for example, is allied to a full-blood imported Arabian horse, and the female produce is then served by a Schagya stallion; or a Furiosa stallion serves the produce of an English thorough-bred stallion and a Furiosa mare. If the produce is strong, she receives the full-blood English or Arabian according to her family. If she is sufficiently noble and elegant, she is mated with a half-bred of her own particular type.

"It is, in fact, a system of breeding from a half-bred stock with the occasional use of thorough-breds when there is a tendency towards coarseness.

"8th. In answer to the question whether English blood is still likely to be required, the foregoing remark shows that there is still a use for English blood.

"9th. In answer to the question, 'Do you hope to establish fixed or permanent half-bred races which may be bred truly *inter se?*' the answer is, The families of Nonius, Majestosa, Gidran, and Schagya are already constant; Furiosa, Abugress and Norfolk breeds will require 10 or 12 years more of careful breeding."

There is great difficulty in obtaining first-rate Arab stallions, as the Arabs will not sell their best blood. Colonel Horváth is now trying to breed a stallion at Mezöhegyes for the Schagya family, and showed me three exceedingly beautiful foals, the result of crossing a Schagya mare with a Gidran horse.

Constant illustrations of the above system of breeding were seen during a long drive. We first examined 160 yearling fillies of all families mixed, and subsequently came upon the following groups grazing in spacious pastures, attended by their csikosen: 36 Nonius mares, with their foals, nearly all bay, with black points; 4 farm-horses, bred between a Norfolk stallion and half-bred Nonius mares; 46 fine two-year-olds, all, with the exception of 7, fine greys, bred between Arab and Spanish parents; 23 mares with foals, and 6 fine hunting-horses, among which was a wonderfully fine mare by Chieftain, a son of Chief Justice, and from a Gidran mare.

Various lots of horses, of fine type, were also visited, and we also examined the celebrated Mezöhegyes herd of Hungarian cattle, and the fine Mangolicza swine.

The love of horses has taken deep root among the landed proprietors of Hungary, and the improvement of the horses of the country is enthusiastically carried on in private studs, as well as in those under the immediate control of the Government.

On Count John Palffy's estates Mr. Robinson has the management of 17 to 20 capital half-bred brood mares, and one thorough-bred—Cygnet. These have been allied with Actor, by Leamington out of Actress; North Countryman by Cotswold, the property of Count Esterhazy; a son of the celebrated horse Gladiateur; and other good horses, both of English and Arabian descent.

Count Antal Esterhazy, of Lanschütz Castle, near Presburg, has two excellent studs of English horses, managed by one

English stud-groom. The Count believes that in time they will be able to establish a race of saddle-horses which can be relied upon to breed truly without further importation of English blood. The average realised at Count Esterhazy's sale of young horses in the spring (1873) was 2800 fl. over 9 head, or about 31*l.* each. He also had sold a colt by Carnival for 5600 fl., or 560*l.*

Count Waldstein maintains a capital stock of English thorough- and half-breds at Csicso, near Komorn, on the Danube. There I saw the old mare Gambia, and the sire Flying Cloud. Albert, North Countryman, and Pride of England were also all represented in this stud.

The result of much observation was to show me that the best horses in Hungary are descended from English stock. The cart-horses also are often the result of crosses with English horses. They are not of the heavy character of English draught-horses, but light, spirited, active animals, standing 15 to 16 hands high.

The Archduke Albrecht has imported Clydesdale horses into his estates in Lower Hungary; but, with this exception, no other horses but thorough-breds and Norfolk trotters were to be seen from Britain. I also saw on the estate Bellye, some half-breds between Clydesdale horses and Styrian mares. The mothers were red bay and light bay, inclining to chestnut, with black points. They were high in the rump, and on the whole well formed.

Agriculture.

Hungarian Agriculture labours under many disadvantages; among which may especially be mentioned an extreme climate and a scarcity of labour. It is, in a general sense, exceedingly simple and uniform, so that a run through Upper and Lower Hungary gives the traveller a good general impression as to the mode of cultivation pursued. I was sometimes disagreeably aware of this uniformity, when travelling for several days in succession over level tracts, cultivated by peasants or by large proprietors, in which the same objects and methods repeated themselves to a tedious extent. Some of the general peculiarities of the country have already been pointed out. The frequency of bare fallows, and the entire absence of turnip culture throughout Hungary, owing to the heat of the summers, is very noticeable. Sugar- and fodder-beet (mangold), especially the latter, are grown in large quantities, and take the place of our root crops. Folding sheep on the land is never practised, either in summer or winter, but the whole of the beet and fodder crops are carried to the buildings, there to be cut up for cattle and horses. Clover and lucern are very largely cultivated, forming pastures for sheep, and furnishing a supply of hay. Vetches and oats mixed are very generally used as fodder crops throughout summer, and the damp and rather cold season of 1873 particularly favoured their growth. There appeared usually to be only one sort of wheat, one sort of rye, and one sort of barley cultivated, and these crops covered a large proportion of the country. A good deal of corn is cut green, especially upon peasant-land, to supply fodder during the hot months. Artificial manures are never used, and only once did I see oilcake, or any artificial and extraneous sort of cattle or sheep food. Rape is also a favourite, and magnificent crops of it were to be seen. Oxen are almost universally employed for working the land, and ploughing is generally shallow and imperfect. There is as yet no steam ploughing or cultivating. Turning to live stock, we find the Hungarian ox, the merino sheep, and the woolly Hungarian swine, almost in complete possession of the field. Drilling is extending, and is becoming general on the large estates, as also is reaping by machinery and threshing by steam. Broad-casting, hand-reaping, and treading grain out by horses, are, however, still practised in many districts.

Agriculture without artificial manures and foods, robbed of steam cultivation, and having no great diversity of animals and cultivated plants, loses many of its most interesting points as a study, and hence, after English farming with its multitudinous and important problems, that of Hungary falls somewhat flat.

Rotations.—Rotations of crops are very strictly adhered to in Hungary, and often are made out prospectively for 20 years, and then rigidly kept. In this particular Hungarian agriculture differs from our own, for it is not too much to say that in England the tendency is to slacken the cropping restrictions imposed on tenants. It would be wearisome, and perhaps unprofitable, to give a large number of these rotations, varying as they do in every conceivable manner, from a 3 to an 11 years' course. At Ungarisch-Altenburg, upon the Archduke's estate, no fewer than 36 different rotations are in use, and from the elaborate manner in which this and other subjects connected with scientific agriculture are studied, probably some principle lies at the foundation of each.

Sometimes green crops predominate, and in other cases the rotations are very scourging or severe, indicating very rich land. The following are examples :—

1. Barley.	1. Peas, mixed Fodder.
2. Rye.	2. Wheat.
3. Millet (*Panicum italicum*).	3. Maize.
4. Maize.	4. Barley.

1. Maize, Sugar-Beet.
2. Fodder, Peas.
3. Wheat.
4. Maize.
5. Wheat.

1. Maize.
2. Wheat.
3. Beet (Fodder).
4. Barley or Oats.

1. Millet.
2. Barley or Oats.
3. Peas.
4. Rye with Lucern.
5. Lucern.
6. Lucern.
7. Wheat.

1. Maize.
2. Barley.
3. Rye.

1. Peas.
2. Wheat.
3. Maize.
4. Oats.

1. Sugar-Beet.
2. Barley.
3. Peas.
4. Rye with Lucern.
5. Lucern.
6. Lucern.
7. Wheat.

1. Maize. 2. Oats. 3. Peas. 4. Rye, with Lucern. 5. Lucern. 6. Lucern. 7. Oats. 8. Mixed Vetches and Oats. 9. Wheat. 10. Maize and Oats. 11. Oats and Wheat.

Rotations upon Count John Palffy's estates in Upper Hungary were as follow:—

1. Fallow, dunged.
2. Rape.
3. Wheat.
4. Maize.
5. Barley.

1. Fallow, dunged.
2. Wheat.
3. Maize, Fodder.
4. Barley.

1. Fallow, undunged.
2. Rye.
3. Potatoes and Mangold.
4. Barley or Oats.

One or two fields will also be sown with lucern after the last-named crop of barley.

Mr. Butter, Verwalter at Kœnigsheiden, near Presburg, gave me the following two rotations, as in use upon the estate under his charge:

1. Fallow, dunged.
2. Wheat.
3. Barley.

1. Fallow, dunged.
2. Wheat.
3. Barley.
4. Clover, cut twice.
5. Clover.
6. Maize (Fodder).
7. Barley.

In Lower Hungary, upon the estate Bellye, a common rotation is,—

1. Clean or cropped Fallow.
2. Wheat (Winter Corn).
3. Green Fodder.
4. Barley or Oats (Summer Corn).

Again a 10 years' course is in use,—

1. Fodder.
2. Wheat.
3. Fodder.
4. Oats, with Clover.
5. Clover.
6. Clover.
7. Clover cut and then fallowed.
8. Wheat.
9. Fodder.
10. Oats.

Upon Schwarzwasser estate the rotation followed is,—1st year, Fallow. 2nd, Rye or Wheat. 3rd, Mangolds or Potatoes after the Rye, and Indian Corn after the Wheat. 4th year, Barley. About 2 fields of lucern are kept down. The fallows are seldom dunged for rye, but generally for wheat. The mangolds and potatoes are also dunged.

Lastly, upon Mezöhegyes estate the rotation given me was,—1st year, Fallow, or Fodder Mohar (*Panicum italicum*), Vetches and Rape. 2nd year, Winter Grain. 3rd year, Summer Grain. 4th year, Indian Corn. 5th year, Winter Grain. 6th year, Summer Grain.

Cultivation and Manure.—The richness and depth of the soils over a vast extent of the Hungarian plains points at once to the importance of cultivation. *Deeper and more efficient cultivation* is, in fact, the chief direction in which improvement can be at present pushed, and this shows the immense importance of recent improvements in cultivating implements introduced through the establishment of English firms (see last Report).

The wretched shallow ploughing so constantly seen, especially on peasant properties, shows how much remains to be done; but the advantages of a better system are thoroughly appreciated by the agricultural leaders. On many large estates ploughing 6, 7, and 8 inches in depth is now practised, and the improvement in the crops is in consequence very great.

On the Archduke Albrecht's estate an exceptionally good cultivation exists, owing in a great measure to the introduction of Fowler's steam-plough. On the estate Bellye, in South Hungary (Sátoristye farm), the fields, or rather sections, each of which is 40 acres in extent and square in form, have all been done over twice with steam, and the effect showed itself in the fine and level crops of Indian corn and mangold. The improvement is valued at one-fourth increase over ox-cultivation.

The ordinary cultivation of a bare fallow in Upper Hungary is as follows:—

1st. Plough in spring.
2nd. Plough again later.
3rd. About harvest cart out manure, spread it, and plough it in.
4th. Plough a little less deeply for the seed-furrow.

An old but nearly abandoned system of working fallows was—

1st. To cart out the dung on the stubble (in spring), after finishing barley and oat sowing.
2nd. To plough it in immediately, or to leave it unploughed for some time.
3rd. To plough before harvest.
4th. To plough the seed-furrow.
5th. To sow wheat in September.

The improved system which is now being followed on many farms is—

1st. To plough in autumn 8 to 10 inches deep.
2nd. Plough in the spring to bury weeds.
3rd. Plough again in June or July.
4th. Plough in the manure for seed-furrow.

Manuring.—Mountains of two and three-year-old straw and great heaps of unused dung were formerly commonly seen in Lower Hungary. This wasteful system is, however, fast disappearing; and much care is now taken in order to manufacture manure of good quality. Well-squared-up manure heaps and provision at the best buildings for the proper making of this important product I frequently met with both in Upper and Lower Hungary.

Dung is as yet the only manure valued, and there seems to be no prospect of artificial manures coming into vogue, unless it be in the more northern portions of the kingdom. This is apparently owing to the droughty character of the summers, and the native richness of the land; also the absence of turnip husbandry, which deprives the cultivators of the best opportunity for the application of artificials. The dung is often applied in a dry and strawy condition, and this is especially to be seen upon the peasant land, as I noticed at Talos and other places.

On the other hand, the manure is excellently managed upon many estates, as upon Count John Palffy's farms, where dung-pits are provided at every steading. The squared-up and well-kept manure heaps upon the Archduke Albrecht's estates were most worthy of commendation, as was almost everything else to be seen upon them. The general management upon these estates must not, however, be used as an illustration of the agriculture of the country, as they are decidedly superior. In the matter of dung-management, I met many examples, among which may be mentioned that of Count Alexander Erdödy, near Steinamanger, and of Count Széchenyi, at Zinkendorf, where the steward makes his manure heaps with alternate layers of dung and earth, to which a little gypsum is added. The heaps are well squared up and watered with liquid manure from tanks beneath the heaps. Gypsum is also sprinkled in the cattle-stalls.

H. Benke, steward at Vamosfaln, on the Schütt district, told me that he could only manure his poor land once in ten years; and when a field bearing a light crop was passed, the explanation was that no dung had been applied.

Fodder-Crops.—I was particularly requested to notice "any novelty in the use of green crops used by the farmers where grass is scarce, which might be applicable to British agriculture."

So far as growing forage-crops is concerned, we have not much to learn from Hungarian practice. Attention has already been directed to the cultivation of maize in England, but so far without much success. Its great prevalence not only over Hungary, but also in Silesia and Saxony, even in high-lying districts, indicates considerable hardihood, while the large number of varieties which cultivation has produced encourages the hope that still hardier sorts might be propagated. If maize or Indian corn could be established as a fodder-crop in England, it would, no doubt, be a great assistance to the stockkeeper.

Professor Tormay, of Pesth, writes to the 'Agricultural Gazette,' 1874:—"The number of pastoral herbs that thrive well in the great Hungarian plain is very small. Lucern is the only one on which we can rely in those parts of the plain where the subsoil water lies deep. Red clover and sainfoin do not thrive well. The principal safe and early green forage crop is rye sown early in autumn. When this begins to turn old, the first cut of lucern is ready. After this comes millet or 'Mohar' (*P. italicum*), which gives an excellent fodder for oxen and cows in its fresh green state if not too old; for sheep and horses it makes a capital hay. For pigs we have plenty of provender in the shape of maize and pumpkins."

In the management and preservation of fodder-crops, the Austrians and Hungarians are in advance of English agriculturists. Almost all green food is cut with chaff-cutters and used in the house. On no occasion did I observe sheep or cattle "folded" on fodder-crops. The heat is too great and the green food is too valuable to allow of such a system, and consequently all is brought home, and the greater part is consumed by cattle. It was strange to observe the care with which fodder was treated, and to hear the exact weight per head per day required by a stable of cows or work-oxen.

The system of making "sour-hay" is also well worth the attention of English agriculturists. It is done by digging long graves or trenches, 4 feet by 6 or 8 feet, in depth and breadth, and cramming the green grass or green Indian corn tightly down into them, covering the whole up with a foot of earth. The preservation is complete, and the wetter the fodder goes together the better. No salt is used, and the operation is as simple as it appears in the description. (See Fig. 5, p. 377.)

This sour-hay affords a capital winter fodder, and when cut out with hay-spades, it is found to be rich brown in colour and very palatable to stock. The making of sour-hay is very similar to the process of preserving "pressling," or sugar-beet pulp, which also is stored in long graves until wanted for winter's use.

All fodder and hay for sheep, cattle, and horses are placed at once in their respective stables, and it is seldom that a rick of hay or other fodder is to be seen out of doors. As may be imagined, the lofts over the stock-stables are very commodious (see *Buildings*). Clover, lucern, millet, Mohar and Hirse (millet), are all in very general use as forage-crops.

Sugar-Beet.—The cultivation and manufacture of sugar is not carried on so generally in Hungary as in other parts of the empire. The soil often contains too many salts, and especially soda-salts, to favour the production of the best quality of sugar. At Zinkendorf, near Œdenburg, there is a large sugar factory upon Count Szechenyi's estate, where from 17,000 to 20,000 tons of beet are annually used, and yield 9 to 10 per cent. of their weight of sugar. The quantity to which they are liable for excise duty is 943 cwt. daily, and the work of sugar-making is continued from the beginning of September to the end of February. They grow a large quantity of sugar-beet, and purchase it at the rate of 1*s.* 1*d.* to 1*s.* 2*d.* per cwt., delivered at the factory, and the pulp, which amounts to 17 per cent. of the beet, is given back. There are at the present time only twenty-six sugar-factories in Hungary.

Pasture Land.—Pasture land is fast diminishing in Hungary. According to statistics collected in 1853, the following proportions of the productive land of the country were found to exist:—

Arable land	40·43	per Cent.
Vineyard	1·61	,,
Meadow and garden	13·87	,,
Pasture	17·19	,,
Wood	26·19	,,

These relations have been much altered of late years. Since the river courses have been regulated, hundreds of thousands of acres, which were formerly lying as pasture or reeds, have been laid dry and converted into the richest arable land. Also thousands of acres of sound pasture lands have been broken up by the plough. I was constantly meeting with instances in which pastures had been broken up, and there is good reason for supposing that more and more land will be devoted to corn-growing. The system of managing these pastures is bad, and consequently they become poorer yearly. Although 1873 was a good year for pastures, I was frequently struck by their poverty, especially at Bösing and near Presburg. They are unenclosed, and constantly grazed by sheep and cattle, which, being invariably driven home at night, carry the food-constituents to the manure heap, and from thence it passes to the arable land. In Upper Hungary much of the pastures ought to be broken up, as the soil and climate are not suitable for grass, and they would evidently be more profitable as arable land. The Hungarian agriculturists value their pastures as being well adapted for the growth of fine wool; but as this commodity is likely to give way to longer and coarser wools, there will be less inducement to preserve these poor grazing grounds.

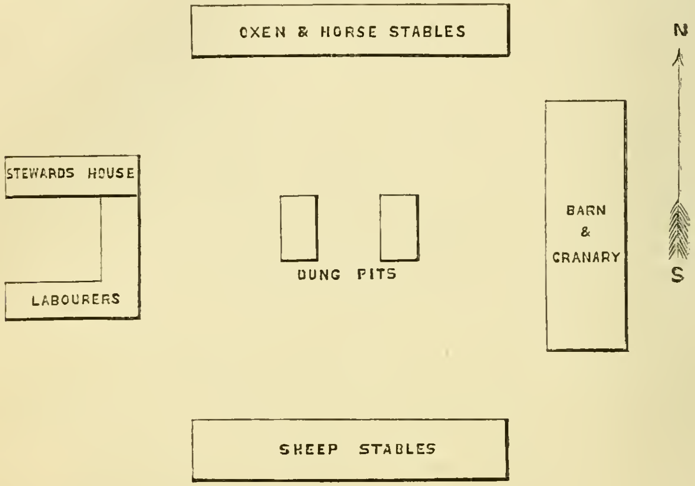
In other localities natural pastures of better quality were observed, and I must especially notice a fine tract of 1600 acres in extent, situated at Tarnok, in the midst of a singularly rich district of the Presburg Comitat. It is divided into two parts by a fine avenue of poplars, and further, into square portions, of from 8 to 16 acres, by rows of trees. One or more of these portions of meadow is allotted to each district of the Palffy property.

Again, in Lower Hungary, I shall never forget the wooded pastures on the sides of the Danube, between Lak and Essegg. They may generally be described as wild in the extreme, traversed by almost impassable roads, and grazed by fine herds of cattle. In my notes upon the Bellye estate I find the following passage:—"Drove down to a large rough pasture encircled with woods, where we saw the 'Menes' or stud of horses attended by the csikos and his boy. The attendants are careful to keep the horses quiet, as when they once begin galloping they are very unmanageable. Then on to inspect a fine herd of young bulls, and leaving them we jolted over very rough ground, requiring careful driving, to the Danube side and along the top of the embankment for some time. Afterwards drove into the wooded pastures through morasses overhung by trees, the air resounding with the croaking of frogs resembling hounds in full cry. The steward who accompanied me shouted in vain for the herdsman, but after an hour's driving we came upon him suddenly with his gulya or herd of cows." Also, "in the middle of the woods came upon a pig colony attended by herds," who constantly remain with them day and night, summer and winter. The swine are sheltered in summer in rough sheds, and in winter remove to a more permanent steading. The land was in a natural state, and the grass was frequently in tussacs or hassocks, but evidently capable of great improvement. No backwoods of America could be more desolate, and for four hours I saw no trace of human habitation.

Farm Buildings.—The general scheme of the farm-buildings of Hungary is pretty uniform. They form a spacious quadrangle, and are generally arranged as shown in the accompanying figure (next page), illustrating the Maholány buildings on Count John Palffy's estate.

At Tarnok on the same estate there is a fine granary with spacious cart-sheds and store-houses beneath. The granary is furnished with two floors and a seed floor in the roof. An ingenious sack-lift is used for taking up the grain to the highest floors. A bullock-shed occupies three sides of a square, and is fitted for the accommodation of 120 cows in a double row, with side space for calves. The building is 44 feet wide and 240 feet long.

Fig. 3.—*General Plan of Farm-Buildings at Maholány in Upper Hungary.*



The Hungarian bullock-stables are often worth inspection. They are spacious, and roofed by stone arches springing from fine pillars which extend along the centre of the building. These handsome, whitewashed, vaulted buildings reminded me of the crypt of some cathedral, and appeared equally permanent. When filled with a double row of handsome Hungarian oxen standing head to head, their fine horns forming a central avenue, the effect is very imposing. Such is the bullock-stable at Kœnigsheiden.

The sheep-stable is a long rectangular building divided by hurdles for the different sections of the flock, and furnished with pens for rams. Some of these stables are L shaped, and are of great size. One visited at Harkányi estate (Tokay district) housed easily 780 lambs, and was 100 feet long by $22\frac{1}{2}$ feet wide; 638 ewes were seen resting at mid-day in another shed on the same farm.

The farm-buildings upon the Archduke Albrecht's estates, both in Upper and Lower Hungary, rival anything of the sort in England for the grandeur of their general plan, the excellence of their construction, and the elaboration of their internal fittings. Guide-ways and turn-tables carry trucks of both food and manure to their destination, and every contrivance of modern agriculture is adopted. Such buildings must not, however, be thought to represent Hungarian homesteads in general, which are, in the majority of cases, arranged as in the above given figure.

Live Stock.

Cattle.—The cattle of Hungary have been already described (p. 31). Statistics obtained in 1870 showed that there were 15,077,000 cattle in the kingdom, and this was a diminution of 6 per cent. upon the number reported in 1857. That cattle are diminishing in Hungary is undoubted, and the cause is easily found in the breaking up of the natural pastures of the country, as already noticed. Another cause assigned, is that of the frequent occurrence of rinderpest, which has not only destroyed many cattle, but, especially among the peasants, caused oxen in many cases to be given up for horses. Thus, while cattle have diminished in the above-named ratio, horses have increased (1857–70) 3 per cent. I often inquired if many oxen were sold off the estates visited, and the universal answer was that they could scarcely breed a sufficient number to supply themselves with draught animals. There is a considerable interchange of stock between the various provinces of the Austro-Hungarian empire; and Hungary, no doubt, supplies the countries of Bohemia, Moravia, and Silesia, with many superior draught animals. Also the Vienna market is supplied to the extent of one-half by Hungarian fat cattle. It does not, however, follow from this that Hungary can be looked to for a supply of cattle for the English market, and I think we must come to the conclusion that, for the present at least, we must look elsewhere.

Herr von Kenessey, secretary to the Minister of Agriculture, in Pesth, sent me the following tables of the comparative value of Hungarian exports and imports of cattle during three recent years.

Imports.

	Florins.
1868	6,140,540
1869	4,425,570
1870	4,014,310

Exports.

1868	3,410,034
1869	6,258,694
1870	3,468,260

He had no later statistics.

Baron Max Kübeck, *Conseiller de Legation*, Vienna, obtained some information from Professor Wagner, of the Hungarian

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Ministry, which he forwarded to me. Hungary during late years has exported 50,000 head of cattle per annum, and about 250,000 cwts. of meat and grease (probably lard and fat). About half the supply of fat cattle for the Vienna market comes from Hungary. The markets for Hungarian draught-oxen are principally found in the Austrian provinces of Bohemia, Silesia, Moravia, and Lower Austria.

Baron Kübeck also supplied information on another point of interest, namely, the cattle plague. He wrote as follows:— "The cattle plague (rinderpest) shows itself every year in Hungary, but generally only in a sporadic manner, without claiming many victims. The quarantine has lately been most excellently organised between Podolia, Russia, and Hungary, so as to cause us to expect with all certainty the entire removal of the evil, the more so as the cradle of this disease is in more eastern countries than our own. The cattle plague is, however, also acclimatized in the more western countries of Europe. It does not now appear with its former virulence, and is not so fatal in its attacks. The western races of cattle, as well as such eastern ones as the Hungarian and Podolian, have become hardened against and less liable to this plague." Further, with respect to the method employed for effecting the arrest of the disease, the Baron writes:—

"A continuous quarantine against the east; prohibition of any export of cattle during the existence of the plague; quarantine in each individual district (comitat) of the country in which the plague appears. The strictest and most energetic measures are also used by the official executive officers in keeping the quarantine."

Working Oxen.—One of the pleasantest sights in Hungary is the long teams of majestic oxen either ploughing or drawing the Hungarian waggon over the rough roads.

I have seen twenty-three teams, of four oxen each, ploughing in one field. One ploughman guides both plough and oxen without the assistance of reins or a driver, and all is done with the voice and whip. In Upper Hungary I saw oxen engaged in carting hay home from a distance which would only allow one journey to be made in the day.

Sheep.—A description of the Merino sheep will be found, together with remarks upon merino wool, in my Report upon the Vienna Exhibition. The Merino sheep may be said to occupy all the sheep-stables of Hungary, if we except a few Southdown crosses, seen upon the estates of the Archduke Albrecht and Count A. Erdödy. They are housed in sheep-stables every night in summer, and day and night in winter. In summer they are also housed during the hot hours of the day. They graze on the natural pastures, and are never folded on forage crops as in England. Neither must they ever be out in the rain, and on the approach of a shower the shepherds hurry them home. They follow the shepherds like dogs, both in and out of their stables, and he leads them to the pastures in true oriental style.

In April the flocks are classed according to the quality of their wool, and the examination is conducted upon the principle already explained (p. 41). There are two lambing seasons; the first in April and May, the second in August and September. Lambing takes place under cover, and the ewes are good mothers, but middling milkers. Shearing takes place in May, and is done by women, who shear in a shearing-house with strong scissors. Washing is very carefully attended to, and is done in cold or in hot water. In cold washing they are dipped two or three times, and then allowed to stand and sweat to soften the dirt. They are then washed with the hand and swum through clean water. In hot washing they are first dipped two or three times in cold water to soften the dirt, then they are washed in a large tub in warm water with soap, and lastly douched in cold water. Some flock-masters are now clipping their sheep dirty, and selling the wool to the factory washers, who wash the wool and preserve the potash contained in it. The lambs falling in the spring are washed and clipped in August, and yield about ¾ lb. of wool.

As wool is the principal object in keeping sheep, the wethers are kept on to ten and even thirteen years old. The old-fashioned practice, fifteen to twenty years ago, was to feed in winter upon coarse hay and straw. Mangold-wurzel is now generally used for breeding-ewes, and this is pulped and given mixed with hay and straw-chaff. The stock or store sheep at the present day only receive mangold upon the most advanced estates. Corn or cake is never given unless to rams, and occasionally to lambs and culls which are fatting.

The cull sheep are run on the stubbles, and are then sold to the butchers at low prices, being only culled on account of extreme old age. This is the course upon less advanced estates. Where a more enterprising management exists, and especially where there is a distillery, the culls are fed through the winter upon wash and mixed meals, and are sold fat in the spring either rough or shorn. Examples will be presently given of sheep-feeding under the best circumstances.

Upon large estates the sheep flock is divided into sections, according to quality. Thus, for example, on Count John Palffy's estates the fourth-class flock is always kept on two particular districts; the third, second, and first classes also have their localities, as also the Pepenier or highest quality of flock. In April, when the sheep are thoroughly inspected, any bad or worn-out sheep are culled, and any excellent sheep are promoted into the flock above them.

Meat Manufacture.—Oxen are worked up to 13, 14, and even 17 years of age, and are then fattened and sold. Sheep are shorn until they are 8, 10, and even 13 years old, and are then turned into inferior mutton. The oxen are essentially workers, and the sheep wool-producers, so that superior beef and mutton can scarcely be looked for under such conditions.

The cattle are highly esteemed, and are not likely to be supplanted by imported breeds for many years to come. Sheep, on the other hand, are declared to be unprofitable (see last Report), and require to be crossed with English races.

Although the quality of the animals to be fatted is not usually high, I found great attention was given to the subject of fattening stock, and the utmost precision observed in mixing the foods and apportioning them to the various animals.

The following instances of what I saw will best illustrate the scientific accuracy with which cattle and sheep are fattened on a Hungarian estate.

At Talos I found 259 sheep put up to feed. In winter they had daily received 5 lbs. of potatoes and mangolds mixed, about 3½ lbs. of hay, and summer and winter straw besides. In March and April this food was continued, with the addition of one pint of oats, and in May one pint of Indian corn was substituted for the oats. After May 20th they had received a pint of Indian corn with clover-hay in the morning and barley- or oat-straw at night. After June 10th they received the same food with the addition of one and a quarter pint of oats. A complete list of the weights of all the sheep during various periods of the fattening process was handed to me. The general result was that the sheep weighed, alive, from 86½ to 150 lbs., or, on an average of 259 head, 105 lbs. each. Of this 105 lbs. one-third is said to be offal. These sheep were sold fat at 27*s.* each.

Thirty-seven oxen, of from 13 to 17 years of age, were fat and ready for sale. They had been receiving, per head per day, from the commencement of the fatting period the following foods :—

In January—
37 lbs. of mangolds and potatoes in equal proportions,
2½ lbs. of rape-cake and chaff,
8 pints of tail barley-meal.

In February the same food was continued.

In March they received—
30 lbs. of mangolds and potatoes,
2½ lbs. of rape cake and chaff,
12 pints of barley-meal.

In April and May the meal was reduced to 10 pints, and Indian corn took the place of barley-meal; also 6 lbs. of hay was given at mid-day. In June, clover-hay and 12 lbs. of Indian corn, $2\frac{1}{2}$ lbs. of rape-cake, and chaff were allowed.

The total weight of these 37 Hungarian cattle was 489 cwts., or 13 cwts. 22 lbs. each, and the heaviest ox weighed 15 cwts. Of this, 40 per cent. was supposed to be offal. The cattle are fed three times in the day, and all food is weighed out of the store. Even the working oxen and all the other cattle have their portions weighed and bound up separately.

Salt at the rate of 1 oz. per head per week for sheep, and 2 ozs. per head per week for cattle, is allowed.

At Ungarisch-Altenburg fatting cattle were noticed upon a liberal diet, of which the following are examples:—

$12\frac{1}{3}$ lbs. of oats,	$3\frac{3}{4}$ lbs. pea-meal,
$1\frac{4}{5}$ lb. of pea-meal,	$3\frac{3}{4}$ lbs. oats,
$1\frac{4}{5}$ lb. of mixed meal,	$3\frac{3}{4}$ lbs. mixed meals,
$1\frac{1}{5}$ lb. of oil-cake,	$1\frac{1}{5}$ lb. oil-cake,
$1\frac{1}{5}$ lb. malt-combs,	$1\frac{1}{5}$ lb. malt-combs,
With cut hay-chaff.	With green food.

Calves of from 6 to 12 months old were receiving—

$2\frac{1}{2}$ lbs. of pea-meal,
5 lbs. oats,
$1\frac{1}{5}$ lb. malt-combs,
With green fodder.

The oxen were increasing about $2\frac{1}{2}$ lbs. per day upon an average. I was also informed that half-bred Southdown and Merino wethers had been sold fat at one year old for 33*s*. each.

Such cases might be multiplied with profit, for they are in themselves instructive. Since my object in introducing them is merely to give an idea of the system pursued, they seem sufficient for their purpose.

Milk Production.—In a well managed cow-stable a little blackboard hangs behind each cow, upon which her name is inscribed, and underneath the amount of milk she last yielded. A large blackboard, ruled for each day in the week, and for each cow in the byre, gives the aggregate daily yield of milk.

The beautifully arranged cow-byres on the Archduke Albrecht's estates were enlivened by the presence of a multitude of swallows, which are encouraged in order to destroy insects.

Allgau cows at Altenburg were receiving—

$2\frac{1}{2}$ lbs. rape-cake,
$1\frac{4}{5}$ lb. Indian corn,
$1\frac{4}{5}$ lb. wheat bran,
60 to 74 lbs. green fodder.

And this yielded rather more than 7 quarts (6 mass) per day of

TABLE I.—Showing the AVERAGE PRODUCE per ENGLISH ACRE in BUSHELS, TONS,

NAME OF ESTATE.	POSITION OF ESTATE.	BUSHELS PER ACRE.						
		Wheat.	Barley.	Oats.	Rye.	Maize.	Rape.	Other Crops.
Tarnok	Near Presburg	30	37	50	30	17	27	13½ H.* 13½ M.†
Acs	8 to 10 miles W. of Komorn ..	18 to 42	23 to 46	..	16½ to 30	21 to 46	..	..
Kœnigsheiden ..	Near Presburg	28	39	44	30½	20	..	..
Lower Pudmeritz	N.W. Hungary	12 to 20	12 to 22	12 to 20	..	17 to 30	..	..
Boleraz	N.W. Hungary	17	34	25	20	..	..	..
Maholány	Near Presburg	28¾	39	44	30½	20	..	..
Szillard	N.W. Carpathians	22	23	25	..	40 to 50	..	..
Szuha	N.W. Carpathians	30½	13½	10	24	..	..	..
Talos	Near Presburg	30½	44	60	27	34	..	..
Csicso	Komorn	13½	25	34	..	..	20	..
Zinkindorf ..	Œdenburg ..	30½	40½	45½	23½	50¾	..	..
Babolna	Komorn	19 to 26	24 to 31	26 to 33	..	..	..	..
Wittendorf ..	Steinamanger	25⅓	35½	51	23½	34	..	..
Tot-Megyer ..	Pesth Plain ..	23	33	50	25	28½	26	..

LOWER

Ötvönös	Arad	..	..	..	..	..	..	..
Mezöhegyes ..	Csanad	18	28½	26	19	..	26	17¾ H.* 17¾ M.†
Harkányi	Tokay	18 to 20	23 to 25	23 to 30½	18 to 20	20 to 30	13½ to 30½	..

* Hirse, *Panicum italicum.*

and Cwts. upon various Estates visited in Upper and Lower Hungary.

Tons and Cwts. per Acre.						
Mangolds.	Sugar-beet.	Hay.	Lucern Hay.	Potatoes.	Other Crops.	Quality of Soil.
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
11	..	3	2½	1	..	Pesth Plain, rich.
7 to 9	..	¾ to 2	..	2⅗ to 5	..	Schütt District, various.
7½ to 10	..	1¼	..	..	..	
10 to 12½	..	½ to 1	..	..	..	Hill Farm.
6¼	..	..	..	..	1 Maize dry	Hill Farm.
7½ to 10	..	..	..	4⅘	1¼ Sainfoin	Schütt, various.
5 to 7½	..	..	10 to 20 cut green	..	..	High mountain.
..	..	¾	..	..	..	High mountain.
15	..	1½	2	7½	..	High lying, but rich.
..	10	..	1½	..	..	Sandy.
..	13	..	..	..	..	Rich.
..	..	..	..	..	..	See page .
15	..	1½ (in two cuts)	..	4⅘	8 tons of green clover	Very rich.
13	10½	21 cwt.	28 cwts.	..	17½ Sainfoin hay	Very rich.

HUNGARY.

..	..	..	..	..	..	
..	..	1½	2½ to 3	..	..	Very rich.
10 to 17½	..	..	1½ to 1¾	..	..	Rich, but hilly,

† Millet, *P. miliaceum*.

milk, on an average for 203 cows in milk, exclusive of 13 dry cows.

Dutch, Bernese, and crossed cows at Casamir were receiving—

> $1\frac{4}{5}$ lb. oil-cake,
> $1\frac{1}{5}$ lb. mixed Indian corn and barley-meal,
> $1\frac{4}{5}$ lb. bran,
> 44 to 50 lbs. green food,

and were giving 6 quarts per day per milking cow.

Pinzgau cows at Zinkendorf were giving an average of $8\frac{1}{2}$ quarts per day on ten head, and a good Pinzgau cow was said to yield 10 to 11 quarts per day throughout the year except three or four weeks when dry. They were receiving $3\frac{3}{4}$ lbs. of tail barley-flour mixed with wheat and barley-chaff, and 5 or 6 lbs. of hay with sugar-beet pulp. I also heard of one Swiss cow at Zinkendorf that gave 17 to 20 quarts per day for a short time.

At Bellye I found 64 Dutch cows giving an average of 8 quarts per day. Some cows had yielded (June 28th) 17 quarts in the day, others 4 to 6 quarts. The crossed Shorthorns and Dutch cows on the same day had in no instance exceeded $8\frac{1}{2}$ to 9 quarts, and were said to be worse milkers than the pure Dutch. As a set-off, they require less food in the proportion of 6 to 4.

All the cows are fed from a mixture which is composed of oil-cake, bean-meal, millet, and bran, mixed and ground together, and from the resulting heap, food is supplied to each cow-stable.

The Dutch cows consume from $7\frac{1}{2}$ to 10 lbs. of this mixture, and 60 lbs. of green fodder; the half-bred Shorthorns and Dutch only consume 5 lbs. of the mixture and 100 lbs., or even 120 lbs., of green food.

Productive Power of the Soil.

Limited space obliges me to confine myself to a tabular statement regarding this important point. The preceding Table (I., pp. 360, 361) is constructed from answers made to a printed schedule of questions left at every estate visited. An idea has already been given of the crops usually grown in Hungary, which will, with the help of a few more statistics, be rendered more distinct. It will be noticed that upon some of the richest land, such as that at Tarnok, Wittendorf, Tot-Megyer, and Mezöhegyes, the produce is far below what the soil is capable of growing.

Head of Live Stock.—Details as to the number of cattle, sheep, and horses are given in the case of several large estates. The accompanying Table (II.) further illustrates this point, and also shows the large proportion of arable land which generally exists in Hungary. The figures relating to the area under cultivation, wood, reeds, pasture, &c., as well as those relating to the live stock maintained were all contributed by the

TABLE II.—Showing the ACREAGE and HEAD of LIVE STOCK maintained upon HUNGARIAN ESTATES.

NAME.	Total Area.	Arable.	Meadow and Pasture.	Wood.	Waste.	Vineyard.	Reeds.	Pond-, Buildings, Roads, &c.	Horses.	CATTLE. Bulls.	CATTLE. Cows.	CATTLE. Fatting.	CATTLE. Working Oxen.	CATTLE. Stores.	SHEEP. Rams.	SHEEP. Ewes.	SHEEP. Lambs.	SHEEP. Wethers.	Swine.
	Acres.	Acres.	Acres.	Acres.	Acres.														
Tarnok	3,430	1,390	1983	..	58	..	..	..	10	6	60	12	[illegible]	139	..	..	1050	1060	..
Kœnigsheiden ..	2,500	1,700	620	127	..	..	..	..	19	3	21	16	72	62	165	1,652	702	360	..
Lower Pudmeritz	1,409	1,329	70	..	10	..	..	..	12	..	..	8 to 10*	44	..	..	600	400	300	..
Boleraz	2,170	2,014	240	320	50	..	..	..	12	..	..	10 to 12*	64	..	107	1,050	500	..	..
Maholány	2,295	1,440	480	365	..	..	..	..	10	..	..	9*	56	..	130	1,180	921	612	..
Szillard	4,900	2,114	1100	1580	75	1	..	..	22	..	..	..	70	..	309	1,776	789	509	..
Szuha	2,000	1,256	208	534	..	2	..	..	12	..	..	Culls	44	..	..	1,095	387	548	..
Talos	8,038½	4,931	1010	1235	186	..	8	660	50	4	40	48	20[illegible]	125	100	2,600	2000	2200	..
Zinkendorf ..	3,014	2,814	170	..	..	..	..	..	16	2	20	..	88	100	150	1,500	1000	1400	..
Wittendorf ..	1,418	1,080	112	140	86	..	..	..	12	2	20	48	44	28	40	750	200†	..	..

LOWER HUNGARY.

NAME.	Total Area.	Arable.	Meadow and Pasture.	Wood.	Waste.	Vineyard.	Reeds.	Pond-, Buildings, Roads, &c.	Horses.	Bulls.	Cows.	Fatting.	Working Oxen.	Stores.	Rams.	Ewes.	Lambs.	Wethers.	Swine.
Ötvönös	8,532	7,110	1137	55	..	..	..	..	28	2	150‖	160	200	..	40	1,627	1142	1277	1060‖
Harkányi	10,812	7,420	2756	530	106	27	5	..	70 to 80	5	240 to 260	..	340	2 to 300		4500 to 6000			600 to 700
Magocs	34,492‡	20,953	6483	785	1771§	0	113	..	226	..	..	120	600	..	410	11,800	7100	5460	1013

* Culled working oxen.
‡ 5264 acres are let to tenants.
† The surplus ewes and all the wether lambs are sold as fat at good prices.
§ Including roads and buildings.
‖ Servants' stock.

resident stewards. There are no doubt discrepancies, and probably occasional omissions, but the Table may be trusted to give a fair idea of the stock kept upon ordinary Hungarian estates. In all the cases cited, Merino sheep and Hungarian cattle were kept.

Implements.

Throughout Hungary there is a great and increasing demand for English implements. In my Report upon the Vienna Exhibition, I pointed out the superiority of English workmanship over that of Continental makers in general. The impression conveyed by the collection of exhibits in Vienna was fully borne out by subsequent travel, and there is abundant evidence in the present Report that English and American implements are thoroughly appreciated in Hungary. The introduction of English ploughs, through Messrs. Clayton and Shuttleworth, took place in the year 1861; and the use of reaping-machines, as has already been mentioned (see Kis-Szalás), dates from the International Exhibition in London, 1851. Messrs. Clayton and Shuttleworth were the pioneers in both ploughs and heavier implements, such as steam threshing-machines; and Garrett, and Priest and Woolnough, are as well known in Hungary as in England.

The Hungarian peasant is certainly less enlightened, and, for the most part, still uses the old-fashioned native implements. He sows his corn broadcast, although an exception to this rule was observed at Ungarisch-Altenburg; and threshes out his corn with horses. Since one-half of Hungary is possessed by peasants this is important; but enlightenment is gradually spreading from the great estates downwards to the smaller ones, and every year brings changes for the better. The subject of implements is so connected with the general agriculture of the country that it scarcely seems advisable to collect all the observations made upon them under one head. I must therefore refer the reader to the entire Report as containing information upon the subject, as also to the Report on the Vienna Exhibition in the earlier pages of this volume.

Tot-Megyer.

This fine estate, the property of Count Alois Karolyi, lies on the left bank of the Waag, which divides it from the Schütt Island. It is most conveniently reached from Vienna by booking to Tot-Megyer Station, on the Vienna and Pesth Railway. The estate comprises 22,770 acres ($16{,}035\frac{317}{1600}$ jochs), divided into seven districts, the chief of which is Tot-Megyer proper, with its handsome mansion, clean, pretty village, and commodious houses and offices for the officials of the estate. The staff comprises a hofrichter or head-steward, rent-meister, engineer, book-keeper, cashier, and sheep-flock verwalter at Tot-Megyer; and in the seven districts there are 7 verwalters, 8 adjunckten, 1 doctor of medicine, and 1 veterinary surgeon. There are also a pretty church and parsonage, a good school, and a casino, where the stewards meet and enjoy themselves in the evening.

The stewards live apparently very comfortably, having good commodious houses, with out-buildings for their cows and pigs, as well as for a pair of good horses and carriage, for taking them over their wide-lying farms.

The farm-buildings at Tot-Megyer are very fine, and comprise stables for oxen, horses, stud-horses, and foals; feeding-byres and servants' lodgings. These form a large square; and there is also a spacious implement-shed behind the cottages.

The sheep stables are on a large scale, and form a separate square, appropriated to ewes, lambs, and rams.

The workshop comprises accommodation for blacksmiths and wheelwrights on the ground-floor, and for fitters, turners, carpenters, and saddlers above. Thus all the repairs of the estate are done at home, and many new implements and machines are also constructed on the estate.

After inspecting the buildings we drove over the home-farm, passing through a fine alley of trees, on either side of which extended regularly laid out fields of black, free-working soil, which became heavier as the Waag was approached. Next the river are very extensive pastures and meadows, separated from the arable land by a dyke or bank, to prevent the water from flooding the crops when the snow melts upon the Carpathians.

Herds of fine Hungarian cattle, and flocks of 400 and 500 ewes, were noticed; and also good crops of cereals, and espepecially of barley. Sugar-beet was also seen for the first time since I had entered Hungary. It is sown in rows 16 inches apart, and singled to 5 and 6 inches between the plants. After singling and horse-hoeing, the plants are earthed up over the tops of the roots with 2 inches deep of soil. On this estate the beet is sold to the sugar factory at Surany, which is the largest in Hungary. The pulp, which weighs 20 per cent. of the entire sugar-beet, is returned as fodder. On driving to Ondroho, one of the districts of Tot-Megyer, I had the opportunity of contrasting the farming of the estate with that of the adjoining peasants; and, as was usually the case, the comparison was much in favour of the former. The same flat character of country was still preserved, and the acacia-bounded drives continued to form a feature as we passed the district of Logoshalma.

Here we found a spacious farmyard, enclosed by the usual offices of a Hungarian farmery: the ox and horse stables, sheep stables, servants' houses, and granary. In an old distillery, forming a portion of these buildings, I witnessed the style in which the Slavonians, who come to assist in harvest, are housed. A large room was littered with straw, and around the margin reclined many fine-looking slovaks, both men and women, dressed in their peculiar and picturesque garb. Again, driving forward, I once more found myself amid regularly laid out square fields, bearing splendid crops, or pastures in which fine merino lambs grazed up to their eyes in sainfoin, but with no hurdles. There is not a hurdle to be seen in Hungary, not a fence nor a gate. It is impossible to convey a correct impression of such an estate as Tot-Megyer. Its flatness, richness, and vast extent, bounded by no hedge, gives it a character difficult to realise in England, except upon the marsh-land of the Eastern Counties. The following facts regarding it were supplied by the head steward, who was exceedingly hospitable and courteous.

The entire estate contains,—

Acres.		Jochs.	
11,777	=	8,293 $\frac{90}{1600}$	arable land.
3,296$\frac{1}{2}$	=	2,392 $\frac{317}{1600}$	pasture ,,
4,646$\frac{1}{4}$	=	3,271 $\frac{1322}{1600}$	meadow ,,
30$\frac{1}{3}$	=	21 $\frac{536}{1600}$	vineyard ,,
917$\frac{1}{2}$	=	645 $\frac{152}{1600}$	waste land, comprising roads.
1,550	=	1,093 $\frac{965}{1600}$	wood.
49	=	34 $\frac{1008}{1600}$	reeds.
304$\frac{1}{2}$	=	213 $\frac{1505}{1600}$	park, gardens, &c.
99$\frac{1}{2}$	=	70 $\frac{142}{1600}$	let to tenants.
22,669$\frac{7}{12}$	=	16,035 $\frac{317}{1600}$	Total estate.

The rotations followed upon the arable portion are of two kinds—a five and a ten years' course. They are as follow:—

I.	II.
1. Fodder Vetches, dunged.	1. Rape, dunged.
2. Winter Wheat.	2. Winter Wheat.
3. Sugar-Beet.	3. Sugar-Beet and Mangold.
4. Barley.	4. Barley.
5. Oats.	5. Winter Rye.
	6. Indian Corn, dunged.
	7. Lucern or Sainfoin.
	8. Ditto.
	9. Ditto.
	10. Ditto.

In some parts of the estate, according to circumstances, a freer system of cropping is adopted.

The whole of the estate is cultivated by means of 186 horses and 400 working oxen. The crops are sown entirely with Garrett's drills. English reapers, Clayton and Shuttleworth's threshing-machines, and English implements, are in general use.

Three ploughings are usually given for rape and for sugar-beet, and two ploughings are given for wheat, rye, and maize.

The average crops are stated to be as follow :—

	Austrian Metzen.		English Bushels per Acre.
Rape	22	per joch	26
Wheat	20	,,	24
Rye	21	,,	25
Barley	28	,,	33
Oats	42	,,	50
Maize	24	,,	28½
			Cwt.
Hay	21	Vienna centner	21
Sugar-beet	300	,, ,,	300
Mangold	380	,, ,,	380

Maize, cut green	60	cwts. of dry produce.
Lucern	41	,, ,,
Sainfoin	25	,, ,,
Red clover	32	,, ,,

The entire live stock upon this vast area was as follows :—

	Horses.
Stallions	5
Mares	96
Foals	150
Other horses	95
Total	346
	Cattle.
Bulls	5
Cows	77
Work oxen	400
Calves	60
Yearlings	64
2-year-olds	47
3-year-olds	61
Fatting	73
Total	787

	Sheep.
Rams	569
Ewes	7,790
Lambs	4,594
Yearlings	2,630
Wethers	5,890
Total	21,473
	Swine.
Boars	51
Sows	117
Suckers	657
Stores	644
Total	1469

Kis-Szalás.

The estate of Kis-Szalás offers, from its isolated character, a noteworthy example of a Hungarian *puszta.* It lies 14 miles north of Maria-Theresiopel, and occupies a position midway between the Danube and the Theiss. It is the property of the Countess San Martino and the Baroness Puthon, and is at present under the management of Herr Samuel Nagy, to whom I am greatly indebted for his hospitality and information. The estate comprises nearly 38,000 English acres (35,800 H. jochs),* and consists of black and grey sandy soil of 9 to 18 inches in depth, and varying in tenacity, with a subsoil of sand and gravel. The entire tract is divided as follows:—

	Acres.
Arable	18,550.
Pasture	7,420.
Meadow	1,166.
Unproductive	3,180.
Woods	7,420.
Reeds	212.

The quality of the arable land is further indicated by the yield of crops. Wheat yields 20 bushels, barley 27 bushels, and oats 30 bushels per acre, on an average; and they produce 24 cwts. of hay, 5 tons of potatoes, and $12\frac{1}{2}$ tons of mangold, per acre.

The entire stock maintained upon this large extent of land was, at the time of my visit, as follows:—

200	Horses.
15	Bulls.
140	Cows.
500	Working oxen.
120	Calves.
70	Yearlings.
70	2-year-olds.
60	3-year-olds.
300	Fatting oxen.
1215	

500	Rams.
12,500	Ewes.
4,500	Lambs.
8,900	Wethers.
26,400	

Reckoning five sheep as equivalent to one cow or bullock, 1215 cattle are equal to 6075 sheep. If this number is added to the 26,400 sheep, there is a stock equivalent to 32,475 sheep upon 25,600 acres of productive land—an amount which may compare favourably with the stock upon many an English farm.

An offer of 3000 acres of this land was made to a tenant a few years since at 8*s.* per acre, and it would now be worth 14*s.* to 16*s.* per acre. To the owners it returned a revenue in 1870 of 18,000*l.*, or just about 10*s.* an acre all round; and in 1872 it returned 9000*l.*, or 5*s.* per acre. This estate is surrounded entirely by a belt of sandy desert, averaging about six English miles across. It may, therefore, be viewed as an isolated district,

* 1 Austrian joch = 1·4223 English acre.
1 Hungarian „ = 1·0667 „
1 Metze = 1·6918 English bushel.

the entire population and industry of which is under the control of the stewards of the estate. I ascertained that the population, all of whom are employed on the estate and its breweries, distilleries, &c., amount to 1900 persons, or 5·25 to the 100 acres.

At the time of my visit (July 3rd and 4th) harvest was commencing. Splendid fields of wheat, of 150 acres and upwards in extent, were inspected, and a field is cut without difficulty in two days. They had at that time 310 pairs of reapers engaged, and most of the corn was being cut by hand.

I saw 140 fatting oxen in one byre, which were receiving 4, 5, or 6 lbs. of Indian corn each, according to their size and condition, 5 to 6 lbs. of hay, and as much draff from the distillery as they could drink. The head steward estimated the cost of the food at 1*s.* 7½*d.* per day, and the value of the meat produced at 1*s.* 5*d.* Therefore the dung cost him 2½*d.*, and this was thought satisfactory. These cattle were increasing at the rate of 2 lbs. per day. There were in all, at the time of my visit, 246 fatting oxen, and 150 more will be fatted in winter.

At the central homestead is a distillery, where 340 gallons of spirit are made daily; and a mill, with four pairs of stones, worked by a 60-horse power engine.

The following is the substance of a note communicated to me by Mr. G. T. Yull, who has known Kis-Szalás for many years:—

No great reform took place in Hungarian agriculture before 1851. At the Exhibition of 1851, in London, the show of agricultural implements attracted the attention of Hungarian visitors, and by the year 1852 English threshing-machines, reapers, ploughs, harrows, and cultivators, were at work on the extensive plains of the Danube, Theiss, and Drave. I was employed as steward on this estate in the years 1855–9.

Szegadin, thirty miles distant, was at that time the nearest railway station, and the roads were (and are to this day) exceedingly bad, being very dusty and sandy in summer, and mud up to the axles of carriages during the winter. There is no material for road-making over the entire plain, and this made—and still makes—communication very difficult, except in frost and snow, when sledges are used. At that time the stock of implements was very poor, and especially of those used in the cultivation of the land, and all were made of wood. Drills were quite unknown. Reform commenced by the introduction of English and other improved cultivating implements, such as Garrett's drills. The automaton reaper, from Garrett's, was indeed on the estate, but was not used. The slovenly system of harvesting led to the purchase of twenty of Baron Ward's reapers, made upon Hussey's principle, in 1857. Each machine cut with a 7-foot knife, and was worked by four oxen, two men, and one boy, and cut, on an average, ten acres per day.

Garrett's drill, horse-hoe, and the ridging-plough, were all found exceedingly useful in the cultivation of Indian corn, and reduced the cost of production very considerably. The difficulty of marketing the produce of such an isolated estate led to the erection of a distillery, and as the land was also well adapted for rape, an oil-mill was added, as was also a corn-mill.

Fig. 4.—*Plan of the Kis Szalás Estate.*

References to Plan of the Kis Szalás Estate.

A. Heinrichs Hof. 8-field shift.
B. Eduardshofer. 10-field shift.
C. Eduardshofer. 10-field shift, with Lucern.
D. Eduardshofer. 5-field shift.
E. Sindelyeser. 10-field shift, with Lucern.
F. Tompaer, now in Lucern.
G. Tompaer. 10-field shift, with Lucern.
H. Tompaer. 9-field shift.
I. Convention-field.
J. Lower Kovacser. 10-field shift.
K. Lower Kovacsgyeper. 10-field shift, with Lucern.
L. Middle Kovacsgyeper. 10-field shift.
M. Kovacsgyep. 10 fields.
N. Middle Kovacsgyep.
O. Convention-field.
P. Unterhofer. 10-field-shift, with Lucern.
Q. Unterhof.
R. Unterhofer. 10-field shift, with Lucern.
S. Friedhofs. 10-field shift.
T. Johanneshofer. 5-field shift.
U. Kapolnacz. 10 Lucern fields.
V. Out-farm.
W. Kapolnacz. 10-field shift.
X. Kapolnacz. 7-field shift.
Y. Hutmacher. 10-field shift.
Z. Jvankacz. 9-field shift.

AA. Thormacher. 10-field shift.
BB. Halaser. 5-field shift.
CC. Middle Kovacsgyeper. 7-field shift.
DD. Dongohuter. 10-field shift, with Lucern.
EE. Dongohut.
FF. Grenzweger. 10 fields.
GG. Lucern rotation.
II. Dongohut.
JJ. Upper Kovacsgyeper.
KK. Out-farm.
LL. Tuskos.
MM. Tuskoser. 12-field shift.
NN. Boundary fields. 10-field shift, with Lucern.
OO. Tuskos Grenznegar. 9-field shift.
PP. Convention-field.
QQ. Jvanka.
RR. Somleher. 10-field shift.
SS. Dongohuter. 8-field shift.
TT. Jankovaczer. 7-field shift.
UU. Boundary fields. 7-field shift.
VV. Jankovaczer boundary.
WW. Tuskoser. 9-field shift.

A *a*. Heinrichs Hof.
C *a*. Eduards Hof.
E *a*. Sindely.
G *a*. Tampa.
K *a*. Lower Kovacsgyep.
L *a*. Upper Hof.
W *a*. Kapolna.
Y *a*. Johannes Hof.

In 1855 there were thirteen to fourteen horse threshing-machines, with closed drums, 15 inches in diameter and 18 inches wide, furnished with flat, iron beaters: 250 horses were also engaged for treading out the grain. The bad quality of the work, the dirt and waste owing to the treading process, and the pilfering on the part of the peasants and labourers employed, led to the introduction of the first steam threshing-machine in 1856, two more in 1857, and three more in 1858. This enabled us to thresh all the grain by November, did away with the necessity of thatching, and was estimated to save one-fourth.

There being no stone, and bricks being very expensive, the cottages and buildings were constructed of stamped earth, and roofed with wooden tiles.

The accompanying Plan shows the various sections, each of which is subjected to a special rotation, and the positions of the main buildings and roads.

Lessons to the English Agriculturist.

It seems only reasonable to ask if there are any agricultural practices followed in Hungary which might be adopted in our own country with advantage; and also if we have any processes or products which might still further develope the agriculture of Hungary.

With reference to the first point, there is little for the Englishman to learn from Hungarian farming. It is so simple, and so trammelled by difficulties of climate, that, as has already been pointed out, English farming is far before it, both in intensity and in the variety of its objects and methods. Nevertheless, it is a valuable lesson to see hundreds of thousands of acres all under a central management, since it demonstrates the practicability of what might at first sight appear impracticable. The system surrounding and controlling everything upon a Hungarian estate, and enabling the stewards to supply precise information upon any point required, astonished me. The area of the estate under arable, pasture, or wood was always given exactly, to the smallest fraction of an acre, and the amounts of food consumed by stock, and the increase in weight for food consumed were accurately known.

The esteem in which systematic agricultural education is held is also very worthy of attention.

The pains taken to increase and improve the horse-stock of the country is a point which is likely to create interest at the present time. The hope, which appears, indeed, to have been realised in Mezöhegyes, of producing a fixed or constant race of high blood-horses capable of breeding *inter se*, without the further introduction of thorough-bred blood, is worthy of the attention of English breeders.

In rural practice, the making of sour-hay (see page 351) might be introduced with success into England.

In other parts of the Austro-Hungarian Empire it was interesting to notice the pains taken in breeding live stock. Take, for instance, the record of successful sheep breeding at Keltschan, given in the Report on the Vienna Exhibition. Foreign breeds are introduced and experimented upon in order to find the best possible races, or crossed races, for producing milk and beef. Probably we have good reason to be satisfied with our own stock, and certainly the best results obtained by these painstaking experimenters fall short of what English farmers very ordinarily attain.

In the next place we have to consider, if English agricultural practices may be further imported into Hungary. I visited an estate near Arad—Otvönös, the property of Countess Zelinski. The late Count was deeply impressed with the beauty of English farming, and determined to introduce it wholesale on to Otvönös. A Scotch bailiff and English labourers were engaged, English stock was purchased, and English cultivation commenced. All that now remains of this enterprise is a portion of the buildings, and some engineering work contributed by Messrs. Ransome and Sims of Ipswich. The whole scheme broke down, owing, I am informed, to difficulties of climate, and, still more sad, both the bailiff and many of the labourers died from cholera, fever, ague, and other causes.

The graves of these poor men, sadly overgrown and neglected, supplied food for reflection upon the folly of fighting against natural circumstances, and the return to Hungarian oxen, merino sheep, and ordinary Hungarian management upon the estate also supplied its lesson. This sad result was of course due to too rash an attempt to introduce a foreign system without regard to altered conditions. There are no doubt directions in which English practice might be advantageously followed. Among them, I think road-making and drainage should be pushed, and steam cultivation introduced. English swine and sheep might also effect as great an improvement, if used for crossing with the native breeds, as English horses have already done. Afterwards, it might be found advisable to introduce the English plan of folding such crossed sheep upon vetches, clover, and other summer forage crops, taking care at the same time to protect them from the mid-day heat. These are the chief points in which England may still be useful to Hungarian agriculture, but it is quite absurd to think of introducing turnips and winter feeding on the land when the summers are too hot for the turnips, and the winters too cold for the sheep.

AUSTRIA PROPER.

The line from Vienna to Linz passes through a lovely mountainous country. It is almost all owned by peasants, and presents the usual patchwork appearance of land so held. Higher on the hill-sides pasture prevails, which again gives place to abundance of wood. I did not see a beast, sheep, or pig all the way between Vienna and Linz. The rye was cut and neatly stooked into what are there called "mandels," of ten sheaves each. Nine sheaves, arranged in a conical form, with all their heads together, and the tenth forming a protecting hood over the rest, is a common and safe method of stooking. Clover and hay are cocked around posts with cross arms of wood to keep the hay from blowing over, and to promote quick drying. Sheaves were also noticed spitted on long upright sticks to the number of 15 and 20, and thatched on the top.

Rye-stubbles were already broken up, and in some cases even sown with buckwheat and turnips (July 14th). Potatoes also had been harvested, and the land was already sown with another crop. The margins of the fields were kept clean, and neat farming with good crops was the rule. Often the land was trenched up, and was usually in narrow ridges or stetches. The background of mountain was always picturesque; the air cool and refreshing after the heat of the Hungarian plains, and a pleasant air of prosperity prevailed.

I visited a thriving peasant at Eikhof, near Kleinmunchen, in the neighbourhood of Linz, who owns about 80 acres of land. This man appeared to be singularly happily placed, and was doing his best to put in practice what he had learnt at an agricultural college. I was surprised to find a peasant living in such comfort and even style. His homestead, like all those to be seen here, formed a square with an inside court; and, in this case, possessed an outside enclosure with pretty garden and orchard. The dwelling-house formed one side of the square; and servants' rooms, a horse-stable and cow-byre constituted a second. The two remaining sides were used as barns. There was a nice stock of white English swine and Pinzgau and crossed cows. I also noticed some good working horses, Richmond and Chandler's chaff-cutter, and an improved plough.

The cow-byre was extremely well fitted with handsome cement troughs and good level pavement, reminding me on a small scale of the fittings at Ungarisch-Altenburg. Behind each cow was the little black-board, already noticed in earlier pages, with the daily register of the yield of milk inscribed upon it.

A short run from Vienna, on the Raab Railway, through a somewhat poor and sandy tract, brought me to Velm, a property purchased seven years ago by the late Mr. Smallbones, and now enjoyed by his son. The soil on the flat portions is poor, light, black, and alluvial in character, and is underlain by a white gravel. Higher up the hills it becomes stiff and of fair quality. Mr. Smallbones told me that his late father began his career in Hungary and Austria, full of English ideas, but that he relinquished most of them, as unsuitable to the climate. The present owner believes highly in town manure carted from Vienna, but not in "artificial" manures, or even in cake fed upon the land. He adopts a suburban system of farming, sending as much as possible into Vienna, and bringing back manure. He also applies refuse from glue works, and dissolved bones prepared at home. A neighbouring proprietor, Baron Hopfen, had been trying experiments with various artificial manures upon mangold, but without much effect. The water lies near the surface, and can be easily reached by open cuttings. This is taken advantage of by the peasants, who grow cabbages on square panes, and water them from intersecting trenches. Rye-stubbles were, at the time of my visit, already broken up and sown with buck-wheat.

MORAVIA, AUSTRIAN-SILESIA, AND BOHEMIA.

Ten days were devoted to a rapid tour through these three rich provinces of the Austrian Empire. The contrast between them and Hungary is very marked, and is exhibited in the undulating and picturesque character of the landscape, the greater prosperity of the peasants, and the more thorough cultivation of the land both upon large and small properties. The same system of proprietor-farming is followed, but the estates are not so extensive as in Hungary. The land is often exceedingly rich, and commands a high rent when it is let. English implements are in constant use, both among the peasants and upon the large estates. Hungarian oxen are largely used for purposes of draught, and merino sheep are kept, unless in rare cases, or where sheep have been given up altogether as unprofitable.

The first estate visited was that of Göding, the property of the Emperor; a fine tract of excellent land, partly in Hungary and partly in Moravia. Nothing can exceed the beauty of the landscape here. There are no trees or hedges, but the long strips of peasant-land, under various crops, running straight over the hills, and hanging as it were on the horizon, are very effective. The poplar alleys traversing the estate, the white villages, and rich cultivation, all contribute to the exquisite beauty of the scene.

I was informed that 35*s.* per acre would be the letting value of this land, and in some cases even 70*s.* is given for the purpose of growing sugar-beet. The average return or profit to the proprietor is 42*s.* per acre, while it occasionally amounts to as much as 90*s.* The capital required to stock and farm it is estimated at 7*l.* per English acre. The whole of this estate is under the control of his Excellency Count Wrbna, Administrator of the Imperial Estates, and is under the management of Herr Fostik, the resident inspector. It comprises a tract of 19,485½ acres, 6750 of which are arable, while nearly 9000 acres are underwood. The remainder is mostly in pasture; and there are also some 400 acres of waste land. The key to the management is the cultivation of sugar-beet. The estate supports a sugar factory, and all cultivation seems subservient to the chief product.

The land and its management can scarcely be too highly spoken of. Twenty tons per acre of sugar-beet are produced, which yield 9 per cent. of sugar; and a clear profit of 60 fl., or 6*l.*, per acre is derived from the farm of Egballer.

140 head of the ordinary cattle of Moravia were up feeding in spacious byres. They were receiving—

$$36 \text{ lbs. hay} \begin{cases} 18 \text{ lbs. cut into chaff.} \\ 18 \text{ lbs. long.} \end{cases}$$

4¾ to 5 lbs. of barley and maize meal.

The average increase per head on 120 days was 265 lbs., or 2·2 lbs. per day. Another byre contained 56 of the ordinary cows of the country. They were giving, on an average of the whole, 6 of them being dry, 1⅖ gallon per head; and a cow will yield from 373 to 435 gallons per annum. There were a few Hungarian oxen, but for the most part they were Moravian cattle, purchased from peasants for 2*l.* 16*s.* to 4*l.* 2*s.*, at one year old.

We were now within two hours of the celebrated Keltschan sugar factory and estate, so frequently referred to in my Report on the Vienna Exhibition; but I was unfortunately unable to visit it. As in Hungary, so here, the peasant-farming could not bear comparison with that upon the large estate.

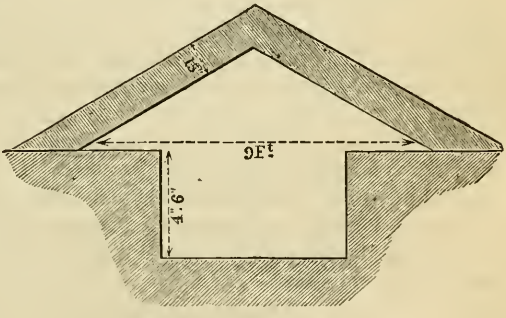
Cigar-making here absorbs much female labour: 2400 women are employed, and paid 10*s.* per week. They make 104,000,000 cigars a year, and sometimes 2,250,000 per week.

From the Imperial estate of Göding I went, *viâ* the Prerau and Olmutz Railway, to Kwassitz, the property of the Countess Thun-Hohenstein, but let on lease to the Ritter von Proskowetz, who was unfortunately from home. I was received by the steward, and saw all that was necessary, and especially inquired as to the cultivation of sugar-beet. The estate is 1423 acres in extent, and the whole is under arable cultivation. It is of various quality, and undulating in character. The rotation is as follows:—1st year, wheat or rye, dunged; 2nd year, sugar-beet, grown with ashes and superphosphate; 3rd year, barley; 4th year, sugar-beet, grown with wood-ashes and superphosphate; 5th year, peas and horse-beans, dunged; 6th, sugar-beet, with wood-ashes and superphosphate; 7th year, barley or other spring corn; 8th, sugar-beet, with "lime-slime" from sugar-factory; 9th year, barley, sown down with clover or lucern; 10th year, clover or lucern; 11th year, clover or lucern. The farm is worked by 20 horses and 140 to 180 bullocks of the German race. (See last Report.)

The sugar-beet is grown in rows 12 to 14 inches wide, and the plants are left 8 inches apart. They expect at least 12 tons per acre, and consider 14 tons to be an average. They purchase from three-fourths to four-fifths of all the beet they manipulate, at an average price of 1*s.* 3*d.* per cwt. delivered, and the pulp is sold back at 5*d.* (20 kr.) per cwt. fresh, or 8*d.* to 9*d.* stale. The peasants receive from 1*s.* to 1*s.* 6*d.* per cwt. for their beet, and are allowed back pulp at 7*d.* to 8*d.* per cwt.

The greater part of the pulp is consumed upon the estate, and two lots of 70 bullocks each are annually fatted. The working oxen were being fed three times a day. In the morning they received 60 to 70 lbs. of pulp with 2 lbs. per head of barley or bean-meal and chaff, and 1 oz. of salt; and at mid-day green food, when not hard at work; but in busy times they receive pulp three times a day. They also have a handful of long hay after each feed, and a little salt. The pulp is stored in trenches, and will keep fresh for five or six years. No salt is used, but the mass is firmly trodden and well covered with earth. This practice also prevails in Hungary, and has been previously mentioned. The pit is of any length, about 4 feet 6 inches deep, and 6 feet wide. The pulp is raised above the level, and the whole is covered with 15 inches deep of earth.

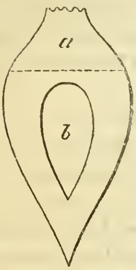
Fig. 5.—*Section of Trench for storing Beet-root Pulp.*



Fatting cattle receive 60 to 70 lbs. of pulp, and 6 to 8½ lbs. of meal, and increase at the rate of rather over 2 lbs. per day. The steward did not recommend pulp or distillery wash for breeding stock, as he considered it injurious to the lungs. Cows are therefore kept until they have had two calves, and are then fatted off. The buildings, stock, and general farming upon the estate are worth inspection. Sheep are only kept to supply the house with mutton, as they are not considered profitable.

The next station was Holleschau, in Moravia (35-36° E. lat., and 49-50° N. long.), where is an extensive estate of 6670 Eng. acres, the property of the Emperor's Estate-Administrator, Count Wrbna, and under the management of Herr Fitz. The soil is throughout very productive, and if let would command a rent of 45*s.* per acre. It is capable of growing 6 quarters of barley, and they expect 12 to 14 tons of sugar-beet. Sugar manufacture is here all-important, as it is over the whole of Moravia, Bohemia, and Silesia. There is also a brewery on the estate. Again I was informed that distillery-wash and sugar-beet pulp are unsuitable for breeding stock. Here 12, 13, and 14 per cent. of sugar is obtained from beet, and the roots are preferred under 1 lb. weight each. This higher percentage of sugar is in a great measure accounted for by cutting off the tops of the root and putting it aside as fodder. The central portion, see *b*, Fig. 6, is said to be richest in sugar, and the portion *a* is cut off as explained.

Fig. 6.—*Section of a Sugar-beet root.*



The rotation followed here is as nearly as possible the Norfolk four-course. It commences with sugar-beet, which is followed with barley, clover, and wheat or rye. The sugar-beet is here grown 16 inches between the rows and 6 inches in the rows. Here I saw, for the first time on my journey, cylindrical draining tiles, and I was told they had made such tiles for 20 years. Two of Whitehead and Preston's machines, one for cleaning the clay, and one for tile-making, were also noticed. Cattle feeding is very systematically and extensively carried on in Holleschau. 300 bullocks are annually fatted, and all are regularly weighed during the process. I examined the tables, and found that 120 days were considered sufficient for fattening an ox, and that he increased during this time on an average 265 lbs. (2 centner 15 pf.) or 2·21 lbs. per day. The first six weeks they receive

48 lbs. of pulp,
7 lbs. of hay,
10 lbs. of straw-chaff,
and a little distillery-wash.

They are also allowed 4 lbs. of salt per month; one-third in fodder, one-third in liquid, and one-third to lick.

The next four weeks they receive the same as above, with the addition of 4 lbs. of barley and lentil-meal. The remainder of the period they receive 6 lbs. of meal with pulp, hay, and chaff, as above. The meal is all given in the shape of a thin gruel with a little salt in it. Here, as at Kwassitz, it was known that old or sour pulp is a more valuable food than when fresh. It is said to have less woody fibre, and to be richer in alcohol and soluble matter. The fermented and soured pulp must, however, be given cool, and not on any account warm from fermentation.

The contracts regarding fattening cattle were very curious. One system consists in the estate taking in cattle as boarders upon the above food, charging $8\frac{3}{4}d.$ (35 kr.) per day, and keeping the manure. The fodder is computed to cost $10d.$ (40 kr.), and the difference is charged to the manure. This is tantamount to a confession that cattle feeding must be carried on at a loss, since they are willing to pay for the manure. Another plan is to buy cattle by live weight—say at 16 fl. the centner. At the end of the fatting period, they are sold again at 17 fl. 50 kr. per centner upon their original weight, and the additional weight is allowed for at 18 fl. per centner. The animal in this case is fasted before the final weighing for 12 hours, and 5 per cent. is also deducted from the total live weight.

Hop cultivation was another feature at Holleschau. In ten years they look for two good crops, four average, and four under average.

The beauty of the landscape, the good quality of the land, and the excellent cultivation, all assisted to convey a very favourable impression regarding the whole district.

I was driven to Hullein Station, on the Cracow and Vienna Railway, and travelled, *viâ* Prerau and Oderberg, into Austrian Silesia, where I had an introduction to Count Larisch, of Karwin, near Oderberg.

Austrian Silesia.

Northward from Prerau the country still continued fine, but the crops became lighter, and grass-land became more prevalent. Harvest had scarcely commenced (July 21st). Passing the pretty town of Weisskirchen and the collieries of Ostrau, we entered a very fine mountainous country, resembling that between Vienna and Linz. The crops were here less abundant, and the same system of supporting clover upon crossed stakes, as in Austria, was noticed. I was told that when so cocked, and thatched over with a little straight grass, rain can do no injury.

Karwin is a colliery district, and is likely to become a great centre of industry. The estate inspector, Herr Staniek, gave me a splendid drive round the estate. We passed through much peasant-land; but, as in almost all places visited, the management of the peasant could not compare with that of the prince. Peasants here own 85 to 140 acres of land, and the district is pretty equally divided between them and the large proprietors. At Holleschau 50 acres is the area usually owned by a peasant, and the larger share of the land is held by the aristocracy. In this part of the empire the peasants live in homesteads built upon their own little properties, and are not congregated in villages as in Hungary. The estate of Karwin is one hour's drive from Oderberg, and extends from the Carpathians to the river Oder, a distance of about 9 English miles. It comprises 17,582 acres. Of this, close upon 13,000 acres are in arable cultivation; 3800 are in wood, and the remainder in pasture and waste. The estate is under the management of the central director, Herr Staniek, and there are besides two estate directors, a steward, and assistant steward for each district, and a "rent meister." The rotation followed varies with the character of the soil. On the light land potatoes, dunged, are followed with rye or barley; 3rd year, clover; 4th year, clover; 5th year, rye, limed, or half-dunged; 6th year, oats. On the heavy land potatoes, or sugar-beets, are followed by barley or wheat; 3rd year, clover; 4th year, clover; 5th year, rape, limed; 6th year, wheat. A mixture of vetches and oats for fodder is also often sown upon the heavier land. The tillage is effected by 280 horses and 290 bullocks, and English implements are very much used for drilling, reaping, and threshing. Two to three hundred cattle are annually fatted, and upwards of 9000 sheep are kept; but for further particulars as to stock and crop, I must refer the reader to the Table given on pp. 388-89, in which several estates are compared in these respects.

Count Larisch possesses a remarkably fine stud of English horses, under the management of English grooms, as is usually the case both here and in Hungary. The thoroughbred stallion *Richmond* is there, and has been of much service. I also saw *Caroline*, a fine chestnut mare, purchased in England for 350*l*; also *Dauntless*, *Favourite*, and a number of fine young horses then preparing for the great Vienna Horse Show (1873). The Count breeds 160 foals a-year, and the stables at the Castle are well stocked with home-bred and imported horses.

I would fain have stayed longer at Karwin, as the young Count was at home, and disposed to show me everything in his power. There is in fact much to see, as there are extensive collieries, a sugar factory, distillery and brewery, all managed from the central office. Iron-stone also occurs on the estate, and it is the intention to develope a great centre of industry at Karwin. The young Count keeps a pack of harriers, and is fond of England, English people, English horses, and English dogs. The country is rich, and the scenery varied and pleasantly cool and fresh after the parched plains of Hungary.

One district of this estate, known as Neorad, 320 acres in extent, was all reclaimed from a lake. This is not uncommon in Moravia and Bohemia. The lakes were often artificially formed in the first place for fishing, and were subsequently laid dry and again brought under the plough.

Count Larisch employs Hungarian working cattle, but does not confine himself to this race. The young Count showed me his own beautiful herd of Bernese cows, all similar to those described in my first Report. The average yield of these cows was stated to be 1400 to 1500 mass per annum, or 436 to 467 gallons. The ordinary cattle of the country are crossed with Bernese bulls. A shorthorn bull is also kept here, and Dutch and Oldenburg cows. All the work in the cow-byres is done by women.

Merino sheep are kept, and appear to be managed much in accordance with the practice described as obtaining in Hungary. The sheep stock, although large, is being gradually reduced, as it is not found remunerative. This can scarcely be wondered at when the merino yields but little mutton, and in this, as well as many other cases, only 3 English lbs. of wool.

There is a great scarcity of agricultural labourers, owing to the inducement of high wages at the pits. The miners work 8 hours and make 3*s.* per day, while farm labourers make 2*s.* to 3*s.* in summer and less in the winter.

With regard to sugar-beet, I saw little that was new. Eleven per cent. is the estimated yield of sugar from the beet, and the pulp is largely used for feeding purposes. Herr Staniek supported what I had already heard by saying, that "lung diseases were not known before the introduction of distillery wash and sugar-beet pulp as foods."

Bohemia.

A four hours' run brought me back to Prerau, and from thence I journeyed to Olmutz through a beautiful country, mostly in peasant occupation—undulating and fertile. Olmutz is situated in the Hanau. The hills on the right are wooded to the summits, and industriously cultivated up to the woods, while a fine flat tract stretches away to the left. Journeying towards Pardubitz, the hills gradually approach both sides of the line, which then passes through a highly picturesque defile of steep wooded mountains. Peasant-proprietors appear to hold all this beautiful district, and their square homesteads are built upon a similar model to those seen in Austria proper and Karwin in Silesia. In the Hanau, and wherever the nature of the country allows of cultivation, the farming appeared neat and painstaking, and the crops were good. Nearer Pardubitz (the centre of the great stag-hunting district of the Imperial Court) the country again becomes open. I visited the Imperial stud at Kladrub on the line between Pardubitz and Prague. Kladrub is a small estate of 710 English acres in extent, and is of poor sandy quality. It is entirely devoted to horse breeding, and is under the superintendence of Major Löffler and his stud groom, Mr. Jackson. The Major forwarded me an interesting account of the stud, which is composed of English thorough-breds, Spanish, Neapolitan-black and Anglo-Norman horses. There were at the time of my visit (July 24th, 1873) 391 horses of all ages at Kladrub, and of these 50 were in training. Mules are also bred here for the Emperor's use: 95 brood-mares are kept, of which 24 are English, 45 half breds, 12 Spanish and 14 Neapolitan.

Among the horses in training were noticed—

A 6-year-old gelding (*Oracle*), from *Buccaneer*, out of *Mosquito*.
A 4-year-old stallion (*Drum Major*), from *Kettledrum* out of *Redpole*.
A 3-year-old stallion (*Pirate Chief*), from *Buccaneer* out of *Lady Tatton*.
A 3-year-old stallion (*Corsair*), from *Buccaneer*, out of *Zeta*, by *Melbourn*.
A 3-year-old stallion (*Springy Jonathan*), by *Stark*, and from *Elastic* by *Ugly Buck*.
A 3-year-old mare (*Red Wing*), by *Ostregor* from *Red-pole*, by *Orlando*.
A 3-year-old mare (*Flora*), by *Ostregor* from *Niobe*, by *Orlando*.
A 3-year-old mare (*Black Flag*), by *Buccaneer* from *Violet*, by *Voltigeur*.
A 2-year-old stallion (*Oro*), by *Thunderbolt* from *Golden Hair*, by *Orlando*.
A 2-year-old stallion (*Cress Bower*), by *Cambuscan* from *Golden Drop*, by *Stockwell*.
A 2-year-old stallion (*Verulam*), by *St. Albans*, from *Aunt Hannah*, by *Westminster*.
A 2-year-old stallion (*St. Audes*), by *Virginius* from *Naïveté*, by *Stockwell*.
A 2-year-old stallion (*Muleiber*), by *Challenge* from *Ugly Doe*, by *Ugly Buck*.
A 2-year-old stallion (*Gauntlet*), by *Challenge* from *Elastic*, by *Ugly Buck*.
A 2-year-old mare (*Silvertail*), by *Ostregor* from *Fairy*, by *Warlock*.
A 2-year-old mare (*Phrygia*), by *Marsyas* from *Guinea*, by *F.D.*

There appeared to be too many horses on this small estate; and I was told that an immense amount of fodder was annually purchased, and that expenses were enormously heavy. Kladrub is not a Government station, but is the private property of the Emperor.

Few estates have attained a greater notoriety than that of Horskyfeld, the property of the Ritter von Horsky, situated at

Kolin, on the line between Pardubitz and Prague. The Ritter von Horsky has been the architect of his own fortunes, and has published a book giving an account of his life, and of the cultivation of his estate.* A large party of agriculturists was entertained by him at Horskyfeld during the Vienna Exhibition. Here I saw Fowler's steam plough at work, with sub-soilers stirring 7 inches beneath the plough-sole—the total depth being 14 inches. The work was progressing at the rate of 11 to 12 acres per day, upon a black sandy bottom. Hudson's overhead railway was also in use. Oxen are extensively used, and when four are yoked to a plough, a cultivation of 10, 12, and even 14 inches is attained. The system of subsoiling and ploughing by means of a deep following tine, after and attached to each plough, is preferred to a deep furrow, and is usually adopted. A double number of oxen are maintained from harvest to winter, and half of them are fatted when work becomes slack. Sugar-beet is one of the most important crops cultivated. A barley stubble was being ploughed and subsoiled 14 inches deep by oxen (July 25th). It was the intention to plough it again in late autumn by steam, and to work it down with grubbers for sugar-beet in the spring. There is in use a special machine for drilling beet. The manure is dropped on the flat and immediately mixed with the soil by two chisel-shaped shares; the enriched soil is at once ridged up by two double mould-boards, and the seed falls at the same instant through coulters into the middle of the ridge—just before it is closed. The drilling is narrow, and it is considered desirable to keep the roots small. The process of diffusion is now adopted in extracting the sugar; and it is thought that the quality of the fodder is higher than when pressure is used. This is because only sugar is extracted, and the cells are not ruptured; there is less alcohol (?) in the pulp, and it is, therefore, more wholesome. In the pressing process, 20 per cent. of pulp is obtained, while by diffusion 80 per cent. is left; 50 per cent. of which is water and 30 per cent. fodder. I saw working-oxen receiving beet pulp, meal and oilcake, cut straw and hay. There is a great amount of ingenuity, of novelty, and of good arrangement displayed, but my numerous queries were answered with a present of the volume already referred to, to which I, again, must refer the curious reader.

A day spent upon the Emperor Ferdinand's estate at Jenc, and another upon Prince Schwarzenberg's estates at Postelberg and Lobositz, completed my tour, and brought me, *viâ* Bodenbach

* 'Mein Streben, Wirken, meine Resultate, &c.; von Franz, Ritter Horsky von Horskyfeld,' &c. Published by Fr. Sudek: Kolin, 1873.

and through the Saxon Switzerland to Dresden. The same lovely country, good land, and capital farming were again and again repeated, and I left Bohemia with a strong admiration for its agriculture.

I conclude this very imperfect sketch of Bohemian farming by giving the result of a conversation with Herr Watzl, the steward at Postelberg. Sugar is extensively made on Prince Schwarzenberg's estate. Most of the beet used is grown on the estate, as its price has lately risen so high—to 1*s.* 8*d.* and 1*s.* 10½*d.*, 2*s.* 1*d.* and 2*s.* 6*d.* per centner of 123½ lbs.

9½ to 10 tons of beet per acre can be grown, and this yields 6, 7, and 8 per cent. of sugar.

So long as sugar-beet can command 60 kr. per centner, *i.e.* about 1*s.* 2*d.* per cwt., with the pulp given back, it is considered to pay better than growing roots for fodder. Tenants growing beet for the factory receive all the pulp back, and from 1*s.* 2*d.* to 1*s.* 6½*d.* per centner for their beet.

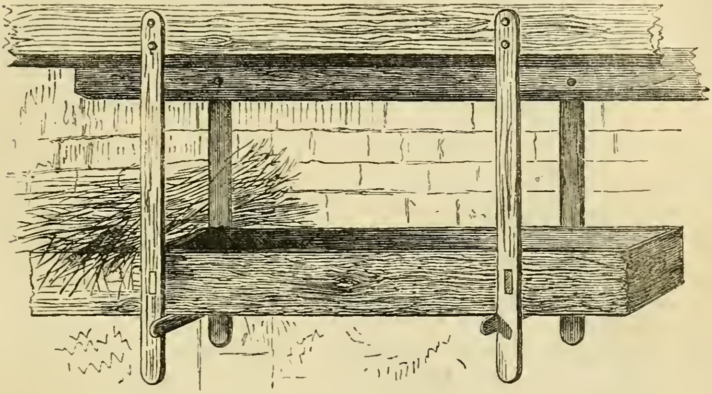
Pulp is a wholesome food for all kinds of stock, so long as it is given sour and cool, but is not to be trusted when given warm from fermentation. The pulp is given mixed with meal from tail-corn.

They commence to feed oxen by giving them as much pulp as they can eat. Oxen of 12 cwts. are found to consume 36 to 48 lbs. of pulp, and 4⅘ of meal. To cows they give 14 to 18 lbs. of pulp, 4½ to 7 lbs. of hay, and 4 to 4⅘ lbs. of meal with straw. The straw and green fodder is cut into chaff and mixed with pulp. Fatting oxen of 12 cwts. live weight will, on the above food, gain from 1·235 to 2½ and 3 lbs. per day, but there are, of course, great differences.

The best manure for sugar-beet is superphosphate manufactured from the refuse at the sugar factories. Eight cwts. per acre (10 centners per joch) is sufficient when no other manure is used. Farmyard manure is never applied with superphosphate. As a rule they dung previous crops for sugar-beet, and manure directly as above. Guano is known, but is considered too dear. There is no steam cultivation on these estates. A sufficient number of oxen are purchased in summer to work the land, then are afterwards fatted off. The intermixture of peasant-land with the estates of the proprietors (see page 320) is one great difficulty in the way of steam cultivation.

Labourers and Wages.—At Göding in Moravia, close to the Hungarian frontier, labourers are paid both in money and kind. A man in summer earns 1*s.* 8*d.* to 2*s.*, and a woman 10*d.* to 1*s.* 3*d.* A shepherd has 13*l.* with doctor's bill paid, and 6¾ bushels of wheat; 27 bushels of rye; 2 klafters of wood; and about one-fifth part an acre of land. Cottage rents were 42*s.*, and six days' work, in a village passed through on the estate. The labourers are usually Slavonians, and do not look for the comforts considered necessary by English labourers. They generally live in the stables of the cattle they tend, and this is very customary over all the countries which I visited. The accompanying sketch of a labourer's bed and pillow of straw, suspended

Fig. 7.—*Labourer's Bed and Straw-pillow in an Austrian Cow-byre.*



from the rafters, was taken in a cow-byre upon the Imperial estate at Göding. At Kwassitz, in Moravia, labourers are paid in money, and teamsmen both in money and kind; 1*s.* 0½*d.* to 1*s.* 7½*d.* for men, and 10*d.* to 1*s.* 0½*d.* for women is considered fair, but as much piecework is contrived as is possible.

At Holleschau, payment is only made in money; 1*s.* 10½*d.* per day is the average wage of a labourer; 1*s.* 3*d.* of a woman; and 1*s.* 3*d.* to 1*s.* 8*d.* of a teamsman.

At Leihwitz, the property of Baron Kübeck, in south-west Moravia, wages are usually paid in money. Men are paid 2*s.* in summer, and 1*s.* 3*d.* in winter; and women have 1*s.* 3*d.* in summer, and 8¾*d.* in winter. Teamsmen are paid 22*l.* to 25*l.* per annum. Upon the Archduke Albrecht's estate of Seelowitz, let on lease to Mr. Julius Roberts, in South Moravia (9000 acres), where Fowler's steam plough, 278 horses and 543 oxen are employed, labouring men have from 1*s.* 0½*d.* to 1*s.* 2*d.* per day, and women 10*d.* to 11*d.* When paid partly in kind, a man has in money 5*l.*, and 6¾ bushels of wheat, 27 bushels of rye, 13½ bushels of barley, 4 cord of wood, or ½ a cord of wood and 18 cwts. of coal; 16 bushels of potatoes; and one-tenth acre of land. At Karwin in Silesia, 2*s.* to 3*s.* per day is considered a good wage for a man, and 6*d.* to 10*d.* for a woman. This is in

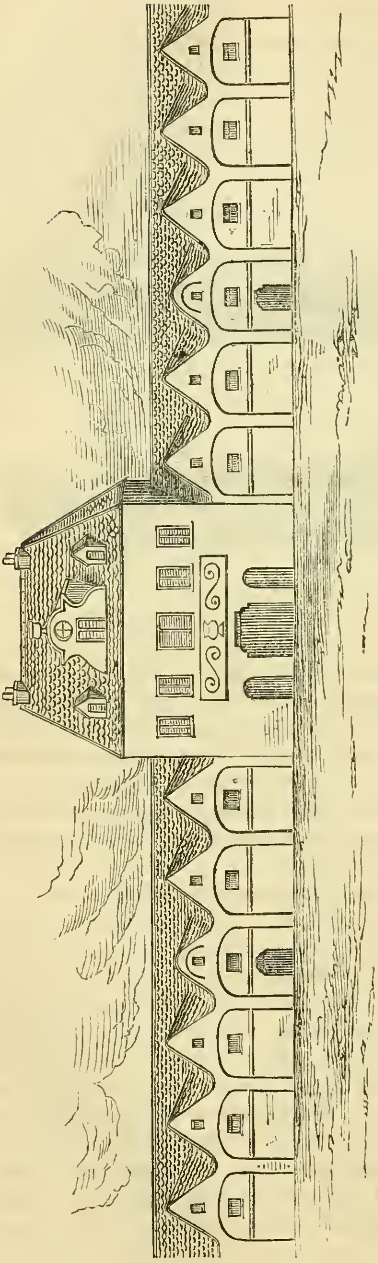


Fig. 8.—*View of one side of the Quadrangle of Farm Buildings at Copschau.*

the neighbourhood of collieries. Teamsmen are estimated to receive in money and kind 29*l.* 12*s.*, and shepherds 32*l.* per annum.

At Postelberg, in Bohemia, labourers receive 1*s.* 8*d.* to 2*s.*, and women 1*s.* $0\frac{1}{2}d.$, to 1*s.* 3*d.* per day; and the payment to shepherds and teamsmen is in kind and very complicated. At Lobositz, in Bohemia, the general wages for a day of ten hours for a man is 1*s.* $1\frac{3}{4}d.$ to 1*s.* $7\frac{1}{2}d.$, and for a woman $11\frac{1}{4}d.$ to 1*s.* 3*d.* As much work is done by piece as possible, and thereby the wage actually paid to men is very much increased.

Farm Buildings.—The farm buildings upon the large estates of Hungary and the provinces of the empire must be surprising to an English agriculturist. Reference has already been made to the noble, vaulted, crypt-like bullock-stables of Hungary, and the same grand buildings were seen upon almost every estate visited in Moravia and Bohemia. The finest met with are situated at Copschau, upon the Imperial estate of Göding and Hollitsch. Here is a remarkably spacious and grand homestead, originally built by that great patroness of agriculture, the Empress Maria Theresa, for the accommodation of a stud.

There is a magnificent square court, one side of which I hurriedly sketched (see Fig. 8). The remaining three sides are the same, with the exception of the central and higher portion. Each of the remaining three sides is composed of 15 gables of 8 yards wide each. The court is therefore 120 yards square. There is not a fragment of wood in this homestead, every part being brick or stone. The stables are arched, and the roofs are all supported upon brick pointed arches. One stable was roofed by arches, springing from a double row of pillars and the side walls. Another wonderful ox-stable was spanned by a single arch of 30 feet.

Crops grown and Live Stock maintained.

The yielding power of the soil and the kind of stock maintained will be best given in tables (see pp. 388, 389), and it may be found useful to compare the figures with those previously given in the portion of this Report devoted to Hungary (see pp. 360-61).

Conclusion.

When the Council of the Royal Agricultural Society entrusted me with a mission to Vienna, and to report upon the agriculture of the Austro-Hungarian Empire, they drew up some general instructions as to certain points upon which inquiry was to be made. They at the same time left me to a great extent to form and follow my own plan. In the instructions forwarded to me by the Society's Secretary, I was requested to report upon the Live Stock exhibited at Vienna, and to keep in view certain important questions regarding their relation to English stock, and their possible relations to England. Secondly, to visit and report upon the agriculture of the Austro-Hungarian Empire, noticing especially facts having reference to the following questions:—

(*a.*) To what extent the primitive practice of a quarter of a century back has been modified or superseded generally or locally by the introduction of English stock and English implements.

(*b.*) The contrast afforded by the large farms of that country to English agriculture.

(*c.*) The question of the supply of cattle from Austria and Hungary to England, and the danger incurred from the presence of cattle-plague on the frontier of that country.

(*d.*) The use made by the farmers of that country of the sugar-beet as an article of cattle-food.

(*e.*) Any novelty in the use of green crops used by the farmers where grass is scarce, which might be applicable to British agriculture.

(*f.*) Organization

TABLE III.—Showing the AVERAGE PRODUCE PER ACRE upon various ESTATES visited in MORAVIA, SILESIA, and BOHEMIA, 1873.

NAME OF ESTATE.	POSITION.	Wheat.	Barley.	Rye.	Oats.	Indian Corn.	Rape.		Clover Hay.	Sainfoin Hay.	Sugar Beet.	Fodder Beet.	Green Fodder.	Potatoes.	Hay.
		Bush.	Bush.	Bush.	Bush.	Bush.			T. Cwts.	T. Cwts.	Tons.	Tons.			T. Cwts.
Holitsch & Göding	Neutra in Hungary & in Moravia	29¾	42	26	60	30	31	..	1 6½	..	11½	15½	..	..	..
Hollischau	Moravia ..	17¾ to 21⅓	35 to 42	21⅓ to 28½	..	..	21 to 28½	Panicum. 25 to 42	2 to 2½	..	11 to 14	14 to 16	..	.	1 5
Seelowitz	S. Moravia ..	26	35½	28½	35½	12	..	..	..	Lucern. 1 0	7¾	9½	..	..	1 2
Leitwitz	S.W. Moravia	22½	28½	21⅓	33	28½	..	Panicum. 21⅓	..	Lucern. 1 10	11	11½	..	..	..
Kwassitz	Moravia ..	28½ to 33	35 to 42	24 to 27	44½ to 47	47 to 70	24 to 30	Panicum and Millet. 24 to 28½	*2 0 to *2 4	*2 15 to 3 0	10 to 13	11½ to 15½	..	..	..
Karwin ..	E. Silesia ..	14 to 23¾	23 to 35½	12 to 20	30 to 42	..	23¾	..	15 cwt. to 1 ton	*1 2 to 2 4	7¾ to 11½	..	..	..	..
Postelberg	N. Bohemia, near Saal	†21 to 30	30	26	35½	..	..	..	*1 2	Lucern. *1 2	9½	..	..	..	..
Lobositz	N. Bohemia	35½	42	30	55	..	..	..	1 15	1 15	11½	15½	..	..	2 0

* In two and three cuttings. † For spring and autumn sown wheat, and these have respectively 1·5 and 1·16 tons of straw per acre.

TABLE IV.—Showing the HEAD of LIVE STOCK maintained upon various ESTATES visited in MORAVIA, SILESIA, and BOHEMIA, 1873.

NAME OF ESTATE.	Total Area.	Area in Arable.	Pasture.	Wood.	Waste.	Gardens, Roads, Buildings, &c.	Horses.	Bulls.	Cows.	Fatting Cattle.	Working Bullocks.	Young Stock.	Rams.	Ewes.	Lambs.	Wethers.	Swine.
	Acres.	Acres.	Acres.	Acres.		Acres.											
Holitch & Göding	19,845½	6,745	3617	8539	550	264	60	2	100	115	434	447	50	1000	700	600	none
Holleschau	9,507¾	4,173	90	5241	..	3¾	42	..	..	300	136	..	..	..	..	..	..
Seelowitz	16,296	9,443	1255	4590	968	40	293	18	375	..	571	28	84	3697	675	1583	none
Leitwitz ..	1,988	1,065	290	633	..	..	14	3	72	..	26	46	..	..	..	..	..
Kwassitz	1,420	1,420	..	..	..	..	26 and 4 foals	2	40	*70	140 to 180	†46	..	..	..	60	none
Karwin ..	17,582	12,961½	350¾	3834	319½	113¼	‡269	25	405	200 to 300	290	not given	160	9030 Sheep			41
Postelberg	12,557	7,061½	2816	3400	160	119½	120 to 124	14	145	80 to 100	260 to 290	282	200	2000	1000	600	60
Lobositz ..	7,414	2,918	811	3179	422 vineyard 28	56	60	10	80	60	200	160	15	550	690 Sheep		none

* Two lots are annually fed, making 140 in all. † Besides calves. ‡ Including 120 foals and young horses.

(*f.*) Organization of labour on the large farms.

All these subjects for inquiry have been dealt with in the preceding pages. I, however, submit that the vastness of the work of reporting upon the agriculture of the Austro-Hungarian Empire can only be realized by those who attempt it. I have already remarked that many whole provinces were never entered, and the foregoing Report is more precisely an account of Hungarian than of Austro-Hungarian farming. Every one knows that a foreigner is apt to fall into grave, and also into amusing errors, in describing the manners and customs of peoples not his own. I shall not be surprised if some such errors have crept into the foregoing pages. I may, however, state that, owing to the custom of printing reports and tabular statements upon the large estates for the guidance of the managers, also owing to my own printed queries, which were returned to me by the Stewards at their leisure, and lastly by noting various observations and answers to numerous questions then and there, I am able to show satisfactory proof of the correctness of the statements made in this Report.

XIV.—*Agricultural Jottings from the General Report of the Census of England and Wales for the year* 1871. By J. Dent Dent, of Ribston Hall, Wetherby.

It is sometimes said that any result which the student desires may be deduced from the study of statistics, although the investigation of long columns of figures and tables of population at first sight presents a very uninviting aspect. No one, however, who reads the General Report of the Census of England and Wales for 1871, will doubt that it contains a history of which a nation may well be proud, and that the record of progress which is inscribed in its pages attracts the reader like a grand romance. It is the story of a people ever proceeding onwards—increasing in numbers, in industry, and in wealth—whose condition improves year by year; not too numerous for well-paid industries at home, yet ever sending out fresh streams of workers into other lands, where they become at once producers of England's requirements, and consumers of the products of her industry, furnishing supplies to the parent land, and adding to her wealth, while assuring their own. Nearly one hundred years ago Dr. Price wrote in alarm of a decaying population; and Malthus somewhat later uttered warnings against the evils which awaited a people increasing more rapidly than their means of procuring subsistence; but in this English nation there is united such a happy mixture of boldness and confidence in the future, and yet withal of prudence, that all these auguries of evil have long since been exploded. In the mother country and her colonies, new "harvest fields of industry are calling for more arms" to work, and the great stream of happy progress, in spite of occasional breakers, still majestically flows on.

In looking at the records of this Census of 1871, we may at first be struck with figures which would indicate that our own special pursuit—agriculture—has not advanced in the same proportion as other industries, and indeed if we call to mind certain exceptional circumstances of this decennial period, between 1861 and 1871, such as the outbreak of Rinderpest in 1865 and the excessive droughts of 1868 and 1870, which so materially affected the graziers during those years, we might find a reasonable excuse for accepting in the figures before us some proof of decline. But, for my own part, I believe that, rightly read, we shall find in these figures no indication of decay, but rather signs of increase in agricultural energy, and of new inventions and appliances brought to bear in order to meet the requirements of a period, which has made greater demands upon every class of labour than had ever previously been known. We shall find that our productive powers have increased, while our surplus labour has diminished, and the prospects of the agricultural labourers who remain, have materially improved without in any way impairing the resources of the tenant farmer.

As in the previous decennial period, so in the one we are now considering, we are struck with the continued development of the urban population, the numbers who are congregated together, and the wealth which they produce and enjoy.

The towns in England and Wales stand thus at the three Censuses of 1851, 1861, and 1871 :—

	1851.	1861.	1871.
Number of Towns	580	781	938
Area in Acres	1,724,406	1,913,945	2,213,421
Population	8,990,809	10,960,998	14,041,404
Increase of Acreage in ten years ..	..	189,539	299,476
Increase of Population in ten years	..	1,970,189	3,080,406

There are thus nearly 300,000 acres of land withdrawn from agricultural production during the last period of ten years in order to meet wants and luxuries of the town population, not altogether covered by streets and buildings, but used also for the gardens and pleasure grounds attached to suburban villas, which environ not merely our wealthy manufacturing cities, but are spreading also in the outskirts of most of our rural towns. To this class of houses, inhabited by the wealthy manufacturer and the thriving tradesman, we may attach a considerable portion of the increase of gardeners, who now amount to 116,757, of whom 2240 are women, as compared to 93,154 in 1861, including then 1773 women. It is amongst the same class that the great demand for domestic servants has arisen,—a startling sign of the increased means of comfort and of luxury amongst our population. The domestic servants' class has increased as follows:—

	Male.	Female.	Persons.	Increase.
1851	124,595	783,543	908,138	
1861	134,443	976,931	1,111,374	203,236
1871	152,971	1,225,014	1,377,985	266,611

The increase in these classes we may suppose to have been very considerably drawn from the agricultural labourers, who have generally filled up the ranks of domestic servants and of gardeners.

Another indication of the wealth and prosperity of the urban population is found in the increased value of the houses which they inhabit. During the ten years ending with 1871 the number of houses which were assessed to the inhabited house duty, that is, houses of the annual value of 20*l.* and upwards, increased 44 per cent., viz. from 519,991 to 748,719; while the number of those below that value only increased 9 per cent., viz. from 3,219,514 to 3,510,398. This augmentation has no doubt principally arisen in towns, although the decision to assess and subject farm-houses to inhabited house duty will have made some addition to the increase here noticed. Although the great rise in prices of building materials and of labour has affected very considerably the rents of houses, we cannot be blind to the very marked improvement in the size and value of the houses, built not only in London and our principal cities, but in most of our provincial towns, where many of the tradesmen and the professional class no longer live, as in old times, at their places of business, but to a considerable extent reside in country villas.

We shall shortly see how enormously personal property and the profits from manufacturing industry have increased the power to purchase the productions of agriculture; and our next inquiry must be, What are this class of producers doing? Are they

III.—NUMBERS of PERSONS engaged in AGRICULTURE in ENGLAND and WALES enumerated at each of the CENSUSES of 1851, 1861, 1871.

OCCUPATIONS.	Persons.			Males.			Females.		
	1851.	1861.	1871.	1851.	1861.	1871.	1851.	1861.	1871.
Total of Agricultural Order ..	1,928,796	1,833,295	1,634,192	1,479,372	1,456,762	1,263,730	449,424	376,533	370,462
Landed Proprietor	30,315	30,766	22,964	17,047	15,131	14,191	13,268	15,635	8,773
Farmer or Grazier	249,431	249,735	249,907	226,515	226,957	225,569	22,916	22,778	24,338
Farmer or Grazier's Wife	164,618	163,765	187,029	..	..	..	164,618	163,765	187,029
Farmer's Male Relative	111,704	92,321	76,466	111,704	92,321	76,466			
Farmer's Female Relative	105,147	83,830	92,187	..	..	..	105,147	83,830	92,187
Farm Bailiff..	10,561	15,698	16,476	10,561	15,698	16,476			
Agricultural Labourer, Out-door	952,997	958,265	798,087	908,678	914,301	764,574	44,319	43,964	33,513
Shepherd, Out-door	12,517	25,559	23,335	12,517	25,559	23,323	..	..	12
Farm Servant, In-door	288,272	204,962	158,756	189,116	158,401	134,157	99,156	46,561	24,599
Land Agent or Surveyor	3,064	4,702	4,810	3,064	4,702	4,807	..	..	3
Agricultural Student	104	490	760	104	490	760			
Agricultural Implement Proprietor or Worker	55	1,441	2,160	55	1,441	2,152	..	..	8
Land Drainage Service	11	1,761	1,255	11	1,761	1,255			

making progress or are they lagging behind, over-weighted in the race? The vast markets of the world are open to our purveyors, who can sweep America and Australia as well as the old world for supplies: but English beef and mutton maintain their supremacy, and Great Britain and Ireland are able to furnish nine-tenths of the supply required, while at the same time we have no indication that the production of corn in these islands is decreasing, and we have some reason to hope that scientific research may enable us to obtain a considerable increase of the growth of barley on strong land not well adapted to root crops.*

If our power of producing these supplies were dependent upon the number of persons employed in their production, the returns of the Census might cause some alarm. The figures for the principal agricultural classes stand as exhibited in Table III., p. 393.

From this Table we may extract the number of Farmers and Graziers, Farm-Bailiffs, Farm Servants (In-door), Agricultural Labourers, and Shepherds enumerated in the Censuses of 1851, 1861, and 1871, in England and Wales.

	1851.	1861.	1871.	
	1,347,387	1,340,916	1,246,561	

The landed proprietors returned at each Census represent those only who give this as their sole occupation; and do not include the large number who own land and yet have other pursuits. The decrease from 30,766 to 22,964, being 7802, of which 6862 were female proprietors, is very considerable and very curious. There can be no question that the selling value of land, especially when adapted for residential purposes, increased much more than its letting value between 1861 and 1871; and during the same period the temptation of largely increased income, and of small responsibility afforded by limited liability companies, may have acted as a strong inducement to small owners of land to part with their property; and this would probably have a peculiar influence on women, who are generally anxious to obtain a high rate of interest for their investments. In the statistical abstract for 1871 presented to Parliament, pp. 15-16, we find that between 1861 and 1870 inclusive, the

* I allude to the success of the experiments on barley growing at Rothamsted, where excellent crops of barley have been grown in succession for a series of years, not merely in experimental plots, but as farm crops, with a top dressing of 2 cwts. of superphosphate and 2 cwts. of nitrate of soda.

gross amount of the annual value of lands and houses assessed to income tax in England and Wales rose from—

	Land.	Houses.
	£	£
1861	42,975,768	49,505,163
1870	47,802,991	70,949,269
Increase	4,827,223	21,444,106

While during the same period we find trades and professions, including railways, 11,652,058*l.*; iron works, 1,112,049*l.*; mines, 3,802,201*l.*; canals, &c., say 2,000,000*l.*, which must be added to the returns of 1861, as these properties were then classed in Schedule A, but are now transferred to Schedule D, rising from

	1861.	1870.
	£	£
Annual Value ..	100,097,634	154,174,613

Being an increase of 54,076,979*l.*

With figures like these before us, we cannot wonder at the smaller proprietors of land being tempted to part with a property which is often encumbered, and returning a small income, in order to take their chance in the race where there appear so many prizes to be won.

In the mean time we notice the stationary number, during the last twenty years, of those who in the Census describe themselves as farmers and graziers, the figures varying from—

1851.	1861.	1871.
249,431	249,735	249,907

And here, singularly enough, we have an increase during the last ten years of about 1500 in the female members of the class. The Census Commissioners notice that there has been a "noiseless but rapid increase in the number and proportion of women engaged in specific reproductive work," in addition to the wives of the industrious classes, who take their share both of business and household work; and this accords with this increase of women farmers. The proportion of about one female to ten male farmers is not quite evenly distributed, but is exceeded in the dairy and grazing counties, as, for instance, in Derbyshire and Cheshire, where the numbers are about one in seven, falling away to one in fifteen in the East Riding of Yorkshire, and one in thirteen in Norfolk, districts which are more especially noted for their arable cultivation.

By another official inquiry, returns of live stock in 1871 were obtained from 469,444 occupiers of land in England and Wales, a number which was increased to 481,412 in 1873, showing that land is occupied by nearly double the number of those who in the Census paper returned themselves as farmers and graziers. The inquiries in 1871 showed that of these, 237,999 were holders of less than 20 acres of land, and in 1872, 103,189 of these were returned as occupying between one acre and five inclusive. The returns for 1873 give us also in England and Wales, 243,700 garden allotments detached from cottages, and which average throughout the country about a quarter of an acre. No doubt some of these allotments are held in connection with the smaller holdings to which allusion has been made; but the enumerators of agricultural statistics estimate that in England there are about 353,000 separate holdings not exceeding five acres in extent, and that number is exclusive of the gardens attached to all classes of dwelling-houses, including those of labouring men. I think we may conclude that the greater number of these small holders will be agricultural labourers, tradesmen in country villages, and artisans in small towns, who cannot be said to derive their chief support as farmers and graziers, and that so the Census returns will mainly represent the class of tenant farmers, by whose energy and capital the credit of English agriculture is for the most part sustained.

Are they prospering, and has their condition improved? If we may take as a test of prosperity the number of marriages, and if we agree with the Registrar-General, that when trade is good, and the industry of any particular class is well paid, the marriages of that class increase, we have at once a satisfactory fact, for at the end of this decennial period farmers' wives had increased from 163,765 to 187,029; and as some proof that their marriages are not hasty and imprudent, we may note that out of this number only 5373 were under the age of 25. The number of the farmer's female relations living in his house had increased, and these and the wives, probably, to some extent replace the female in-door servants, whose numbers fall one-half. As, however, the number of male in-door servants has also declined from 204,962 to 158,756, we may conclude that the work in farm-houses is very considerably reduced, and thereby the necessity for female in-door labour is diminished. The old patriarchal system of boarding young men in the farmer's own house is going steadily out of fashion; and we can scarcely wonder at it, when we see the change that has taken place in the social condition of the farmer and his family. Much might be said for the custom in old times, and, with a careful master and mistress, the discipline was good for servants, and links of gratitude were thereby forged, which, perhaps, do not so often now exist between employer and employed. The farmer's male relatives at home decrease from 92,321 to 76,466. As farms grow larger, and the farmer's social position improves, his sons go out to other professions, and to the ranks of more profitable enterprises. Similar indications are noticed in the increase of the number of farm bailiffs and of land agents, each suggesting that both the holding and the ownership of land is becoming larger, and that more assistance is required for its management and direction.

To fill the ranks of these classes, and to provide for the more scientific practice of agriculture, we have a constant increase in the number of those who are making agriculture a special study, the Agricultural Student Class having sprung from 104 in 1851, to 490 in 1861, and so to 760 in 1871. How few of these 760 have attempted the honours of the Royal Agricultural Society of England, of the Highland Society, or the scientific course of the Royal Agricultural College at Cirencester! Are we to conclude that these societies have pitched their standard too high for practical purposes, and that the study of agricultural chemistry, of geology, of mechanics, or of physiology, are beyond the farmer's requirements; and that the most profitable course for the agricultural student is to follow out the practice on the farm, under the eye and the direction of a successful manager?

The next portion of our inquiry concerns a class which must furnish the backbone of our agriculture, and whose condition and future prospects are at this moment attracting almost universal attention. The number of agricultural labourers, shepherds, and in-door farm servants, has fallen thus:

	Male.	Female.
1851	1,110,311	143,475
1861	1,098,261	90,525
1871	922,054	58,112

On the other hand, the class of male undefined labourers has risen from 324,594 in 1851 to 306,544 in 1861, and to 509,456 in 1871.

The increase in the undefined labourer class, 203,912, being somewhat greater than the decrease, 176,207, of male agricultural labourers, and indicating a transference of unskilled labour from agriculture to other trades, we have to inquire whether this transference of labour has lessened our agricultural products, has injured the farmer, or has been hurtful to the labourer himself.

I think we shall find that there is no diminution but an increase in production.

The Census returns gave in England and Wales in 1851:—

	Acres of Territory.	Cultivated.	Uncultivated or Unaccounted for.
1851	37,324,915	24,905,758	12,419,157
1871	37,324,883	26,322,477	11,002,406

The last line is taken from the volume of agricultural statistics for 1871, and indicates an increase of 1,416,719 of cultivated acres in the 20 years, in addition to what has been subtracted during that time for towns, railways, canals, and roads. The increase of acreage in towns alone has been 489,015, so that we may fairly conclude that in the 20 years about 2,000,000 acres have been taken from the waste and brought into cultivation, or used for purpose of habitation or industry. Nor have we any reason to suppose that the produce per acre of the cultivated land of England has in any way decreased The investigations of Mr. Lawes, and the accounts of practical farmers, lead us to believe that on farms which for some years have been cultivated as highly as possible, the average production remains tolerably constant, although affected considerably by the circumstances of each season. On such farms, if there is no increase, at all events, there is no decrease of production ; but on the other hand, I think all observers will admit that there is a considerable approach to the higher standard of cultivation amongst farmers who have hitherto not arrived at it. It is not an easy matter to arrive at the quantities of corn grown in the United Kingdom. Between the first collection of agricultural statistics in 1868 and those of 1873 there has been a small diminution of the acreage devoted to wheat, and this has been almost exactly compensated by the increased growth of barley,—a result probably arising as much from the wet autumn of 1872, which prevented wheat sowing, as from any other cause. With respect to cattle and sheep, we do know that there had been, from the causes before alluded to, a considerable diminution between the years 1868 and 1871 ; sheep having decreased from 23,599,284 to 20,236,822, and cattle from 4,373,064 to 4,267,652, a diminution of the wealth of the farmer of not less than 5,000,000*l.*, valuing the sheep at 40*s.* and cattle at 10*l.* each. This may be traced to two causes,—first to the great increase in the demand for meat on the part of the industrious classes, and the consequent consumption of animals which might otherwise have been retained for breeding purposes; and, secondly, to the losses which farmers sustained from Rinderpest in 1865, and from the drought of 1868 and 1870. Since 1871, however, these losses have been recovered, in spite of, and perhaps owing to, the excessive demand for meat. The number of sheep in 1873 had increased to 22,136,713, but was still smaller than in 1868. The cattle amounted to 4,816,492, an increase of 443,428, which more than compensated for the diminished number of sheep. In these figures I am taking no account of Scotland and Ireland, from which latter country especially we continue to derive increasing supplies both of fat and grazing stock. Indeed the increase of cattle in Ireland between 1869 and 1873, was no less than 531,209, and for the three kingdoms had reached the amount of 1,071,777, an increase of agricultural wealth of not less than 11,000,000*l.*; but as the stock of sheep was still 1,623,323 below that of 1869, we must deduct for these a sum of 3,250,000*l.*, leaving a net increase of about 7,750,000*l.* In the mean time our supplies of food from abroad continued to increase, and in the ten articles of farmers' produce,—cattle, sheep, bacon, beef, butter, corn of all kinds, cheese, eggs, potatoes, and pork,—the imports into the United Kingdom, which in 1861 were valued at 46,247,258*l.*, had in 1871 reached the sum of 63,702,894*l.*; an amount partly arrived at by increase of price, but still further by augmented supply.

As far as we can judge from the returns, there is not any serious alteration in the rotation of our crops arising from the diminished supply of agricultural labour. The percentages of the different crops do not vary very considerably:—

	1867.	1871.	1873.
Corn Crops	32·3	32·4	31·4
Green Crops	11·7	12·3	11·5
Bare Fallow	3·3	2·0	2·7
Grasses in rotation	10·8	11·4	11·2
Permanent Grass ..	41·6	41·7	42·8

The truth of the matter is, that wider and easier communication with the world has at length reached the agricultural labourer, and has taught him that there are other fields of industry even for unskilled labour, and that higher wages, with a more active life, await him in the towns. To the labourer himself this is a great boon, and I believe it will eventually be found equally valuable to his employer. Low wages have always meant indifferent work. Fewer hands will be employed; these will be better paid, better housed, and better fed. Labour-saving machinery will take the place of the human machine; and as the wages rise, the farmer will find out that his work will be carried out as well and as economically as before, because his workmen are both physically and intellectually more capable.

During a great part of the present year a severe strain has been placed upon farming capital and labour in the Eastern Counties, and a struggle, which must leave painful scars behind, has been taking place between those whose relations should be friendly if agriculture is to be successful. But even in this struggle we have gladly missed the bad features of earlier contests. There have been no stack burnings, no injury to stock or crop; and though inflammatory language has been used, and hard and unjust things uttered by the outside agitators of the movement, on the whole the battle has been fought fairly and straightforwardly on both sides. There have been mistakes committed by each of the combatants, and much loss and suffering to innocent parties has ensued. The farmer will have to recognise that his men have a right to combine with one another for legitimate purposes; and if by such means they can raise their position and prospects fairly, no resistance on his part can prevent their efforts. On the other hand, the labourers will find that they are in greater numbers than are required, and that the standard of wages must be regulated by their work, and not by some fancied measure of their own; and that if their position is to be improved a considerable migration may be necessary. The landowner will see that if he wishes to attach and retain the best men to their work and to the locality, he must provide better cottages, with gardens and appliances to make home more comfortable. The labourer will be able with increased wages to pay increased rent for these comforts; and the probable diminution of numbers will render fewer cottages necessary, and make it easier to provide that these shall be of a superior class.*

Do the figures in the Census bear out this view, and render these suggestions probable? If we look to other orders of industry not exactly agricultural, but either dependent upon agriculture or auxiliary to it, we find manufacturers of agricultural machinery rising from 1034 in 1861, to 3628 in 1871; owners and workers of agricultural machinery for hire in 1861 being 1446; and in

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* Since the above remarks were written, the Executive Committee of the Agricultural Labourers' Union have withdrawn their support from the Eastern Counties labourers, and have left them to come to terms with their old employers, or to seek fresh work by emigration. The contest has resulted in defeat to the labourers, and I fear the coming winter will find most of them with impaired resources to meet its demands. It is surely not too much to hope that the successful farmers will be generous, and remember old ties and happier days, and not put such pressure on their men as may drive them to despair.

1871, 2160. Both these classes are a relief to labour. Another of the helpers in production, although agriculturists sometimes fear he carries off more than his legitimate share of the profits, is the manure-manufacturer; of these, in 1861, there were 589; in 1871, 1210: and linseed-cake manufacturers increased in the same period from 127 to 407. The increase in both these classes indicates the earnest desire of the farmer not to lose any chance of enriching his land and of augmenting his production. Those who deal in his products also increase. Maltsters are almost stationary, but brewers have increased by more than 5000; corn-merchants by nearly 3000, cattle-dealers (a much-abused class) by 1000, and cowkeepers and milk-sellers by about 3000; butchers by 7600—another proof how very largely meat is entering into the daily fare of all ranks of society. What the correspondent of 'The Times' noticed in this respect in Suffolk—what another writer says of the labouring class in Liverpool—I should corroborate from my own experience of country butchers in Yorkshire, that their trade amongst the labouring classes is quite double what it was some ten or fifteen years ago.

I think, then, we may reasonably conclude, that if the tenant-farmers are stationary in numbers, and if their labourers have decreased, their energy and their productive power have steadily progressed, and show no sign of failure.

One word with respect to rural amusements. The cry against game becomes louder, and yet the number of persons employed in its preservation increases. Gamekeepers in ten years sprang from 9848 to 12,431, and huntsmen and whips from 454 to 639; an indication that the "noble science" is more popular than ever. And surely, if fair dealing takes place between the sportsman and the farmer, and if "ground game," the bone of contention, be either surrendered to or shared with the occupier, we may still enjoy those active country amusements, which add such zest to country life, and in which, at least in the hunting-field, sportsmen meet on terms of more equality than in any other pursuit; and, whether from town or country, on foot or on a 500-guinea horse, men are valued for their sportsmanlike qualities rather than for their length of purse.

On the whole, I cannot but think that we may be well satisfied with what the Census tells us of rural England. The number of small holdings is more considerable than was imagined; the demands of the towns are not beyond our means of supply, though they tax our energies to keep up with them; and the condition of the agricultural labourer is fast rising to a more equal rank with that of the skilled artisan.

July 13, 1874.

XV.—*A Report on the Agriculture of Cumberland, chiefly with regard to the Production of Meat.* By Thomas Farrall, of Dovenby, Cockermouth.

It is now twenty-two years since Mr. William Dickinson wrote his very able Report on the Agriculture of Cumberland, which was published in the 'Journal of the Royal Agricultural Society,'* and in which he gave a very interesting account of the system of cultivation pursued at that time. Much of that system is unchanged at the present day, and need not be described here; I therefore intend to confine my remarks chiefly to the improvements which have taken place since the date of his Report, particularly with respect to the production of meat. Up to ten or fifteen years ago, many farmers depended exclusively upon the production of grain in order to meet their rent, rates, and taxes; now they generally rely upon corn-growing and meat-making concurrently; sometimes upon the latter alone, the production of meat having within a few years become a striking feature in the agriculture of the county. In proof of this, I may state that a farmer on returning home from market twenty years ago, would have been asked over and over again, how wheat was selling; now the first question is, "Was there a dear auction?"

Statistics affecting Agriculture.

It may be well at the outset of this paper to give certain statistics, as published in the Returns collected by the Board of Trade from the time of the cattle plague in 1866 up to 1873 inclusive, in order that it may be seen how lands have been laid down to permanent pasture; how corn-growing has become of secondary consideration; and how the live stock of the farm has been numerically multiplied, chiefly with the view of producing meat for an increasing population.

Table I.—Number of Horses, Cattle, Sheep, and Pigs in Cumberland.

Years.	Horses.	Cattle.	Sheep.	Pigs.
1866	No Returns.	109,225	396,021	40,742
1867	,, ,,	104,184	525,064	35,386
1868	,, ,,	117,672	515,002	26,662
1869	21,465	117,320	478,531	24,571
1870	19,705	118,084	478,261	29,937
1871	19,264	121,410	484,980	36,113
1872	19,298	125,590	530,469	35,344
1873	19,071	128,538	561,513	28,229

* Vol. xiii., p. 207, 1852.

The number of horses has always been returned in Ireland along with the other agricultural statistics, and was also included in the Agricultural Returns formerly collected in Scotland, but until the year 1869, horses were omitted from the Returns collected in Great Britain. The marked difference between the numbers for 1869 and 1870 is not attributable to any serious diminution in the actual number kept; indeed, it is scarcely possible to make a comparison, since in 1869 all kinds of horses belonging to occupiers of land were returned, and, in addition, an estimate was made of the total number in towns; but in 1870 it was considered that with respect to horses in Great Britain the Returns should be limited to those used solely for agricultural purposes. Table I. shows a gradual decrease from 1870 to 1873, except in the year 1872, when there was a very slight increase. The falling off in the four years, 1870-3 inclusive, was at the rate of 634 in the aggregate, or 3·2 per cent. on the entire number kept. The decrease of late is not entirely owing to the fact that farmers have, to a certain extent, given up breeding: on the contrary, I believe that, on account of the sudden uprise in value within the past two or three years, breeders have sold off a portion of their surplus stock to go out of the country, or at least out of the county. So marked has been the demand of late for really good cart-horses, that almost fabulous rates have been reached. From 80*l.* to 100*l.*, and even as much as 120*l.*, has frequently been paid for an animal possessing substance, symmetry, and action, notwithstanding the introduction of steam power upon a few large estates. It is generally believed that in two or three years there will be a considerable increase in the number of agricultural horses, inasmuch as farmers of almost every degree are breeding more extensively. In some towns liberal prizes are awarded for strong entire cart-horses to travel in the immediate district; for example, at Cockermouth in the present season (1874), the sum of 60*l.* has been awarded to the best animal, with a guarantee of 100 mares, being the property of subscribers, at 1*l.* 10*s.* each; thus ensuring over 200*l.* to the owner for the use of his horse during the season. Individual enterprise also is very marked in some cases. Mr. Henry Newby-Fraser, of Hay Close, near Penrith, a few months ago brought a first-class entire horse from Scotland —pronounced in the local papers to be the best strong horse that ever crossed the Border—which cost him 1000 guineas. Unfortunately the splendid animal died suddenly just before the season commenced, after his owner had been promised upwards of 70 mares at the high figure of 7*l.* each.

With respect to cattle, the general tendency has been to a large increase in the number returned; to this, however, there are two exceptions. The most notable decrease is in the Returns for 1867, when the numbers were lessened by 5041. Nor is this all. The Returns for 1866 were collected only on holdings above five acres in extent, so that the figures I have brought forward would have been under the actual difference had the Returns been as complete as in after years. The diminution is to be accounted for by the sad ravages made by the much-dreaded cattle plague, when a large number of herds were seriously reduced in numbers, and others totally destroyed. In 1869 there was also a slight decrease. This was mainly owing to the short commons of 1868, when farmers becoming chary, lest a dearth of feeding substances should overtake them, kept their herds within bounds, either by actually selling off the surplus stock, or by refraining from buying in Irish cattle. As a rule, however, the tendency has been for some years, and still is, to an increase of cattle, a fact which I have already stated. The advance from 1867 to 1873 has been set down at 24,354, but 1867 being the year after the cattle plague, perhaps a surer basis will be found in estimating the increase from 1868 to 1873, which is given as 10,866, or 9·2 per cent. During the past three years there has been a steady increase of upwards of 3000 per year; and as trade has been very little restricted during that time, and there have been no panics, arising either from war or famine, the tendency may be considered natural.

The extreme dryness of the weather, and consequent shortness of food for sheep, in 1868, naturally caused farmers to be cautious in purchasing lambs in the autumn, and the result is, that the Returns of 1869 show a diminution from those of 1868. So with the following year to a certain extent. The decrease in the two years was 36,741 in the aggregate, or 7·1 per cent. In the past three years, however, there has been a steady increase at the rate of 27,417 per year, upon an average. The extraordinary demand for mutton, brought about indirectly by the high wages received by labourers at the ironworks and collieries, is causing many agriculturists to turn their attention to the feeding of sheep, and so the Scotch markets are drawn upon pretty extensively to stock the turnip fields and pastures, when the supply of home-bred descriptions fails.

The number of pigs returned in 1867 very nearly corresponds with that of 1872, but the number in 1873 shows a wonderful reduction—7115 in all, or 20·1 per cent. This is chiefly owing to the fact that as the consumption of beef and mutton extends, that of pork and bacon falls off, inasmuch as the poorer classes, whose animal food was at one time almost exclusively confined to that produced by the pig, have lately regarded beef and mutton as indispensable items in their daily food, the reason of which I have already attempted to explain.

Table II. shows the extent of land under each of the principal cereal crops for the eight years ending with 1873.

TABLE II.—TOTAL ACREAGE under CORN CROPS in CUMBERLAND.

Years.	Wheat.	Barley.	Oats.	Rye.	Beans.	Peas.	Total under Corn Crops.
1866	23,979	11,372	71,870	582	447	648	108,898
1867	22,856	11,511	72,046	483	244	436	107,576
1868	26,390	10,484	72,607	575	154	153	110,363
1869	28,916	10,493	71,189	932	276	209	112,015
1870	25,262	11,069	77,261	920	485	340	115,337
1871	26,518	10,200	71,681	699	415	452	109,965
1872	25,745	9,503	68,715	535	426	499	105,423
1873	23,264	10,562	65,473	523	637	245	100,704

The acreage under corn crops gradually increased from the year 1867 to 1870 inclusive. Since then, however, there has been a steady decrease in the breadth of land devoted to the production of cereals. Agriculturists find that corn can be imported, but that butchers' meat cannot; they are, therefore, gradually turning their fields into pasture, and ploughing out as little as possible; at the same time the majority are fully alive to the fact that corn-growing and meat-producing must, to a certain extent, go hand-in-hand.

It is noteworthy that since 1866 the acreage devoted to wheat has not been materially altered. The area under this cereal in 1873, compared with that of 1872, certainly shows a decrease by 2481 acres; but then it should be understood that the autumn of 1872, when the succeeding crop should have been sown, was one of the wettest on record, and so a certain proportion of land, originally intended for wheat, was undoubtedly sown with barley in the following spring.

With the exception of the year 1873, the Returns show that the area occupied by barley has been gradually decreasing, but at the present time, some farmers are quite sanguine that in future years the breadth will be extended, owing to the great demand for this description of grain for malting purposes.

In the year 1870, the largest breadth of oats was grown, viz. 77,261 acres; since which there has been a steady decrease, the Returns for 1873 showing a falling off of 11,788 acres, or at the rate of 15.2 per cent.

Rye, beans and peas are very little grown. The Returns for 1873 show little change in rye; an advance of 50 per cent in beans; and a diminution of 100 per cent in peas. I may also remark that very little attention is paid to the growth of forage crops. With the exception of a few tares, they may be said to be almost *nil*, but I am quite satisfied that a moderately large area could be grown with profit, inasmuch as forage crops may be sown so as to be ready for use when the pastures fail, and thus enable stock to be carried on without deterioration at the most critical periods of the year.

In Table III. is shown the extent of land under the various kinds of green crops, bare fallow, hay, and permanent pasture.

TABLE III.—ACREAGE under GREEN CROP, BARE FALLOW and GRASS, in CUMBERLAND.

Years.	Potatoes.	Turnips.	Mangolds.	Other Green Crops.	Total.	Bare Fallow.	Meadow and Permanent Pasture.
1866	12,137	33,263	381	5,675	51,456	13,954	229,439
1867	11,498	34,690	442	3,276	49,906	11,320	241,612
1868	12,030	34,576	467	1,784	48,857	10,981	239,125
1869	12,866	35,305	654	2,296	51,121	7,964	257,277
1870	12,420	35,389	1,137	2,452	51,398	6,439	229,543
1871	12,846	34,318	1,261	2,339	50,764	6,116	261,979
1872	11,270	33,002	1,480	2,883	48,635	8,019	266,468
1873	11,219	35,259	1,565	2,633	50,676	6,511	283,803

In the relative breadth of potatoes and turnips grown, very little change has taken place within the past eight years; the proportion of the former to the latter being about one to three.

The increase in the acreage of mangolds is very striking. Every year shows a larger extent than the previous one, so that in eight years the area has been quadrupled. The failure in the turnip crop, in the droughty summers of 1868 and 1870, caused farmers to devote at least a portion of their land to the growth of this important root, so that in case of turnips again becoming a failure, they might at least have something to fall back upon. Perhaps Cumberland is a little too moist in the majority of seasons, and its situation a little too far north to admit of the mangold being grown to anything even bordering on perfection; but it is worthy of notice, that, notwithstanding the extremes and irregularities of climate, fine crops have been produced in some parts of the county, especially where due regard has been paid to their management. I may here mention that I have seen splendid mangolds grown upon many of the Netherby farms in East Cumberland, as also upon the farm of Crosscannonby Hall, near Maryport, in the occupation of Mr. Robert Ellwood, one of the most enterprising farmers in the county. In spring, when turnips fail, the mangold is invaluable in the feeding of stock in preparation for the shambles, especially in a district like Cumberland, where both roots and grass are extremely scarce in April and May. Not a few farmers have adopted the system of running their feeding sheep upon a piece of clean lea, in the month of April, and supplying sliced mangolds in troughs. This food, in conjunction with a little cake or corn, fattens quickly, at the very time of the year when sheep are apt to fail under ordinary circumstances.

Since the year 1866, the breadth of bare fallow has been materially lessened. Indeed the acreage of last year was barely one-half of the extent of that of 1868. Fallow at one time was considered essential, not only to facilitate the eradication of weeds during the summer months, but also to restore the fertility of the soil, in order that a better crop of wheat might be grown in the following summer. Autumn cultivation and improved agricultural implements now, however, enable farmers to free the land from weeds without putting it down in fallow during the summer months, and the use of extraneous foods and artificial manures enables them to keep the land in sufficient heart to produce a good crop of wheat. Indeed, many practical men aver that, after judicious management and generous treatment, the land produces as good a crop of wheat after turnips as it does after bare fallow; while others of the old school never exactly fall into the system of cropping continuously. I may also notice that, at the present day, the majority of skilled agriculturists do not go in solely for producing wheat; they would much rather sow the land with oats or barley than forego the turnip crop, which is now looked on as the mainstay of arable farming.

While the above Returns do not show that the breadth of land devoted to grass has increased so much as many are led to believe, yet it is generally conceded that it is to the improvement effected in the pastures, rather than to any perceptible increase in their acreage, that more stock is kept. Some of the best class of land has been permanently laid down to grass, while common lands and the rougher pastures have been brought under the plough, thus keeping up the breadth of arable ground, and the quality of the grazing land has been ameliorated by better soils being devoted to the growth of grass. For example, there are many farms, which I could mention, where the soil is deep and possessed of good body, that a few years ago were heavily cropped under a sort of hand-to-mouth system, and grew little more produce than sufficient to pay rent, rates, and taxes, with a sort of precarious livelihood for the occupier. These have since been taken in hand by the respective landlords, well-drained, thoroughly cleaned, boned and manured, and finally laid down to grass, the best seeds being used. Such lands are now annually producing large quantities of beef and mutton in place of being a blot on the fair face of the country; and have either been let solely as grazing farms, for a term of years, or are let by public auction from year to year in the months of March or April, the tenants retaining possession until the following Martinmas. In this way, the farms are generally pretty well divided into parcels; the fields of a first-class character being usually taken by graziers, on which to fatten their cattle, and the second-class land often falling to the lot of some neighbouring farmer as a turn-out for his young stock, as occupiers of arable farms are able to keep more stock in winter than they can graze in summer. This practice has almost given the death-blow to the system of agistment which a few years ago was so universal. Farmers prefer to keep the cattle under their own personal inspection, because they can behave more liberally towards them than when they are put out to grass upon too-heavily stinted public agistments. With respect to the rent of land let annually, I may state that it varies very materially, according to situation, quality of land (whether well watered and sheltered), and demand in the locality; as it ranges all the way from 15*s.* or 20*s.* per acre for the poorest, to 5*l.* or 6*l.* for the best quality. In the vicinity of towns as much as 7*l.* to 8*l.* is sometimes paid for what is understood as accommodation lands, but these cannot be taken into account when the question of value arises, as such parcels can scarcely pay their way; only, horsekeepers, butchers, and dairymen must have a little bit of land for a turn-out, let the rent be what it may. Within the past three years there has been marked competition at the annual lettings, and rents have gone up in a wonderful degree, notably in the spring of 1873, when the uprise ranged from 10 to 50 per cent. throughout the county.

Cattle.

As one of the principal features of this paper is to trace the improvements in farming, chiefly with reference to the production of meat, it may not be amiss to give a short account of the raw material there is to work upon. Shorthorns being what are usually termed the bovine "aristocracy," I naturally commence with them. They were introduced into the county about sixty years ago, and have gradually gained favour, until, at the present time, many fashionable herds exist in different parts of the county. In the foremost rank we may place those belonging to Sir Wilfrid Lawson, Bart., Brayton Hall; Mr. Fawcett, Scaleby Castle; Mr. J. P. Foster, Killhow; Mr. Robert Jefferson, Preston Hows; Mr. John J. Hetherington, Middle Farm, Brampton; Messrs. Gaitskill, Hall Santon; Mr. Todd, Mireside; Mr. Henry Caddy, Rougholm; and Mr. John Blackstock, Hayton Castle. A few herds have also recently been dispersed, and I have no doubt that the sale of a valuable herd of Shorthorns is a very great boon to that part of the country in which it takes place, for it not only gives those who are wishful an opportunity of introducing blood into their stock, but it also stimulates many to exertion, and causes them to buy animals which they would never have thought of doing privately. Perhaps the best herd ever offered for competition in Cumberland was that of the late Mr. Saunders, of Nunwick Hall, near Penrith, which for blood, symmetry, and fashion was difficult to match; and so the public seemed to think, for many of the animals brought exceedingly high prices. The dispersion of this stock enabled neighbouring farmers to improve their herds very materially; but perhaps no landed proprietor ever gave better facilities to his tenants and neighbours for improving their stock, than did the late Mr. Saunders during the latter part of his life. He allowed them the free use of his fashionable bulls, and many were not slow in taking advantage of the privilege thus offered. It was chiefly from Nunwick Hall that Mr. John Davidson, late of Greengill Farm, laid the foundation of a herd which not only reflected credit upon himself, but also realized a considerable sum of money when dispersed at the fall of Mr. Thornton's hammer. The herds above mentioned are those in which pedigrees are traced; but of course upon many farms, where pedigrees are not kept, good Shorthorns are to be found, with large frames, full of hair, of fine symmetry, and possessing great milking capacities, as well as a propensity to mature early. And it is worthy of remark, that, as a rule, the cattle in the neighbourhood of a good stock of pedigreed Shorthorns are much better than those in districts where no such herds are kept; so that private individuals who bring their cattle to anything approaching a state of perfection are, in an indirect manner, acting as benefactors to the community at large, thus verifying the old adage which states that "Example is more powerful than precept."

As this breed is gradually gaining in public favour, and it is not at all unlikely that in time much more of the beef annually consumed will be traceable, either directly or indirectly, to Shorthorn animals, I have thought it desirable to give a brief account of what has already been done by Shorthorn fanciers. The gradual improvement of land by drainage, manuring, and general good management, is so striking, that pastures which at one time produced nothing but coarse grasses, are now finishing off cattle with blood of Booth or Bates in their veins, and sheep having about them a dash of Bakewell. Should anything occur to stop the heavy consignments of Irish cattle, still more attention would be paid to the breeding and rearing of Shorthorns and Shorthorn crosses at home; and I have no doubt that, with a little extraneous food in the shape of cake or corn, many of the pastures in Cumberland would finish off animals fit for either a Birmingham or a Smithfield market.

Notwithstanding, however, that Shorthorns are gradually displacing both other distinctive breeds and mongrel varieties as permanent stock, yet, anomalous as it may appear, a very small proportion of the beef which is annually grown in Cumberland is produced either directly from the Shorthorn or from the crosses which are here and there common. This is accounted for by the fact that a great demand exists in Cumberland for both steers and heifers to graze upon the fine pastures of Yorkshire, Lincolnshire, Norfolk and other counties along the eastern coast,—many of which are taken into Scotland to finish. And so in the spring of the year, or sometimes as early as the month of February, every nook and corner of the county is scoured by jobbers in search of grazing descriptions to supply the demand; thus the ever-faithful districts are robbed of many of the choicest animals before the spring sales. The remainder, along with the outwields, are sent to the fairs at Carlisle, the April fair at Penrith, or the May fairs at Cockermouth, at all of which a good stroke of business is usually done. In some parts of Cumberland, notably in the "wild regions" of the north and north-east, a few mixed stocks of the black Galloway breed of cattle are to be found, but they are gradually being displaced by the favourite Shorthorn, and the existing black cattle may now be looked upon as the stragglers of a vanishing race. So far as I have been able to make out, only one herd of the ancient breed of Longhorns now exists in the county.

The home-bred cattle which are destined to become "food for the people," are chiefly those which have been kept for dairy and breeding purposes, and are fed off at six to eight, or even as much as twelve to fifteen years old, when they have become no longer serviceable in the sphere they had hitherto occupied. A few, certainly, are prepared annually for the Christmas fat shows held at Carlisle, Penrith, and Cockermouth, but they are few indeed, when compared with the weekly consignments of other kinds. The chief sources whence the Cumberland grazier obtains his lean stock are the large droves of Irish cattle which are shown upon the market stances. A few years ago, Irish cattle were imported chiefly in the spring and autumn months; but now they may be had at almost any time, at prices varying from a five-pound note to three times the money. The supply seems to be almost inexhaustible, and farmers sometimes wonder where lean stock could be found to stock the pastures were the Irish cattle suddenly to fail. In ordinary seasons the grass lands are stocked in the beginning of May, or, in fine seasons, in the early part of

April, and so rapid is the progress of the Dexters, the Donegals, and Moyles, that they are sometimes ready for the shambles by the latter part of June. Present rates considered, a cow purchased in for 7*l.* to 8*l.*, makes in 12 to 18 weeks from 11*l.* to 12*l.*, and so on; but it is generally believed that this class leaves a wider margin for profit than the better class purchased in at 12*l.* to 15*l.* However, both kinds have their zealous advocates. I know of more than one instance where graziers, who were so dead set against Irish cattle a few years ago, that they would not have one on their land, now graze nothing else in the cattle line. And so with those who go in for different descriptions; some prefer the large sorts at one period of their lives, then turn round to the smaller, and *vice versâ*. With the aid of a little cake or corn, not only is the period of keep shortened, but the quality of the animal is improved, so that some graziers are now getting into the way of supplying a little extraneous food daily. Linseed cake, cotton cake, and Indian meal are the principal descriptions of food in use, although here and there a farmer prefers to give a portion of crushed oats. The use of artificial food to assist cattle grazing in the fields is by no means general: on the contrary, it is the exception. In fact, there are still many graziers and farmers who are hard of belief that it is a paying speculation, and so the majority choose rather to take what the pastures produce naturally than go to the price of artificial food. Until recently, so little was known of the virtue of pure and well-made cakes, that most feeders of stock were of opinion that fat could not be laid on any quicker by artificial aid when cattle were fed upon good-bodied pastures; but their minds have at length generally been set at rest upon this point, although here and there an adherent to the practices of the old school still exists, having more faith in either grass or oats than foreign cakes, of which he declares we English know but little. Cake, however, pays—and pays well. Cattle which are allowed a portion while grazing upon the pastures, thrive much more rapidly than those fed solely upon grass, inasmuch as the appetite is improved, and they are less liable to any internal derangement. They become fat fully a month sooner as well, so that the grass parks are freed early; and where a regular quantity is allowed daily, a certain extent of land will maintain more stock. Perhaps the greatest benefit which accrues from the use of cake is to the land; but as many of the permanent pastures change hands at the end of each year, there is no doubt that holders are not so careful to improve the land as they might be under better arrangements, not knowing who is to reap the benefit in future years.

In the winter season large quantities of Irish cattle are either tied up in the byres and fattened off, or run loose in sheds or boxes for the same purpose. Some of the summer-fed animals, which have not gained flesh quickly enough to be ready for the shambles by the end of October, when the pastures fail, are tied up and fed off by Christmas. Indeed, it is somewhat difficult to get very young animals, many of which have but four, and others only two broad teeth, ready for market so quickly as those of a more mature age, inasmuch as a large proportion of the food they receive goes to the formation of "blood, bone, and sinew," rather than flesh. Those animals which are intended for stall feeding solely, are allowed straw and turnips *ad libitum* until after Christmas, when a little hay is sometimes added. As spring approaches, cake or corn is introduced; the usual allowance of the former for ordinary sized cattle being 2 or 3 lbs. at the commencement; the quantity being gradually increased until a maximum of 7 to 8 lbs. is attained. In the late months of spring, or when turnips begin to fail, mangolds are sometimes substituted, upon which cattle make capital progress.

Sheep.

Recently, the breeding and feeding of sheep has become a notable feature in Cumberland farming. So late as 1825 the farmers on many estates were prohibited from keeping sheep by a restriction in the lease, as being unprofitable either to landlord or tenant, and very injurious to the quick-set fences. At the present time, the state of things is entirely different; and it is looked upon as a prosperous sign when a farmer has a good flock of sheep, for they pay well for their keep, and the land in place of being injured, is improved in quality if only "run over with their golden feet." The prevailing breed is the Leicester, which has been brought to a very fine standard of excellence by some of the most eminent breeders and sheep-fanciers. Particularly, as being worthy of record, I may notice the flocks of Mr. Jefferson, of Preston Hows; Mr. Fox, St. Bees Abbey; Mr. Jackson, Calva; Mr. Twentyman, Edderside; and Mr. Joseph Bell, Scale Hill, Lazonby. These noted breeders annually send a number of rams to the special sale at Cockermouth, which takes place on the last Friday of September, and thus the farmers in the immediate district are enabled to secure good rams for their flocks. Some of the finest rams average from 6 to 10 guineas each for the best pens, and it is not uncommon for selections from the most meritorious flocks to make high averages throughout; for example, Mr. Jefferson, and Mr. Norman, of Hall Bank, sometimes realise an average of 8 guineas for 40 animals each, the highest figures being from 25 to 32 guineas per head for the best descriptions. Mr. Norman, of Hall Bank, near Aspatria, has a breed of Lincoln long-woolled sheep; and although, perhaps, the district is a little too far north to admit of this class of sheep attaining anything like perfection, the animals under generous treatment seem to thrive admirably. A few farmers have lately drifted into the breeding of Border Leicesters, as being more suitable to the climate and soil than the pure Leicester; but of this others are not quite so sanguine, for where the pastures are sound and good, the Leicester sheep is healthy, grows to a large size, and produces a fine fleece. In the autumn months, thousands of Cheviots are brought from Scotland, and exposed for sale at Carlisle, Penrith, Cockermouth, and other fairs and markets, and are bought up by farmers who have either parted with their own lambs, or who do not include sheep-breeding in their farm management. Where a single crop of lambs is taken from the same flock, many farmers are now in the habit of purchasing four- or five-year-old ewes direct from Sutherland, as they consider that by the infusion of Leicester blood a good healthy fall is ensured. The ewes cost about 25*s.* to 40*s.* each when bought in, and in the following spring throw about 130 to 150 lambs to every 100 ewes. Both the ewes and lambs are fattened off as early as possible, in some cases; in others, the lambs are held over. This system increases the number of crosses by the addition of Leicester-Cheviots, which are held in great repute by some graziers. Highland black-faced wethers are also brought from the Scotch hills for consuming the turnip crop; and black-faced ewes are purchased and put to Leicester rams. Here and there may be seen a Down ram, as well as a few crosses between the Down and Leicester; but although the cross lambs have a remarkable aptitude to fatten, and are well liked by the butchers, this class of sheep, as a rule, is not much esteemed, not being calculated to thrive upon many of the high-lying heaths in this county, inasmuch as in the spring there is a great deficiency in the quantity of wool produced.

Hitherto I have been remarking principally upon the varieties of sheep found in the in-fields and upon the lowland pastures; but the sheep of the hill districts is undoubtedly the Herdwick. The origin of this breed is veiled in obscurity. Tradition asserts that a sloop containing several animals of this class was wrecked near Ravenglass, and that the sheep swam ashore, established themselves for a time near the coast, and at length found their way to the hills. The Herdwick is strongly attached to its native heath; and even where there are no fences, the flocks rarely stray far from their own pastures. Sheep of this breed seem well adapted to the Cumberland mountains. They will live and even thrive on the most meagre herbage, and in times of storm will instinctively huddle together in places where snow is not likely to drift to a great depth. The lambing season extends from the middle of April to the end of May, when the ewes are brought down into the in-fields, and kept until the lambs are sufficiently strong to go to the heaths. About 110 to 120 lambs to every 100 ewes are considered a fair crop; but doublets are by no means uncommon, and triplets now and then occur. After losses are taken off, however, in rare instances does a flock rear more than one lamb per ewe throughout. The ewes which have more than one lamb are sometimes kept for a few weeks in the enclosed lands to ensure a good supply of milk. After the ewes have bred pure Herdwick lambs for four or five years, those upon the enclosed commons are crossed with a Leicester tup, and the offspring bear the name of crosses or half-breds. The ewes are then fed off and taken to market. Herdwick wethers are allowed to run upon the heaths until between four and five years of age; they are then put upon better pastures and sold off as they become fat. The flesh of the pure-bred Herdwick is much esteemed by the gentry and landed proprietors of the county for its delicacy of flavour; and many purchase a few four-year-old wethers at the back end of the year, and slaughter them for their own use as they become ready, or rather as they are required. Many also are annually sent into Scotland for a similar purpose. Several far-seeing flockmasters of the present day, however, strongly deprecate the system of running the wethers upon the heaths until they are four years old, not only because it is an unprofitable practice, but also because it is unnecessary, inasmuch as they are convinced that a three-year-old sheep would give quite as much satisfaction when brought to table as one two years older, were the fact not divulged. Wethers of the Herdwick breed will feed to upwards of 20 lbs. per quarter, or even more when artificial food is given. The wool of the Herdwick is coarse, and the clip rarely averages over 3 lbs. per head for an entire flock.

The crosses between the Leicester and Herdwick are much admired for feeding purposes, having an extraordinary aptitude to fatten early, and the flesh being highly flavoured and juicy. Lambs are usually sold during the months of August and September, high prices being sometimes realised. For example, in the autumn of 1872, several breeders obtained as much as 30*s.* per head for their fall throughout: others from 25*s.* to 27*s.* Certainly the season was an exceptional one, and the marked demand caused breeding to be carried on to a greater extent in the following year, so that a reduction had to be submitted to. As soon as the lambs are purchased, they are generally dipped to free them from parasites, a very small proportion being salved at the present day. For a few weeks they are run upon the stubbles and pastures to pick up odds and ends, after which they are either put upon turnips, or, more generally, turnips are thrown to them upon the pastures. Sometimes a little corn is added, by which means their progress is rendered quicker and more certain. As the sheep become ready, they are drawn off and taken to the nearest auction-mart, where they are converted into cash. From 40*s.* to 50*s.* is the usual selling price, so that after all expenses have been paid, there is a pretty wide margin left for profit. Some farmers prefer to keep the whole of their sheep until after they have secured the clip in June, when they are finished off upon the pastures, and sold throughout the summer months. From 38*s.* to 45*s.* is then considered a good price, which, added to the amount realised by the clip, makes up for the extra keep. Nice hoggets clip 7 to 8 lbs. of wool on the average, which, calculated at 1*s.* 6*d.* per lb., brings in 10*s.* 6*d.* or 12*s.*

Pigs.

The breed of pigs found in Cumberland is principally the pure white type, with short ears, thickly-set carcases, and remarkable aptitude to fatten early. This breed has gradually displaced the ungainly animal which was kept twenty to thirty years ago, and which had extremely coarse hair, long thin sides, and crooked legs; in fact, it had few qualities to recommend it. Therefore, on the introduction of an improved breed by a few of the more enlightened farmers, others were only too glad to embark in a similar enterprise. Here and there may be seen a few pigs of the Berkshire breed, but this class is by no means numerously represented. Some five or six years ago, lean pigs attained an enormous value; an eight-weeks' pig of the better class realising 35*s.* to 40*s.*, while secondary descriptions brought 30*s.* to 35*s.* At the present time prices are not so high, but they are still sufficient to remunerate the breeder; and, while on this point, I may just remark that the Agricultural Returns published annually by the Board of Trade show a serious falling off in the number of pigs kept in the country. With pork at 7*s.* 9*d.* to 8*s.* 3*d.* per stone in the curing season, and the marked demand for Cumberland bacon in most of the large towns of England, this seems an anomaly; yet, when circumstances are explained, there is no wonder that farmers do not care to keep many pigs. Indeed, any person making a tour across the country will see pigsty after pigsty untenanted; and should the reason be asked, the answer invariably follows, that "feeding pigs does not pay." Still these words do not fully express the meaning they are intended to convey; for farmers undoubtedly consider that the corn and meal which pigs consume pay much better when given to cattle or sheep, and so the majority are content to keep only two or three pigs to consume the offal which is not available for any other class of stock, such as the refuse from the dairy, and the waste from the kitchen. For some time past a few farmers have been in the habit of buying strong shots at Annan, and they find them to pay much better than the younger home-bred pigs, as they have attained almost full size at the time they are purchased.

Poultry.

Very little attention is paid to the breeding and rearing of poultry as a paying speculation. A few are kept upon the homesteads merely to consume the scattered grains and other waste produce, but few farmers rear with a direct view to profit. While there are some distinctive breeds, as the Dorking, Cochin-China, Brahma, Houdan, and pure game, such as used to be found in the cockpits, most of the poultry-yards contain a mixture of various sizes, colours, and crosses. Eggs, like most commodities, have gone up in price very much of late, the demand in the towns keeping pretty good pace with the supply, without any export trade.

Size of Farms.

According to the Returns of 1873, the average number of acres held by each occupier is 69. Of 38 counties in England enumerated, the average size of the farms in 12 is greater than that of Cumberland; 1 is just the same, and that of 25 is smaller. I may notice that there has been for many years a tendency to increase the size of holdings; but in the absence of statistics directly bearing upon the point, it is impossible to say to what extent the enlargement of farms has been carried on since 1853. However, I may state that the tendency is not nearly so marked as formerly, when a very large proportion of small farms existed, the occupiers having just sufficient land to prevent them from earning a decent living as farm-labourers, and too little to keep them well-fed, well-clad, and enable them to secure for their children a fair education. As an instance of many small farms having been thrown into one, a better example can scarcely be adduced than that of Oakbank Farm, near Longtown, the land of which at one time comprised 11 holdings.

Large Farms.—There are several large farms in the mountainous districts of Cumberland, each containing from 4000 to 5000 acres. They are principally grass-farms, consisting of large tracts of mountain land used as sheep-runs, and a little in-field and meadow. On such holdings hay is a very important commodity, being required in winter when frosts occur, or when snow is upon the ground. Many of the large arable farms are from 400 to 600 acres in extent, and are in general well managed. The prevailing system of cropping is the five- or six-year course; in rare instances the four-course shift is practised, but it does not answer well, except under peculiar circumstances. The following example of the management of a farm cropped under the six-course system will serve to illustrate the methods observed on most of the well-conducted large holdings. The farm consists of 790 statute acres, 740 of which are arable, and the remaining 50 permanent pasture. The rotation is, first year, oats; second, roots—partly consumed by sheep being folded on the crop, and partly used for stall-feeding purposes; third, wheat or barley; and the three remaining years in grass. When I visited the farm in 1870, the green crop covered an extent of 147 acres, 90 of which were occupied by swedes, 35 by common turnips, 5 by mangolds, 3 by carrots, 1 by potatoes, and 13 by beans. The root-crops are always liberally treated; 20 tons of farmyard-manure being put on per acre, with 5 cwts. of artificial manures—Peruvian guano or bones. For mangolds, the soil is made manurially rich by the application of 25 loads of home-made manure per acre, together with 6 cwts. of artificial manure, and 3 cwts. of salt. Beans are always taken after oats on the flat, the land having been previously manured and reduced to a fine tilth. The seed is then deposited by the drill in rows, about 14 inches apart, and the crop is succeeded by turnips after the land has again been well manured. So much of the turnip land as can be got ready is sown with wheat during winter; the remainder is cropped with barley.

The basis of the sheep flock kept consists of 200 half-bred ewes, which are served by Border Leicester rams. These are kept upon the pastures throughout the winter months; and their lambs, which average from 14 to 15 score, are fed off during the following winter. About the middle of May the hoggs become fat, and are sent to market. Rough hoggs are then bought in to supply their places, and, after having been dipped, are turned upon the pastures, where they usually make such satisfactory progress that the tups are ready for the butcher in six weeks to two months. From 700 to 800 lambs—according to the appearance of the root-crop—are also annually bought in at St. Boswell's or Melrose Fair, to be ready for folding upon turnips in the early autumn months. Although a few sheep are bred, yet the flock may be spoken of in general terms as a "flying flock," and the number of sheep upon the holding at different periods of the year is entirely dependent upon the amount of food ready for consumption, whether of grass or turnips. In hard weather the winter-fed sheep have straw, or occasionally a little hay with their roots. There are two principal purchases of white stock in the year as a general rule; but, as I have already said, the ordinary method is not always strictly adhered to, because a partial failure in the pastures or the turnip-crop materially changes the position of affairs.

With respect to cattle, as many Shorthorn two-year-old steers and heifers as can be conveniently grazed are purchased in the spring; and this number is considerably supplemented in the autumn, as twice the number can be kept in winter. These cattle are then drafted off for market through the winter months as they become ready. In this way about 100 head are annually fed off; the stalled ones being liberally fed with straw and turnips in the beginning of the season, and, as the year advances, cake is added with crushed oats or meal. Altogether, about 200 cattle are wintered, and a pulping-machine is kept pretty regularly at work for the purpose of preparing the food for them. The above example farm is one of a very few where English steers and heifers are fed off.

Small Farms.—The system of rotation practised upon the small holdings varies considerably; indeed, there is scarcely a single farm where a regular practice is observed. Sometimes the best patches of soil are cropped so often that they become quite exhausted; and as little compensation is given in the shape of manure, the crops are somewhat light. Here I may remark that many of the holders of small, and even medium-sized, farms plough out far too much land; and as they cannot manage it thoroughly, it is poor when ploughed out—poorer when laid down again. There are still too many farmers who have great faith in keeping the plough going; in fact, the writer heard an occupier say the other day, that "a farmer never need become bankrupt, he need only plough out another field." Mistaken policy! Mr. Mechi never uttered more true words in his life than on the occasion when he said that nine farmers out of every ten have too much land. "If," said he, "half of their land were taken from them, and they invested the whole of their capital upon the other half, not only themselves but the community at large would be benefited." I well remember, fourteen years ago, when Mr. John Archer took a farm at Bassenthwaite, 113 acres in extent, that nearly 100 were under the plough, and the neighbours all said that in a few years he would be a ruined man. However, he took the land in hand field by field, cleaned, manured and limed it well, and laid down to grass as quickly as possible, until, at the expiration of his 14 years' lease, 100 acres were in pasture; while the stackyard contained a larger bulk of grain and hay than when 100 acres were under the action of the plough. When the farm was re-let at Candlemas, 1874, it realised 70*l.* per annum more than the rent which the knowing ones declared would make the previous farmer a bankrupt. Such examples as the above show the necessity of a system of tenant-right, where the farmer would at least be partially compensated for permanent improvements, and for the manures locked up in the soil.

Grazing Lands.

The best permanent pastures are mostly found near the basins of rivers, where the soil is formed from a deposit caused by their overflow, after heavy rains, or the breaking up of frost. There are also some good fattening pastures resting upon the limestone in various parts of the county, as well as here and there snug little fields and paddocks close to farm buildings, which aid in the production of beef and mutton. As a rule, cattle and sheep are fed upon the same pasture, the grazing being of a mixed character; and while this practice is to be recommended for many reasons, it must be admitted that sheep nip the finer feeding grasses so close as to sadly deteriorate the pasture for cattle. On the other hand, where sheep are fed exclusively, so many have to be kept in the fields that the grass soon becomes foiled, and this is doubtless one reason why the mixed system is so prevalent.

Much drainage, both in grazing and arable lands, has been effected during the past 21 years, especially in the early part of the period, but there is still a considerable breadth which requires to be freed from underground water, as evidenced by the rushes and coarse grasses which are to be seen upon many of the pastures. Some of the lands which were put down with stone drains in the early part of the century require going over again, the present drains being ineffective, either from want of depth, from being cut in an improper direction, or from being put down too far apart. Other grounds have never been drained at all, and so the herbage is none of the sweetest, let the management be what it may. This want of drainage is in part attributable to the apathy of landlords, but it is chiefly owing to the scarcity and dearness of labour, especially during the past eight or ten years. The system of drainage which is most effective is that in which pipe tiles are used. Numerous drains which were made when pipe tiles were first introduced, are found to be as effective as when they were first cut. Many farmers of the present day, in their management of pastures, are industrious to keep down all bushes and weeds which tend to injure the growth of the grasses, and to this end the mattock, the scythe, and the sickle are often called into requisition. Lands which have been reclaimed from the moors and commons naturally produce gorse and heath: these spring up years after the ground has been reclaimed, and have to be eradicated as they appear. Docks are generally uprooted by means of a two-pronged instrument thrust into the ground, and thistles by being persistently cut with a scythe or sickle.

Various plans have been adopted for the improvement of pastures by surface dressing. In some instances there is a little farmyard manure to spare; or the farmer, if near a town, can procure a few tons in addition now and then. But these are exceptional cases, so much manure being now required for the turnip crop. As the breadth of grazing land is extended, the resources of the dunghill will become much more limited, unless, indeed, the arable land is made to produce proportionately larger crops. Road-scrapings, ditch-scourings, refuse salt, earth, and in fact any substance that can be laid hold of will do good as a surface dressing on pasture; and the industrious farmer collects everything available that comes under his notice. The extreme price of coals during the past three years has almost entirely precluded farmers from using lime as a manure. A few years ago, when agriculturists were only considered to be second class who did not lime a certain portion of their land every year, lime could be had at the public kilns for 2*s.* 6*d.* per Cumberland cart of 20 to 25 cwts., now a cartload is charged at 6*s.* to 7*s.* There are still farmers whose leases contain a clause stating that so much lime has to be used each year, and it is almost unnecessary to add that these restrictions are very hard upon the occupiers who at the time they signed their leases had little conception what a few years would bring forth. Conversing with one of this class the other day, I was apprized of the fact that at the time he entered upon his occupation he could obtain coal-dust for use in the limekiln at 3*d.* per cartload,—now the price is 2*s.*, or eight times the value it then was! On the mountain pastures and sheep runs, lime has a wonderful effect. The intelligent observer may trace its outlines upon the mountain sides when at a distance of many miles, and so much is the herbage sweetened by its application, that the dressed parts are dotted over with hardy Herdwicks and Blackfaces so long as there is the tiniest blade of grass, while the undressed portions are quite rough with coarse herbage. Bones and special manures have also their advocates, especially the former. These supply food to the exhausted grass-plants for a long period, so that they become more vigorous and robust, throwing rootlets into the soil in all directions; and it is a well-known fact that where there is an increase in rootlets below there is a corresponding increase in branches and leaves above. During the present spring (1874), many farmers, however, top-dressed their pastures with special manures, but May proving a dry and ungenial month, no benefit whatever seemed to accrue from the application, and a remarkably droughty June did not mend matters.

Three years ago, I remember walking over the farm occupied by Mr. John Tinning, at Oakbank, when I was much struck by the verdant appearance of a plot of ground of about seven acres, which on closer inspection I found to be clothed with luxuriant herbage of clover and other nutritious grasses. Enquiring the cause of the healthy aspect of the plot, it was explained that the part which I was admiring was originally the worst in the pasture, producing very little but a kind of coarse grass which nothing but extreme privation would tempt the most unpampered ox to eat. By way of experiment, 300 loads of compost were applied at the back end of the year, and this dressing was followed up by one of half a ton of $\frac{1}{4}$-inch bones per acre in the succeeding spring; the ground was then thoroughly harrowed and consolidated by means of a heavy stone roller, and the result was the growth of the superior grasses which arrested my attention. This is one method of improving grass lands which cannot fail to give satisfaction, that is, where material is within reach.

Indirectly, grazing lands may, and in many cases now are, much improved by the use of extraneous food for stock. By allowing cattle a few pounds of oilcake per day, the rough herbage gives place to one of finer quality, and of more rapid growth, while cattle and sheep thrive better upon it. Some farmers are now in the habit of wintering sheep upon the pastures, giving them corn and cut turnips: this is a practice worthy of the highest commendation, inasmuch as land so treated grows a much better quality of herbage, and more of it, for many years.

There is no doubt that meadows are still the neglected portions of a large number of holdings. Many are mown year after year without any compensation being given, in the shape of manure; and so the grass they produce is of very small bulk, and of poor quality. It has truly been said that "the scythe is the greatest robber that comes upon the farm." To compensate for what has been taken away in the shape of hay, manure should be liberally bestowed, so that the succeeding crop may be increased, and the manure-heap swelled in return. In the vicinity of towns, much manure and also other sorts of refuse may be obtained, which are admirably adapted for the purpose, but fertilizing substances are not so easy to command in more remote districts. As with pastures, one excellent plan is to winter sheep upon the land with cake and turnips, by means of which the hay crop may be quite doubled, and the feeding properties considerably increased. Irrigation is sometimes practised to a limited extent, but it cannot, by any means, be said to be common. Here and there may be seen a patch irrigated with sewage; other plots by the use of flood-gates or courses, by which the muddy water is thrown over the meadows at the time of high water; and a very few fields and meadows are watered by the ordinary ridge-and-furrow method. There is not the slightest doubt that irrigation might be carried out much more extensively than it now is, and that too with profit; for it is a notable fact that our county is intersected with streams and rivulets like a network, as if inviting the skill of man to apply the waters to some useful purpose. Some noted agriculturists aver that artificial waterings could without difficulty be given to grain and root crops; and while in this case there might be danger of the water washing away the soil, it does not seem that there would be much difficulty in watering pasture land and meadows. In many parts of Hindostan, where agriculture is of the rudest kind, the soil is rendered exceedingly fruitful by the overflowing of the rivers; and as a provision in times of emergency, water is preserved by means of tanks and artificial ponds, or wells, which are numerously formed in all the cultivated districts. In Egypt, too—once the granary of the Roman Empire—wherever water can be had, there is abundance of vegetation, so that the chief care of the cultivator is bestowed on the irrigation of the soil. At the periodical overflowings of the Nile, great pains are taken to supply with water, by artificial means, those portions of the land which the inundation fails to reach. Canals are cut in every direction, into which the water is forced by wheels, called *sakiahs*, which, though rude and simple in their construction, propel the water forward into ponds, ditches and channels, constructed for its reception, and where it is preserved or distributed as occasion may require. Is it not, then, a thing to be regretted, that with all their eminent agriculturists, their skilful engineers, their powerful engines, locomotive as well as stationary, the landed proprietors and farmers of Britain should suffer themselves to be eclipsed by people whose knowledge of agriculture is in the earliest stage of infancy? For many years the utmost care has been taken to remove all superfluous moisture from the soil, by drawing it off into ditches and rivers; and what a comfort it would be to the farmer in times of drought like the summers of 1868, 1870, or 1874, to be able to give his fields a copious supply of water, and so revive the languishing plants, in place of seeing them daily withering away before his eyes, without having the power to lift his hand and save them!

The Agricultural Labourer.

Any report upon purely agricultural matters would scarcely be complete without giving certain details respecting the labourer, especially at a time when Agricultural Strikes and Labourers' Unions are causing so much commotion in various parts of the country. Since 1853 the position of the labourer in Cumberland has been very much ameliorated; wages have been almost doubled; superior cottages provided on many estates; and, owing to the recent Elementary Education Act, children are being better educated.

At the time I mention, wages, although higher than in most southern counties, were so low that many of the comforts and even some of the necessaries of life were denied to the labourer and his family. The payment to a first-class married man ranged from 10*s.* to 12*s.* per week, with a cottage; but even the use of the so-called free dwelling could not be set down as a part of his remuneration, for in most instances his wife was required, as a sort of equivalent, to attend to cattle in the fields in summer and in the byres and courts in winter. Where no dwelling was provided, the wages varied from 11*s.* to 13*s.*, but seldom was 14*s.* reached. Now, the same class of men get from 20*s.* to 24*s.* with superior cottage rent free: certainly, on some estates, the old hands only receive from 15*s.* to 18*s.*, but these cases are exceptional. The agricultural labourer is paid very little in kind. Some, however, stipulate with their employers to have their coals brought; others, who have a pig, are permitted to plant potatoes in the farmer's field with the manure; while, in a few instances, a quart of skim milk is allowed daily for the use of the family, but even these practices are fast dying out. It was formerly the custom for the farmer to board one or two of his constant workmen, the wages then paid ranging from 7*s.* to 9*s.* per week with victuals. At present, the rule is, to pay each workman the whole of his earnings in hard cash; and in the same manner as he is at liberty to sell his labour in the dearest market, he has the privilege of buying his goods in the cheapest.

Extra hands (men) were usually engaged in the time of harvest, and were known by the name of "month-men." These obtained 2*l.* 10*s.* to 3*l.* for the harvest month, together with bed and board. A good month-man was expected to be able to reap, bind, stook, pitch corn, and stack; in fact, he had to make himself generally useful. In wet weather, he was employed in threshing and preparing thatch, in making straw ropes, and in covering in and finishing off the stacks. Since the more extended use of machinery, the month-man is now very little sought after, but where his services are still required, he demands 4*l*. 10*s*. to 6*l*. with rations, for his labour.

Besides men-of-all-work, many additional reapers were also required in harvest time. Shoemakers, tailors, nailers, weavers, carpenters, joiners, petty shopkeepers, &c., with their wives and children turned out *en masse;* and on large farms it was not uncommon to see fifty or sixty people busily employed in cutting down the crops. In towns, men, women, and children repaired to the market cross at six o'clock in the morning, and farmers in want of reapers went thither daily to engage the requisite number. Good hands were soon known and singled out, while those who were inferior, in slack times, often had no demand for their services. Wages in the country were regulated by the rates at the market cross. In ordinary times a full reaper, that is, one who, in local parlance, could "carry his rigg," was paid 2*s*. to 2*s*. 6*d*. per day; if work were scarce, willing hands were to be found at 1*s*. 6*d*. When the crops ripened rapidly, and the demand was great, wages sometimes ran up to 4*s*. or 4*s*. 6*d*. for a few days, until the heat was over. The harvest rigg was usually the scene of much contention. Those in authority had the greatest difficulty in prevailing upon those employed, who were principally the off-scum of the lowest parts of the neighbouring towns, to do their portion in anything like decent fashion, and the work when performed, was often, on the whole, very unsatisfactory. Nevertheless, harvest was said to be a very honest time, inasmuch as every man had his own separate rigg to clear along with the others. Four good reapers were calculated to cut an acre of average corn daily, but when hands were obtained from the market, five to the acre would be nearer the mark. It will thus be seen that, in times of emergency, the rate of cutting an acre was sometimes as much as 15*s*. to 20*s*.

I must not omit to mention the fact that hundreds of Irish labourers came over to take part in the harvest. These principally took the cutting at 8*s*. to 10*s*. per acre, with perhaps milk and potatoes gratis, the farmer putting the corn into stook. Engaged as they were by piece-work, the sons of Erin made as few bands as possible; thus the sheaves were so large, that in unfavourable seasons, it was almost impossible to win them.

Until recently, women and boys were extensively employed at other seasons of the year, in gathering stones, picking weeds, planting potatoes, breaking manure, singling turnips, making hay, hoeing and weeding root crops, raising potatoes, and topping and tailing turnips; but as greater facilities are now afforded, these branches of work are mostly done either by the aid of improved implements, or by the regular hands, whose time is not so fully engaged. Twenty-five years ago the universal rate of payment was 10*d.* per day; four years later, wages advanced to 1*s.*; eleven years later still, to 1*s.* 3*d.*; and at present they stand at 1*s.* 6*d.*—in extreme cases at 1*s.* 8*d.*

I have hitherto confined my remarks to the wages paid to married men, who are constantly employed, as also to extra farm hands; I now come to speak of those engaged by the half-year. The statute hirings are held at all the principal market towns twice in the year, namely, at Whitsuntide and Martinmas, and at Carlisle four times, the additional terms being Candlemas and Lammas. The generality of servants are engaged by the half-year; but occasionally, some of them leave before the expiration of their term, and farmers are obliged to repair to the mid-term hirings at Carlisle to obtain others in their room. Twenty years ago, the best servants in the market—those who could plough, mow, sow, reap, thresh, hedge and ditch—were engaged at 10*l.* to 12*l.* for the half-year; second-class hands, at 7*l.* to 9*l.*; and boys at 2*l.* 10*s.* to 5*l.* Best women servants obtained 5*l.* to 6*l.*; second-class, 3*l.* 10*s.* to 4*l.* 10*s.*; and young girls, 1*l.* 10*s.* to 2*l.* 10*s.* At the present time wages are very high. I have been informed, on reliable authority, that some selected servants have 24*l.* for the summer of 1874, while 20*l.* and 22*l.* are quite common rates. Second-class men get 16*l.* to 18*l.*; and lads of 15 or 16 years of age, 9*l.* to 12*l.* For good females there is great demand, those accustomed to cooking and dairy work find no difficulty in securing 9*l.* to 10*l.* for the half-year; second-class, 6*l.* to 8*l.*; and young inexperienced girls, 4*l.* to 5*l.*

With respect to the duties of servants, I shall make one or two remarks. Firstly, with respect to males. The hours of labour are short, compared with the times when wages were much lower. Take the example of a ploughman. He attended to the cattle in the morning while his horses fed; helped to thresh corn during his dinner hour, and frequently assisted in dressing grain by candle-light in the long evenings of winter. In fact, to use the words of an old hand, "he was never out of a job." Now he has little to do but attend to his horses, and as he has great facilities for feeding and keeping them in order, not only are the hours much shorter, but his work is comparatively light. Secondly, with respect to females. They used to have to perform all sorts of field-work, besides attending to cattle and pigs in the yard; indeed, they had harder times than the men-servants, inasmuch as after working out of doors all day, they had their household duties to perform at night, and seldom finished until a late hour. In these days, the first question which the female asks when about to enter into an engagement is, if "she will be required to work out?" If answered in the affirmative, the would-be-master or mistress may look in the market throng for another as soon as he or she likes, for in nine cases out of ten, the agricultural "girls of the period" have a decided objection to being employed in the fields. I may therefore assert that not only have wages been doubled, so far as relates to money matters, but farm-servants do not perform over two-thirds of the labour they formerly did. And while on the subject of females working in the fields, it may safely be stated that not one-fourth of the number are now employed that were twenty-one years ago. I have already stated that female servants engaged by the half-year have a decided aversion to out-door labour; neither are labourers' wives anxious for this kind of work, owing to their husbands making higher wages; and other branches of industry being good, for example, at the factories and workshops, few women can be engaged from the towns, so that the supply of female workers is limited indeed. Where young girls are seen at work in the fields now-a-days, they are often the daughters of small occupiers, who choose to remain at home rather than engage themselves in other spheres of action, and so have to put their hands indiscriminately to any of the miscellaneous operations of the farm.

It is to be regretted that hiring fairs still continue, where the on-looker is mortified at seeing men and women engaged according to their physical capacities upon the public streets, in much the same way that horses and cattle are bought and sold. Well might the French tourist give a public hiring the unenviable title of "an English slave market."

The Economy of Labour.

By the increase of agricultural implements, labour has been much economised. Perhaps it is well that such is the case, for had it been otherwise, it is difficult to say how in these times of high wages and scarcity of work-people, farmers would have got their hay made and their corn gathered in. No doubt the difficulties attending the labour question have tended to cause the agriculturist to extend his use of machinery; but it is a question that works both ways, for it is doubtless in part owing to the introduction of machinery that labourers have emigrated, and engaged themselves at home in the collieries, mines, iron-works, and other spheres of industry. I shall be best able to illustrate how labour has been economised by giving the details of an example farm which has been under the present occupant for over thirty years. Two men and a boy were at one time regularly kept, one man being employed almost exclusively in winter in threshing the grain crops with a flail. His work is now done by a water-power machine in a couple of hours per week. Six to eight women and boys were employed in hay-time, the regular men-servants cutting the grass in the early mornings with the scythe — say from 4 to 10 A.M.; the remainder of the day they were occupied with the extra hands in making hay. Now the grass is cut by means of a Wood's machine tended by the man, at the rate of several acres per day; the boy, in the mean time, strewing and turning with the tedder; gathering into rows with the horse rake; and collecting into cocks with the sweeps. When dry, another forker, lader and raker are required, and the hay is put into the stack, while the outlay is but a few shillings in place of many pounds. As a rule, too, the quality of the hay is superior, for the grass being cut at the proper time, the seeds are saved, and the hay being made more quickly, the nutritious juices are retained. Similarly, in harvest. Instead of two or three month-men, and a host of full reapers, half-reapers, piece-workers, &c., four good hands for sheafing, and a couple of bandsters only are required; and the grain is cut and secured as it becomes ready, in a short time and at little outlay. I could multiply instances in favour of machinery over hand labour, not only in the matter of efficiency, but also as a means of curtailing actual expenses; from the steam machine which will thresh and dress a Carlisle bushel of wheat per minute to the neat little oil-cake breaker which is declared to be such a boon to the cattleman; or from the first-class reaper, that will cut down ten acres of wheat per day, to the newly-invented sheep-shears that will denude a sheep of its fleece in a few minutes, although guided by the most inexperienced and unskilful workman; but I forbear, as enough, I trust, has already been advanced to show the importance of introducing improved machinery upon every homestead, not alone on the ground of economising labour, but also because it is always under the farmer's control—in times of prosperity as well as adversity; when wages are low, and when the value of labour is excessive.

Concluding Remarks.

The principal feature of this Report being an account of the improvements which have taken place with regard to the production of meat, I have already endeavoured to show how its manufacture has extended of late; and while this is so far satisfactory, yet it should be understood that there ought to be a limit even to putting land down to pasture, in place of its being devoted to the growth of corn and roots. No doubt the most choice soil would pay best in grass; the second-class and inferior might be cropped under a system of rotation, so that a supply of corn and roots would be ensured for the winter. The breadth of arable land being thus reduced, it could then be more generously treated, to the end that it might produce maximum crops for winter consumption.

In the body of this paper, I have touched upon many of the improvements which have been effected within the past 21 years, chiefly with reference to the point already mentioned. A few additional points, however, claim attention on account of their importance.

The establishment of auction-marts, for the sale of fat cattle and sheep, has been a great boon to both sellers and buyers. The latter now know where to go to obtain their weekly supplies; the former are sure of their money at the fall of the auctioneer's hammer. The Agricultural Hall, Cockermouth, established several years ago, by Mr. Robinson Mitchell, was one of the first in the north of England, and still continues to be an excellent mart for the sale of stock. Close upon 10,000 cattle (principally fat) and from 40,000 to 50,000 fat and keeping sheep are disposed of within the year. One of the rules of this mart is, "that no seller be allowed to bid either directly or indirectly for his own stock," so that all the sales are purely *bonâ fide*. This system has given the buyers full confidence, and the sales are always animated, and prices high. At certain seasons, there are special sales of bulls, rams, lambs, &c., &c., so that the aggregate business done in the year is very extensive. The Christmas fat show has no rival in this district, and it may be fairly styled "The Smithfield of the North." Last year the fat stock sold at the two sales immediately preceding Christmas, which were only three days apart, realized within a trifle of 12,000*l*. From these figures some idea may be formed of the extent of the business transacted at the West Cumberland Christmas Fat Show.

There has been a marked improvement in the kind and quality of implements used within the past 21 years. Reapers, mowing-machines, hay-rakes, tedders, oilcake-breakers, pulpers, grinding mills, double-furrow ploughs, and a host of agricultural implements have been gradually introduced, and the work of the labourer has, in consequence, been much lightened. Steam cultivation has made a little, but not very marked progress. On a large scale, it will doubtless work wonders, but it is not quite so available for small farms. Costly, and to a certain extent, cumbersome, it appeals chiefly to men of capital—men who have large hearts and well-filled purses—and much has yet to be done before it can in any way be adapted to farms of limited extent, whose occupiers are in straitened circumstances. By a system of co-operation, small surface-holders might certainly share in the benefits of steam cultivation, but before this end can be accomplished, the scheme will have to be taken up either by wealthy individuals or enterprising companies.

The rise in the value of farm produce has been remarkable since Mr. Dickinson penned his *Report.* The price of grain certainly has remained almost stationary, with the exception, of course, of fluctuations now and then owing to droughty seasons, war panics and the like; but that of most other substances has advanced materially. Agricultural horses are 80 to 100 per cent. higher; lean cattle and sheep, 60 per cent.; beef and mutton, 80 per cent.; potatoes, 20 per cent.; milk 75 per cent.; butter, 40 to 50 per cent.; and eggs, 80 per cent.: while, on the other hand, the occupier has to pay 25 per cent. more for his land, and double the price for hands to work it. Notwithstanding this, the position of the Cumberland farmer for many years, in spite of advance in rents and critical seasons, has been anything but unsatisfactory.

XVI.—*Field-Experiments on Permanent Pasture.* By Dr. AUGUSTUS VOELCKER, F.R.S., Consulting Chemist to the Society.

THE object of the following short paper is to put on record the results of some experiments which I set on foot eight or nine years ago, and which have since been carried out in various parts of the country, chiefly by former pupils of mine, in accordance with the plan which I laid down for uniform observance.

The manures most generally used for improving pasture land are lime or chalk, bone-dust, Peruvian guano, and superphosphate of lime. I have included these fertilizers in the manuring scheme, which further comprises experiments with salts of potash and common salt.

The first series of experiments on which I have to report were made in 1868 by Mr. Clement Cadle, at Ballingham Hall Farm, near Ross.

The manures were spread on the land on the 14th of April, and the grass cut and weighed on the 29th of June, when the following results were obtained:—

Plots.	Description of Manure.	Quantity of Manure per Plot of $\frac{1}{25}$ of an Acre.	Weight of Grass per Plot.			Weight of Grass per Acre.			Increase per Acre over Average Produce of Unmanured Plots.			Decrease per Acre.		
		bushels.	cwts.	qrs.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.
1	Quicklime	5	4	2	15	4	12	6	0	16	78	..		
2	Quicklime .. .. and Salt	5 lbs. 28	4	3	7	4	16	28	1	0	100	..		
3	Bone-dust	84	4	3	14	4	17	56	1	2	16	..		
4	Mineral superphosphate and Crude potash salts ..	28 28	4	3	24	4	19	32	1	3	104	..		
5	No manure	..	3	2	21	3	13	84		..		..		
6	Common salt	28	3	1	20	3	8	64		..		0	6	88
7	Peruvian guano ...	28	6	0	12	6	2	16	2	6	88	..		
8	Crude potash salts ..	28	3	3	14	3	17	56	0	2	16	..		
9	Mineral superphosphate and Peruvian guano ..	28 28	5	2	26	5	14	72	1	19	32	..		
10	No manure	..	3	3	11	3	16	108		..		..		

The average produce per acre of the two unmanured plots was 3 tons 15 cwts. and 40 lbs.

It appears from the preceding tabulated results :—

1. That Peruvian guano produced the largest increase.

2. The addition of superphosphate to guano had no beneficial effect: on the contrary, it somewhat diminished the produce, for 5 cwts. of guano alone produced 6 tons 2 cwts. and 16 lbs. of grass, and the mixture of 5 cwts. of guano and 5 cwts. of superphosphate, only 5 tons 14 cwts. and 72 lbs., or $7\frac{1}{2}$ cwts. less per acre. 5 cwts. of guano appear in this instance to be as much manure as the land could bear at the time of its application, and the addition to the ground of 5 cwts. of a soluble manure like superphosphate probably has placed more soluble matter within the reach of the grass-roots than was conducive to the most luxuriant growth of the grass.

3. Fertilising materials which are very soluble in water, and are not absorbed chemically and rendered insoluble by the soil, require to be used sparingly, and should always be used in showery weather, in order that they may be washed into a large body of the land.

The experiments illustrate the force of these remarks unmistakably.

On Plot 6 common salt was used at the rate of 5 cwts. per acre, and the effect of this dressing was that 6 cwts. and 88 lbs. less grass per acre was cut on Plot 6 than on the unmanured plots of the field.

4. Potash salts applied alone had no beneficial effect.

5. The mixture of superphosphate with potash salts produced a considerable increase.

6. The experimental field was deficient in lime, and hence the application of lime, as also that of bone-dust, had a decidedly beneficial effect.

Mr. Cadle also tried the same manures on pasture land of rather better description than the field upon which the preceding experiments were made.

Each experimental plot occupied the space of $\frac{1}{20}$th of an acre. The manures were sown on the 14th of April, and the grass cut and weighed on the 30th of June.

The following Table shows the particulars, as regards manures and the effects which they produced :—

Plots.	Description of Manure.	Quantity of Manure per Plot of $\frac{1}{20}$ of an Acre.	Weight of Grass per Plot.			Weight of Grass per Acre.			Increase per Acre over Average Produce of Unmanured Plots.			Decrease per Acre.		
		bushels.	cwts.	qrs.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.
1	Quicklime	5	5	3	1	5	15	20	1	10	20		..	
2	Quicklime .. .. .. and Salt	5 lbs. 28	5	3	23	5	19	12	1	14	12		..	
3	Bone-dust	84	5	2	9	5	11	68	1	6	68		..	
4	Mineral superphosphate and Crude potash salts ..	28 28	6	1	26	6	9	72	2	4	72		..	
5	No manure	..	4	2	2	4	19	40		..			..	
6	Common salt	28	2	3	11	2	16	108		..		1	4	40
7	Peruvian guano ..	28	6	0	11	6	1	108	1	16	108		..	
8	Crude potash salts ..	28	3	3	6	3	16	8		..		0	8	104
9	Mineral superphosphate and Peruvian guano ..	28 28	5	3	16	5	17	108	1	12	108		..	
10	No manure	..	3	3	26	3	19	72		..			..	

The produce from the two unmanured Plots, Nos. 5 and 10, varied rather more than is desirable in comparative trials. The average produce of these fields is 4 tons 5 cwts. per acre.

In these experiments the applcation of salt had a decidedly injurious effect upon the grass; and potash salts also, though in a minor degree, diminished the produce. On the other hand, the mixture of superphosphate and potash salts gave the largest increase, and all the remaining manures had a markedly beneficial effect upon the grass crops.

In the next place, I have to report the results of experiments with the same dressings which were employed in the preceding trials, in a field of permanent pasture of great age, on Crook's Farm, Coldstream, Berwickshire, in the occupation of Mr. George P. Smith. A part of the field was laid out in ten experimental plots of one-tenth of an acre each. The manures were spread on the plots early in spring, and the produce of the several plots was cut and weighed on July 29th, 1871, when the results contained in the following tabular statement were obtained:—

Plots.	Description of Manure.	Quantity of Manure per Acre.	Produce per Acre.			Increase per Acre over Average Produce of Unmanured Plots.		
		bushels.	tons.	cwts.	st.	tons.	cwts.	st.
1	Quicklime	100	5	1	0	1	12	1
2	Quicklime	100	4	11	6	1	2	7
	and	cwts.						
	Common salt	5						
3	Fine bone-dust	15	4	13	0	1	4	1
4	Mineral superphosphate	5	3	19	4	0	10	5
	and							
	Crude potash salts	5						
5	No manure	..	2	17	2		..	
6	Common salt	5	3	18	2	0	9	3
7	Peruvian guano	5	6	12	2	3	3	3
8	Crude potash salts	5	5	4	0	1	15	1
9	Mineral superphosphate	5	7	6	1	3	17	2
	and							
	Peruvian guano	5						
10	No manure	..	4	0	4		..	

The average produce of the two unmanured plots was 3 tons 8 cwts. and 7 stones, and the difference in the weight of the cut grass of these plots amounted to 1 ton 3 cwts. and 2 stones.

The pasture thus appears to have been less uniform in its productive powers than is desirable for experimental purposes. Probably the want of uniformity of the field will explain the anomalous results which were obtained on Plots 4 and 8. It will be noticed that whilst 5 cwts. of crude potash salts per acre produced an increase of 1 ton 15 cwts. and 1 stone, the mixture of 5 cwts. of potash salts and 5 cwts. of mineral superphosphate per acre, which was employed on Plot 4, gave an increase of only 10 cwts. and 5 stones per acre, or barely more than the common salt on Plot 6.

As the addition of superphosphate to guano on Plot 9 had a beneficial effect, the maximum produce being obtained on that plot, it is impossible that the combined effect of potash salts and superphosphate upon grass land, can be less favourable than that of potash salts alone. Notwithstanding all the care and precaution which the experimenter may take in conducting field experiments, he must be prepared to find his experiments vitiated in a great measure if he undertakes occasional field trials upon land, the adaptability of which for field trials has not been specially tested in previous years. This circumstance is a source of frequent disappointment and prevents in a measure the continuation of field experiments by practical farmers, who as a rule are not in a position to set aside one or more fields exclusively for experimental purposes.

Whatever may be the value of the grass experiments at Crook's Farm as a guide to others, they no doubt will have shown to Mr. G. P. Smith that the productive powers of his permanent pasture may be greatly and, I doubt not, profitably increased by the judicious application of manures which, like the mixture of guano and superphosphate or good farmyard manure, incorporate with the soil to which they are applied, all the elements of fertility, the removal of which in the produce, without an adequate restoration, must inevitably lead to the gradual exhaustion and deterioration of grass land.

Judging from the effects which Peruvian guano produced on Plots 7 and 8, Mr. Smith's pasture appears to be specially deficient in available nitrogen and in phosphates; for it will be seen that the guano alone nearly doubled the produce, and that the mixture of guano and superphosphate produced fully twice as much grass as the average yield of the two unmanured plots.

Some of the manures which were used in the preceding experiments produce, it is well known, a more immediate effect on grass land than others which act but slowly, and for that reason are more permanent in their effect upon pasture land. When manuring experiments upon permanent pasture are taken in hand, it is not enough to weigh the produce of a single season, but the experiments should be continued for a period of not less than four years in succession. This has been done by my friend and former pupil Mr. G. Y. Wall, of Durham, who, in 1869, began a series of experiments on permanent pasture, all the results of which he communicated to me for four years in succession.

Experiments on Permanent Pasture by Mr. G. Y. Wall, Durham, at "The Lizards," near Sedgfield, Ferry Hill, County of Durham.

At my suggestion, Mr. Wall tried the same manures which were used in the preceding experiments upon permanent pasture of a rather poor and cold character.

The soil of the experimental field was a clay loam, moderately strong, four to five feet deep, and overlying a strata of sand; the geological formation of the district being the carboniferous series of rocks.

The herbage of the pasture was coarse, and consisted principally of the following grasses and plants:—*Phleum pratense* (Timothy grass), *Dactylis glomerata* (Cocksfoot grass), *Lolium perenne* (Rye-grass), *Cynosurus cristatus* (Crested Dogstail grass), *Briza media* (Quaking grass), *Holcus lanatus* (Woolly soft grass), *Avena flavescens* (Yellowish Oat-grass), *Agrostis stolonifera* (Creeping Bent-grass), *Trifolium pratense* (Red clover), *Trifolium repens* (White clover), *Plantago lanceolata* (Rib-grass), *Plantago major* (Greater Plantain), *Poterium sanguisorba* (Burnet), *Lotus corniculatus* (Common birdsfoot trefoil), and *Ranunculus bulbosus* (Buttercup).

An acre of the pasture land was divided into 10 plots. The manures were spread on the 15th of March, 1869, and on the following day the experimental plots were well chain-harrowed and rolled with a Cambridge roller.

Showery weather setting in soon after the application of the manures, they were well washed into the soil.

The lime used in the experiment was obtained from the Raceby kilns, and weighed 92 lbs. per bushel unslaked.

The necessarily cold and stormy spring kept the grass in a very backward state, and the following hot summer completely burnt up the aftermath.

The plots, Mr. Wall informed me, presented the following appearance on the 4th of May.

Nos. 1 and 2 (quicklime and quicklime and salt). No material difference; the herbage rather finer than the rest of the plots.

No. 3. Fine bone-dust. Very short; herbage fine, full of clover and trefoil.

No. 4. Superphosphate and potash salts. Short, good colour; a good deal of clover and trefoil.

No. 5. No manure. Very bare.

No. 6. Common salt. Brown and bare.

No. 7. Peruvian guano. Dark green, short; apparently second best plot.

No. 8. Superphosphate and guano. Brown; a great deal of clover and trefoil.

No. 9. Dark green, short; more clover than on Plot 7—apparently the best plot.

No. 10. Bare; rather better than No. 5.

After the first week of May, the grass crop grew more rapidly. The crop was mown on the 1st of July, 1869, and the grass weighed, and on the 8th the weight of the hay was ascertained. The results obtained are incorporated in the Table on page 436.

It appears from the tabulated statement of results, that common salt, as well as quicklime and the mixture of quicklime and salt, caused a decrease in the produce.

Bone-dust apparently caused also a decrease, but as the produce on one of the unmanured plots (No. 4) is nearly the same as on Plot 3, it may be concluded that the bone-dust had neither a beneficial nor a contrary effect on the pasture.

Peruvian guano, and in still higher degree the mixture of superphosphate with Peruvian guano, produced a considerable increase in the hay crop. The increase amounted to nearly 66 per cent. in the case of guano, and $84\frac{1}{2}$ per cent. in round numbers in the case of the mixture of Peruvian guano and superphosphate.

The money value of the hay may be taken at 5*l.* a ton. After deducting the price which would be paid for the various dressings, the money value of the produce from each plot, calculated per acre, and the loss or gain on the expenditure on manure, is shown for each plot in the Table given on p. 437, from which it appears that Peruvian guano alone gave a slight profit for the outlay in money in the first year of its application to the land.

Produce in 1870.—In the following year the produce from each experimental plot was carefully weighed, green, as grass, and also as hay. The extreme drought in 1870 prevented again a second cutting being taken.

The results obtained in 1870 are incorporated in the Table on page 438.

It will be seen that neither quicklime nor bone-dust, nor any of the other manures, except the mixture of superphosphate and potash salts employed on Plot 4, and the mixture of Peruvian guano and superphosphate, gave an increase in the hay crop in the second year of the application of the manures. The largest increase was obtained on Plot 9, on which in the preceding year Peruvian guano and superphosphate were used at the rate of 5 cwts. each per acre.

EXPERIMENTS ON PERMANENT PASTURE at the LIZARDS, near SEDGFIELD, FERRYHILL, COUNTY of DURHAM, 1869.

No. of Plot.	DESCRIPTION OF MANURE.	Weight per Acre.	Produce per Acre. Grass.	Produce per Acre. Hay.	Percentage of Hay to Grass.	Grass. Average of Unmanured Plots. Tons. Cwts. lbs. 3 18 86½. Increase.	Grass. Average of Unmanured Plots. Decrease.	Grass. Per Cent. Increase.	Grass. Per Cent. Decrease.	Hay. Average of Unmanured Plots. Ton. Cwts. lbs. 1 2 101. Increase.	Hay. Average of Unmanured Plots. Decrease.	Hay. Per Cent. Increase.	Hay. Per Cent. Decrease.
		bushels.	tons. cwts. lbs.	tons. cwts. lbs.		tons. cwts. lbs.	tons. cwts. lbs.	per cent.	per cent.	cwts. lbs.	cwts. lbs.	per cent.	per cent.
1	Quicklime	100	3 0 20	0 18 21½	33·0	..	0 18 66½	..	23·60	..	4 79½	..	20·56
2	Quicklime .. .. .. and Common salt	100 cwts. 5	2 10 5	0 15 10	33·1	..	1 8 81½	..	36·46	..	7 91	..	34·11
3	Fine Bone-dust	15	3 12 46	0 19 67	36·9	..	0 6 40½	..	8·07	..	3 34	..	14·42
4	Mineral superphosphate and Crude potash salts ..	5 5	4 0 65	1 3 71½	34·0	0 1 90½	..	2·29	..	0 82½	..	3·21	..
5	No manure	..	3 8 99	1 2 33½	30·8	..	..	..	..	..	..	..	..
6	Common salt	5	2 14 42	0 17 43½	31·2	..	1 4 44½	..	30·97	..	5 57½	..	24·07
7	Peruvian guano ..	5	5 19 7	1 18 1½	31·3	2 0 32½	..	51·14	..	15 12½	..	65·97	..
8	Crude potash salts ..	5	3 17 31	1 1 105½	35·2	..	0 1 55½	..	1·89	..	0 107½	..	4·19
9	Mineral superphosphate and Peruvian guano ..	5 5	7 8 109	2 2 26	35·2	3 10 22½	..	89·11	..	19 37	..	84·40	..
10	No Manure	..	4 8 74	1 3 56½	37·7	..	..	..	..	..	..	..	..

EXPERIMENTS ON PERMANENT PASTURE at the LIZARDS, near SEDGFIELD, FERRYHILL, COUNTY of DURHAM, 1869.

Number of Plot.	Description of Manure.	Quantity used per Acre.	Value of Hay at 5*l.* per Ton.	Value of Manure applied.	Per Acre. Money Value of Hay after deducting Cost of Manures.	Per Acre. Loss by the Application.	On Expenditure. Profit.	On Expenditure. Loss.	Percentage on Expenditure. Profit.	Percentage on Expenditure. Loss.
		bushels.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	per cent.	per cent.
1	Quicklime	100	4 10 11	1 6 6	3 4 5	..	..	2 10 1	..	188·9
2	Quicklime .. .. and Common salt	100 cwts. 5	3 15 5	1 12 9	2 2 8	..	..	3 11 10	..	219·3
3	Fine bone-dust	15	4 17 11	5 16 3	..	0 18 4	..	6 12 10	..	114·2
4	Mineral superphosphate .. and Crude potash salts	5 / 5	5 18 2	4 0 0	1 18 2	..	..	3 16 4	..	95·4
5	No manure	..	5 14 6	..	5 14 6	..	..	..	..	..
6	Common salt	5	4 6 11	0 6 3	4 0 8	..	..	1 13 10	..	541·2
7	Peruvian guano	5	9 10 2	3 10 0	6 0 2	..	0 5 8	..	8·0	..
8	Crude potash salts	5	5 9 8	2 10 0	2 19 8	..	..	2 14 10	..	69·6
9	Mineral superphosphate .. and Peruvian guano	5 / 5	10 11 2	5 0 0	5 11 2	..	..	0 3 4	..	3·3
10	No manure	..	5 14 6	..	5 14 6	..	..	..	..	..

EXPERIMENTS on PERMANENT PASTURE (2nd YEAR) at the LIZARDS, near SEDGFIELD, FERRYHILL, COUNTY of DURHAM, 1870.

No. of Plot.	DESCRIPTION OF MANURE.	Weight per Acre.	Produce per Acre.						Per-centage of Hay to Grass.	Grass. Average of Un-manured Plots. Tons. Cwts. lbs. 4 14 59¼		Grass. Per Cent.		Hay. Average of Un-manured Plots. Ton. Cwts. lbs. 1 15 7¼		Hay. Per Cent.	
			Grass.			Hay.				Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.
		bush.	tons.	cwts.	lbs	tons.	cwts.	lbs.		cwts. lbs.	cwts. lbs.	per cent.	per cent.	cwts. lbs.	cwts. lbs.	per cent.	per cent.
1	Quicklime	100	3	18	64	1	11	3	39·4	..	15 107½	..	16·88	..	4 4½	..	11·52
2	Quicklime .. .. .. and Common salt	100 cwts. 5	4	2	1	1	11	110	38·9	..	12 58½	..	13·24	..	3 9½	..	8·79
3	Fine bone-dust ..	15	4	12	11	1	13	16	35·9	..	2 48½	..	2·57	..	1 103½	..	5·48
4	Mineral superphosphate and Crude potash salts ..	5 5	5	0	95	1	17	61	37·2	6 35½	..	6·68	..	2 53½	..	7·06	..
5	No manure	..	4	12	26	1	14	87	37·7	..	..	..	..	..	..	..	..
6	Common salt	5	4	7	51	1	13	49	38·2	..	7 8½	..	7·48	..	1 70½	..	4·64
7	Peruvian guano ..	5	4	5	100	1	14	77	40·3	..	8 71½	..	9·13	..	0 42½	..	1·08
8	Crude potash salts ..	5	4	10	10	1	14	90	38·6	..	4 49½	..	4·69	..	0 29½	..	0·75
9	Mineral superphosphate and Peruvian guano ..	5 5	4	19	72	2	1	35	41·4	5 12½	..	5·40	..	6 27½	..	17·81	..
10	No manure	..	4	16	93	1	15	40	36·5	..	..	..	..	..	..	..	..

Peruvian guano alone, which in the preceding year gave the most satisfactory result, showed no effect upon the grass crop in 1870, or rather showed a slight deficiency in comparison with the average produce of the two unmanured plots.

The decrease in the produce of all the plots, except that of Plot 4 and Plot 9, is too small to be ascribed to any injurious effect which the manures might be supposed to have produced on the second year's crop; and the practical conclusion that may be drawn from the results of the experiments in 1870 is, that with the exception of the manures employed in 1869 on Plot No. 4 and Plot No. 9, the remainder had no beneficial effect upon the hay crop.

Produce in 1871.—The moist spring in 1871 was favourable to the growth of grass, and in consequence a heavier crop of hay was made from all the plots than in the preceding years. The plots were mown on the 10th of August, 1871, and weighed green on the same day, and the weight of the hay made on each plot was taken on the 17th of August, the results exhibited in the Table on page 440 being obtained:—

A glance at the results of these experiments shows:—

1. That the unmanured plots produced a very good crop of hay in May.

2. That the quicklime applied in 1869 caused a decrease in the produce of 1871.

3. That bone-dust showed but a trifling increase.

4. That the mixture of mineral superphosphate and crude potash salts gave the largest increase in 1871, the increase in hay over the hay from the unmanured plots amounting to nearly 37 per cent.

5. That common salt, as in the preceding year, caused a decrease in the produce.

6. That Peruvian guano alone produced a slight decrease, and crude potash salts a slight increase in the produce of 1871.

7. That the mixture of Peruvian guano and superphosphate produced the second best result in 1871.

Produce in 1872.—The experimental plots were mown and weighed green on the 9th of August, 1872, and the weight of the hay made on each plot taken on the 21st of the same month.

The Table on page 441 shows the results of the weighing, and the increase or decrease over the produce from the unmanured plots and other particulars.

It appears from these experiments that the heaviest crop was obtained on Plot 9, which was dressed in 1869 with Peruvian guano and superphosphate, at the rate of 5 cwts. each per acre. Potash salts alone and in combination with superphosphate also produced a slight increase; whilst all the other manured plots gave somewhat less hay than the average produce of the two unmanured plots.

EXPERIMENTS ON PERMANENT PASTURE (3rd YEAR) at the LIZARDS, near SEDGFIELD, FERRYHILL, COUNTY of DURHAM, 1871.

No. of Plot.	DESCRIPTION OF MANURE.	Weight per Acre.	Produce per Acre.		Per-centage of Hay to Grass.	Grass. Average of Unmanured Plots. Tons. Cwts. lbs. 5 14 82		Grass. Per Cent.		Hay. Average of Unmanured Plots. Tons. Cwts. lbs. 2 1 103		Hay. Per Cent.	
			Grass.	Hay.		Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.
		bush.	tons. cwts. lbs.	tons. cwts. lbs.		tons. cwts. lbs.	tons. cwts. lbs.	per cent.	per cent.	cwts. lbs.	cwts. lbs.	per cent.	per cent.
1	Quicklime	100	4 12 106	1 13 94	36·40	..	1 1 88	..	18·98	..	8 9	..	19·27
2	Quicklime .. .. .. and Common salt	100 cwts. 5	5 9 102	2 0 100	37·20	..	0 4 92	..	4·20	..	1 3	..	2·44
3	Fine bone-dust	15	6 0 95	2 2 50	35·12	0 6 13	..	5·33	..	0 59	..	1·25	..
4	Mineral superphosphate and Crude potash salts ..	5 5	8 3 34	2 17 46	35·15	2 8 64	..	42·33	..	15 55	..	36·95	..
5	No manure	..	5 8 14	2 0 0	36·99	..	..	..	..	..	..	..	..
6	Common salt	5	5 3 74	1 15 85	34·49	..	0 11 8	..	9·64	..	6 18	..	14·69
7	Peruvian guano.. ..	5	5 6 68	2 0 30	37·77	..	0 8 14	..	7·08	..	1 73	..	3·94
8	Crude potash salts ..	5	6 3 94	2 3 44	35 03	0 9 12	..	7·93	..	1 53	..	3·51	..
9	Mineral superphosphate and Peruvian guano.. ..	5 5	6 19 92	2 7 56	34·61	1 5 10	..	21·78	..	5 65	..	13·31	..
10	No manure	..	6 1 38	2 3 94	36·12	..	..	..	..	..	..	..	..

Experiments on Permanent Pasture (4th Year) at the Lizards, near Sedgfield, Ferryhill, County of Durham, 1872.

No. of Plot.	Description of Manure.	Quantity used per Acre.	Produce per Acre. Grass.	Produce per Acre. Hay.	Per-centage of Hay to Grass.	Grass. Average of Unmanured Plots. Tons. Cwts. lbs. 5 3 60. Increase.	Grass. Average of Unmanured Plots. Decrease.	Grass. Per Cent. Increase.	Grass. Per Cent. Decrease.	Hay. Average of Unmanured Plots. Tons. Cwts. lbs. 1 15 2. Increase.	Hay. Average of Unmanured Plots. Decrease.	Hay. Per Cent. Increase.	Hay. Per Cent. Decrease.
		bush.	tons. cwts. lbs.	tons. cwts. lbs.		tons. cwts. lbs.	cwts. lbs.	per cent.	per cent.	cwt. lbs.	cwt. lbs.	per cent.	per cent.
1	Quicklime	100	4 5 110	1 6 38	30·84	..	17 62	..	16·95	..	10 20	..	29·06
2	Quicklime .. .. .. and Common salt	100 cwts. 5	4 13 4	1 7 36	29·36	..	10 56	..	10·14	..	9 22	..	26·26
3	Fine bone-dust	15	4 18 104	1 11 92	32·16	..	4 68	..	4·44	..	4 78	..	13·41
4	Mineral superphosphate and Crude potash salts ..	5 5	5 12 26	1 15 102	31·10	0 8 78	..	8·39	..	0 100	..	2·54	..
5	No manure	..	4 16 108	1 14 62	35·63	..	..	..	..	..	..	..	..
6	Common salt	5	4 13 4	1 12 36	34·74	..	10 56	..	10·14	..	2 78	..	7·70
7	Peruvian guano	5	4 14 32	1 13 64	35·60	..	9 28	..	8·93	..	1 50	..	4·13
8	Crude potash salts ..	5	5 17 16	1 15 70	33·25	0 3 68	..	3·48	..	0 68	..	1·73	..
9	Mineral superphosphate and Peruvian guano ..	5 5	6 4 12	2 0 40	32·44	1 0 94	..	20·12	..	3 94	..	10·94	..
10	No manure	..	5 10 12	1 15 54	34·94	..	..	..	..	..	..	..	..

In Mr. Wall's experiments quicklime appears to have had an injurious effect upon the herbage, for the weight of hay produced on the plots dressed with quicklime for four seasons in succession, was less than that of the unmanured plots.

Bone-dust also did not appear the most suitable manure for the field upon which the experiments were tried.

This is not the first time that I have found bone-dust inefficacious as a manure for permanent pasture. On some soils, more especially on poor light pastures, the effect of bone-dust on the herbage is truly marvellous: and hence it is that in certain counties bone-dust is justly held in the highest esteem as a means for renovating worn-out pasture land; whilst in other localities bones do not show any marked effect upon meadow land, and are seldom employed upon pasture. I have had brought under my notice, at one time or the other, many instances in which the expenditure of money for bone-dust as a means of improving pasture land, was almost entirely thrown away; and I would therefore strongly advise landlords and tenants to ascertain, by a field-trial on a limited scale, whether or not bones really and materially improve the grass-land on a particular farm, before heavy expense is incurred in boning permanent pastures. On cold clay soils money not unfrequently is wasted by applying bone-dust to pastures. On such land it has been found a much better plan to top-dress the pasture with a mixture of superphosphate, potash salts, and guano, or nitrate of soda, than to apply to it a heavy and more expensive dressing of bone-dust. Similar remarks may be made with regard to the application of lime to grass-land.

There are, no doubt, soils upon which lime has been used with most beneficial effect upon the herbage. Indeed I do not hesitate to say that, on soils utterly deficient in lime, it is impossible to derive the greatest benefit from the use of farmyard manure or guano and other concentrated manures, unless they have been previously limed or marled. On the other hand, there are both light and heavy pastures on which lime has no effect whatever, for the simple reason that such land contains naturally a superabundance of carbonate of lime. Before a heavy expense is incurred in liming or boning grass-land, it appears to me desirable to examine the pasture land for lime and phosphoric acid. The presence of lime is readily enough detected, but the accurate determination of phosphoric acid in a soil is both troublesome and time-consuming. The necessary cost for a careful soil-analysis should not for a moment deter the occupier of grass-land from ordering a chemical examination, which may save him hundreds of pounds in expending money for manures which, like bone-dust or lime, produce excellent effects on some soils, but which may be of comparatively little use in a particular locality. Pasture soils vary much in composition and physical characters, and hence the same manures which effect a radical improvement on pastures in one locality are often found to be of little use in another place. For this reason it is difficult and hazardous to prescribe manuring compounds for grass-land. In a general way it may be stated that manures rich in nitrogen and readily available phosphoric acid, produce the greatest and most beneficial effect on grass-land. There is no pasture, the productiveness of which may not be largely increased by a heavy dressing of farmyard manure or by a top-dressing of guano, or by artificial manuring mixtures composed of ammonia-salts or nitrate of soda and superphosphate of lime. In some cases I have also found the use of potash salts very beneficial in conjunction with superphosphate and guano, or in combination with superphosphate and nitrate of soda.

Unfortunately the application of artificial manures to permanent pasture is often disappointing in an economical point of view. As a rule, no artificial manuring mixture gives so favourable a return as good farmyard manure; and I cannot help thinking that it would be more profitable for a farmer to apply the larger portion of his yard manure rather to his pasture land than to the arable land: for there is no difficulty in growing roots and cereal crops economically with artificial manures, but I am not so certain that, as a rule, it will be found a profitable undertaking to manure permanent pasture with artificial manures.

Laboratory, 11, *Salisbury Square*, *Fleet Street*,
London, *June*, 1874.

XVII.—*On Ergot.* By Wm. Carruthers, F.R.S., Consulting Botanist to the Society.

Ergot might supply an interesting text from which to exhibit the worthlessness of speculation as opposed to observation and experiment in dealing with natural science. Replacing, as it does, the seeds of different grasses, and always attaining, when full grown, a greater size than the normal seed, it was at first thought to indicate an extra quantity of life and vigour in the particular seed, which exhausted themselves in the production of the anomalous horned grain. No special properties were associated with these abnormal productions. All along the ergot had been exerting its baneful influence on man and animals without being suspected. Through its agency the inhabitants of whole districts in France had been visited with intermittent attacks of gangrenous diseases; and England, as Professor Henslow has shown in the pages of this Journal (vol. ii. pp. 14–19), has records of similar though not so extensive calamities. Yet many years have not elapsed since these and other evils have been traced to their true source,—the consumption of ergotted corn as food.

The remarkable action of ergot on the gravid uterus is well known, and has caused it to be used for many years as a powerful aid in cases of difficult or prolonged parturition. It has been more recently determined that its power of causing muscular contraction extends to all unstriped or involuntary muscular fibre, and it has consequently been applied in treating certain maladies connected with the intestinal canal and the arteries, because these organs, like the gravid uterus, are chiefly composed of this kind of muscular tissue.

This Journal, and other periodicals devoted to agricultural subjects, contain frequent narratives of the injuries to stock resulting from the occurrence of ergot in grass crops. Mr. H. Tanner records the loss to one breeder of cattle in Shropshire of 1200*l.* in three years from this cause ('Journal,' vol. xix. p. 40). Recent losses, especially in the casting of foals by valuable brood mares, having again drawn attention to the matter, I propose to set down what is known regarding this dangerous production. This is the more necessary, because the views of the latest writers in this Journal on this subject were published before the very important observations of Tulasne were known. This eminent fungologist has fully traced the history and development of ergot, and has finally set at rest the many doubts entertained as to its true nature.

Like all diseases which result from the attacks of fungi, the appearance of ergot is mysterious and more or less inexplicable. Atmospheric conditions, without doubt, greatly influence the development of such plants. Moisture is required for the growth of the minute spores of fungi, which at all times abound in the air: a moist and warm atmosphere invariably brings in all suitable localities a large crop of these minute epiphytic or parasitic fungi. Such conditions, it is well known, greatly favour the production and development of the potato fungus. Ergot also is most abundant in wet seasons; and in fields where it is seen, it has been found in the greatest abundance in those parts which are low or undrained. Such physical conditions are, however, not present in every instance of the rapid progress of a parasitic fungus. The recent appearance of a blight among garden hollyhocks, and their allies, the wild mallows, is a remarkable exception. This minute fungus (*Puccinia Malvacearum*, Mont.) was described by Montagne from Chili, of which country it appears to be a native. It was afterwards noticed in Australia; and a year ago it appeared for the first time in England, in such abundance that it was observed almost everywhere in the south, and in some places not a single Malvaceous plant, wild or cultivated, could be found that had not been attacked by it. It is reported in the same abundance from many districts this year.

It is to be hoped that the growing attention which is being given to these smaller fungi may lead to a better acquaintance with the causes inducing their sudden appearance and rapid development. When these causes are known, one may obtain the power of modifying or controlling, if not of totally preventing, their ravages.

Ergot has been observed on a large number of our native and cultivated grasses, as well as on our cereal crops. The grasses that are most subject to its attacks are Rye-grass (*Lolium perenne*, Linn.); the Brome-grasses (*Bromus secalinus*, Linn., *B. mollis*, Linn., *B. pratensis*, Ehr.); Couch-grass (*Triticum repens*, Linn.); Fox-tail-grass (*Alopecurus pratensis*, Linn.); Timothy-grass (*Phleum pratense*, Linn.); Fescue-grass (*Festuca elatior*, Linn.); Barley-grass (*Hordeum murinum*, Linn.); and Manna-grass (*Glyceria fluitans*, R. Br.). With the view of enabling the reader to recognise this pest, which is made too little account of by agriculturists, I have given a number of engravings from remarkably accurate but till now unpublished drawings of its appearance on different plants, made by Francis Bauer, who for several years carefully observed this disease, when he was connected with the Royal Gardens at Kew as botanical draughtsman.

As we are most familiar with the appearance of ergot on the cereals, I shall first notice the grain plants affected by it.

That on which it is best known, and from which it is chiefly collected for use in medical practice is Rye (*Secale cereale*, Linn.). In Fig. 1 (next page) is shown a spike of rye, with only a single ear affected by a short and thick ergot; but in Fig. 2 several ears are ergotted, and the larger and more slender forms of the majority of the diseased ears exhibit their usual aspect. The great increase in the size of the grain, shown in the drawings, suggested to Bauhin the name (*Secale luxurians*) he gave to ergot, more than 250 years ago, in one of the first published notices of the disease.

In barley and wheat ergot is not so frequently met with as in rye: nevertheless, when carefully sought for, it will often be found. It has been observed in all the cultivated varieties of wheat. Fig. 3 (p. 447) represents a remarkable case of diseased spring wheat, observed by Bauer. Two of the ears only are ergotted, while the great majority are affected by another and better known disease, bunt or pepper-brand, due also to a minute parasitic fungus (*Tilletia caries*, Tul.).

Fig. 1. Fig. 2.

Rye, *Secale cereale*, Linn. Two Spikes bearing several Ergots.

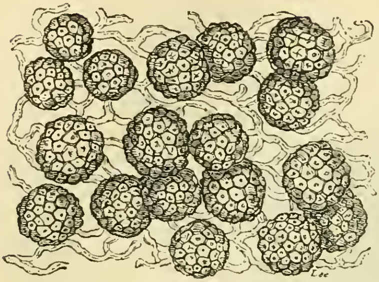
Bauer made a series of experiments with the view of discovering the manner in which different diseases due to microscopic fungi might be communicated to wheat and other cereals. He placed a quantity of the powder (spores) of bunt on the seed of spring wheat, which he then sowed. As the wheat ripened it became extensively affected with the bunt disease. In bunt the contents of the grains are generally completely replaced by a uniform black powder; the grain is brittle and easily crushed between the fingers, when it has a greasy feeling and gives off an offensive fetid smell. Under the microscope this black powder is seen to be composed of spherical spores with a reticulated surface (Fig. 4, p. 448.) If a diseased grain is examined before the spores are fully ripe, they will be seen

Fig. 3.

Spike of Spring Wheat affected with Bunt and Ergot.

to be attached by short stalks to a fine branched thread or mycelium, which appears to be absorbed as the spores ripen; it can scarcely be detected in the fully ripe bunt.

Fig. 4.



Spores of Bunt, showing the threads of Mycelium. Very highly magnified.

Besides the bunt, ergot also appeared in Bauer's small experimental crop of spring wheat, and in the head figured (Fig. 3, p. 447) he observed that the same grain was attacked by both fungi, as was noticed subsequently by Phillipi and others, and has been illustrated and described by Tulasne. A spikelet from the centre of this head is represented double the size of nature in Fig. 5. This consists of three

Fig. 5.

Spikelet from the head of Spring Wheat affected with Ergot and Bunt. Twice the natural size.

Fig. 6.

Section of the terminal Grain of the Spikelet.

Fig. 7.

a *b* *c*

The lateral Grains of the Spikelet. *a* and *b* in section; *c* showing the external appearance. Twice the natural size.

grains, all diseased. That in the centre is the largest, the great size being due to the growth of the ergot below the grain itself, which is entirely converted into bunt-spores, and is carried on the apex of the growing ergot and surmounted by the withered remains of the style. This is clearly seen in the section of this grain (Fig. 6, p. 448), in which the dark colour of the bunt-spores at the apex is contrasted with the lighter-coloured internal structure of the ergot below. The lateral grains of the spikelet are about the size of ordinary wheat-grains, only, like all bunted grains, they are somewhat shorter and blunter. One of these (*a*) is entirely converted into bunt-spores, while the other (*b* and *c*), like the central grain, has an ergot established in the lower portion, though still young and very small.

It deserves to be noticed that in both the ergotted grains of this spikelet the early sphacelia state of the ergot is carried up beyond the ergot itself, and covers the bunted apex of the grains as well.

Maize is subject to the attack of ergot.

The appearance of ergot in rye-grass is well known. A greatly affected head is shown in Fig. 8 of the variety of Darnel (*Lolium temulentum*, Linn.), with very short awns, or altogether without them, which Withering separated as a distinct species, giving to it the name of *Lolium arvense.* Improved husbandry has made this a comparatively rare grass in cultivated fields, where it is of little value as a forage plant, though not so injurious as it has been called: indeed recent experiments make it almost certain that the evils reported and believed to have been produced by the use of darnel have been really caused by the unobserved ergot. The frequency with which rye-grass is attacked has often been noticed. Edward Carroll says he never failed to discover it more or less ergotted in fields allowed to stand for seed, and he adds, what appears to be opposed to general experience, that its extent is in proportion to the wet or dry state of the summer months during

Fig. 8.

Awnless Darnel, *Lolium arvense*, With. *L. temulentum*, L. var.

its maturation; being rarer when wet, frequent when dry. The probable explanation of this reversing of the experience in England and the Continent is, that it is due to the normal moist atmosphere of Ireland, where Mr. Carroll made his observations, being fitted for the germination of the spores of fungi; while rain would wash the spores off the plants, and a superabundance of water would be unfavourable to their growth.

A head of Timothy-grass (*Phleum pratense*, Linn.) is represented in Fig. 9 with an extraordinary number of ergotted ears.

Fig. 9.

Timothy Grass, *Phleum pratense*, Linn.

Fig. 10.

Barley Grass. *Hordeum murinum*, Linn.

This grass forms a considerable portion of the late meadow crops in many districts.

I have already in the darnel figured the ergot in a weed in cultivated grounds; and in the barley-grass (*Hordeum murinum*, Linn.), Fig. 10, we have it on one of the most common annual grass-weeds of our road-sides and waste places. Although this is a worthless weed, as it is rejected even by the half-starved animals that feed by the road-side, it may be actively injurious to the agriculturist if it is to any extent a nidus for the growth of ergot.

Numerous other illustrations might be given, but our figures of the ergot, as it appears in cereals and in pasture and weed grasses, are sufficient to show the general aspect of this parasitic fungus, and to enable the reader easily to detect it.

No farm or district has any right to hope for exemption from this dangerous pest. It may not have been noticed, or it may have actually been absent for many years, yet it may suddenly, without any obvious cause, appear in great abundance and prove a cause of serious destruction to the cattle or sheep placed in the field where its presence is not suspected. The late Mr. John Curtis, a keen and learned entomologist, who had an accurate knowledge of the British grasses and a quick eye for natural objects, had for thirty years beaten the ground between Southwold and Kessington, on the coast of Suffolk, for insects, and had never noticed any specimens of ergot till the year 1847, when he found it on the spikes of *Arundo arenaria*, Linn., in such abundance that he estimated that one-sixth, if not one-fourth, of all the ears of this grass in the district were diseased! ('Gard. Chron.,' 1847, p. 653.)

Fig. 11.

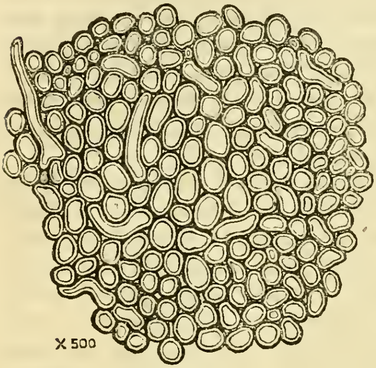
Spikelet of Rye with Ergot. Natural size.

Fig. 12.

Fine Ergot on a foreign species of Lyme Grass, *Elymus giganteus*, Vahl. Natural size.

The different drawings have shown that the ergot bears a certain relation to the seed of the plant in which it occurs, but that in all it attains a larger size than the normal grain, and is especially longer and more horn-like. It occupies the place of the seed, but, unlike most of the parasitic fungi with which agriculturists are acquainted, it sends no roots down into the plant, its whole organisation being confined to the affected ear. The external surface is scaly or somewhat granular, and is generally marked by longitudinal and horizontal cracks, penetrating into and exposing the interior. The colour is black or purple-black, but the interior is white or purplish, and of a dense homogeneous structure (Fig. 13), composed of spherical or polygonal cells, so largely charged with an oily fluid* as to burn freely when lighted at a candle.†

Fig. 13.



Microscopic structure of Ergot, magnified 500 diameters.

De Candolle suggested that this anomalous structure had some affinity to the amorphous indurated masses of mycelium which had been united together in a spurious genus to which was given the name *Sclerotium*. The illustrious mycologist Fries separated it from *Sclerotium*, and established a genus for its reception, which he designated *Spermoedium*, although he doubted whether it should be included among the fungi at all, considering it rather as only a morbid condition of the seeds of grasses.

The true nature of ergot was at length determined by observa-

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* The oil is of a brownish yellow colour, of aromatic flavour and acrid taste; it is viscid, and its specific gravity is ·9249. It consists of 69 per cent. of oleic acid, 22 of palmitic acid, and 8 of glycerine, with traces of acetic and butyric acid, and trimethylamin, ammonia and ergotine as colouring matter.—Dr. Herrmann.

† The inorganic constituents of ergot are—

Potash	30·06
Soda	0·65
Lime	1·38
Magnesia	4·87
Alumina	0·58
Oxide of iron	0·86
Oxide of manganese	0·26
Phosphoric acid	45·12
Silica	14·67
Chloride of sodium	1·50
	99·95

Dr. Herrmann in Buchner's 'Repertorium for 1871,' p. 283, and 'Pharmaceutical Journal,' 1872, p. 241.

tions first made on its early history and development on the diseased plants, and then by experiments on the ergot itself, with the view of determining its ultimate product. In both directions the most satisfactory results have been arrived at, and we now know the complete history of the plant.

In its earliest condition this parasitic fungus escapes notice, being composed of a large number of very small elongated cells borne in a colourless liquid. In about three days after the plant is attacked the ergot becomes visible, appearing as a yellowish viscous substance resting on the outer coating of the as yet undeveloped attacked grain (Fig. 14). It exudes from between the glumes and more or less completely covers the whole seed. It has a taste like honey and an odour like that of grated bones. The ears naturally attacked do not belong to less vigorous or healthy plants than those that escape.

Fig. 14.

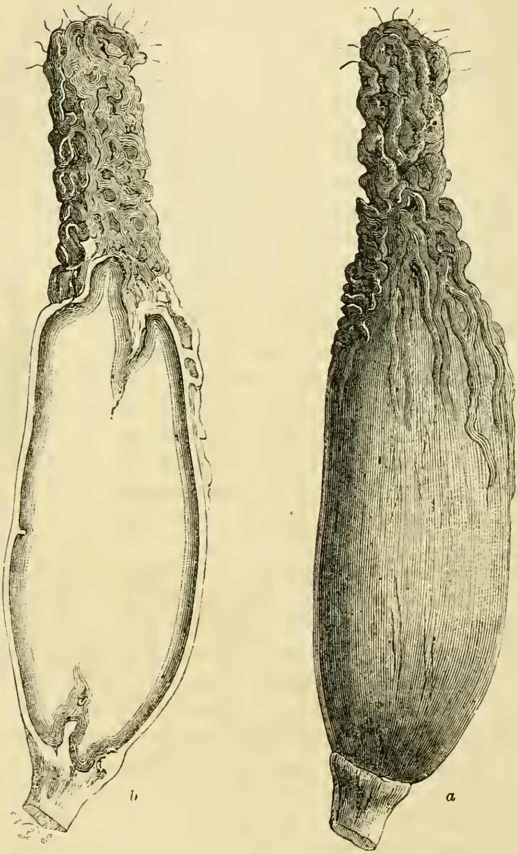
A Grain of Rye, covered with early, or sphacelia, state of Ergot. Twice the natural size.

Once established, the fungus rapidly developes, carrying upwards the aborted remains of the seed, crowned with the withered styles, and forming below the homogeneous sclerotioid mass, which becomes the true ergot.

The state of the development of the ergot had been observed early in the century by Bauer, though none of his figures were published till 1841. He had noticed its relation to the outer covering of the seed, and had supposed it to be an altered condition of that structure ('Linn. Trans.,' vol. xviii. p. 475).

Léveillé, in 1826, noticed that the ergot commenced with this soft covering, and considering it to be a distinct fungus, parasitic on the ergot, he proposed for it the name of *Sphacelia*. John Smith and Quekett, in 1841, published descriptions of the structure of this sphacelia condition, as far as they were able to observe it. They thought it was an amorphous mass of small spherical cells, with a number of larger doubly-nucleated oblong cells scattered among them. It was supposed to be the immediate cause of the ergot, and Quekett gave to it the name of *Ergotætia abortifaciens*, while Berkeley and Broome, believing it to be a true *Oidium*, removed it to that genus under the name *O. abortifaciens*. Bauer's drawings are singularly accurate representations of the general aspect of the disease in its different stages, and while his microscope disclosed to him in 1805 all that Quekett published in 1841, it was not sufficient to exhibit the minute structure as it has been recently described and figured by Tulasne. In Bauer's drawings (Fig. 15) the sphacelia is represented as

Fig. 15.



Ergotted ear of Rye, showing the early sphacelia state at the apex, and the young Ergot at the base. *a.* External appearance. *b.* Section. Magnified six times.

consisting of tortuous and anastomosing ridges or plates, with numerous open cavities in the interior. Tulasne showed that the sphacelia was organically connected with the ergot, and was, indeed, only a condition of it.

Bauer detected the elongated nucleated cells of the sphacelia, but, like Quekett, he did not observe their connection with the supporting structures; while the cavities accurately represented by Bauer in the foldings of the sphacelia (Fig. 15) are the free spaces where the nucleated cells or "spores" are produced.

The illustration (Fig. 16), copied from Tulasne, shows the relation of the different structures. The dark lower portions of the woodcut is a section through the growing sclerotium or ergot, properly so called. This is composed, as we have already seen, of densely-packed polygonal cells, filled with oil globules. On its outer surface and from its apex are given off elongated cells, which are the supports (sterigmata) of oblong cells (spermatia or conidia), the most of which are free in the drawing. These cells are the spores of the *Ergotœtia* of Quekett, and the *Oidium* of Berkeley and Broome. The oblong cells or "spores," when placed in water, freely germinate (Fig. 16, *a*), and they have

Fig. 16.

Magnified section of an Ergot covered with the Sphacelia. *a*. Spermatia germinating in water. (From Tulasne.)

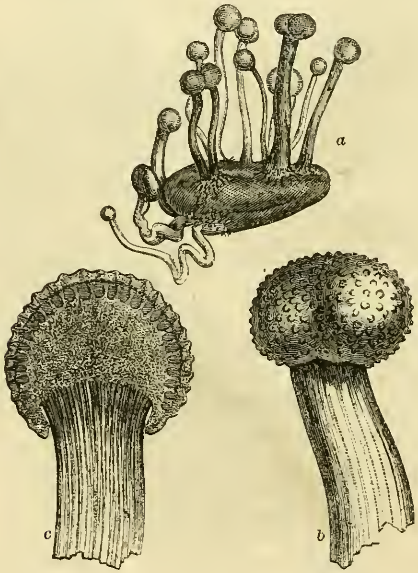
the power of reproducing the parasite. But we have not here the perfect condition of the plant. Recent observations have shown that many fungi produce at different stages of their history free cells possessed with the power of germination. The spermatia-bearing stage has been observed in other fungi besides the ergot.

When the ergot attains its full size the sphacelia disappears, or only the withered and dried up remains of it can be detected at the apex of the ergot.

The further history of the ergot has been determined also by

Tulasne. The frequent occurrence of minute sphærias on the ergotted grains of grasses suggested to him that they were probably not accidental productions, as had been supposed, but were organically connected with the ergot, and represented a further stage of its development. With the view of testing this opinion, he planted a number of ergotted grains, and had the satisfaction to find that a considerable proportion produced sphærias. Those produced by the ergot of rye were the same in form and structure with what were grown from the ergots of most of the other grasses, and believing them all to belong to the same species, he gave to it the name of *Claviceps purpurea* (Fig. 17). This perfect

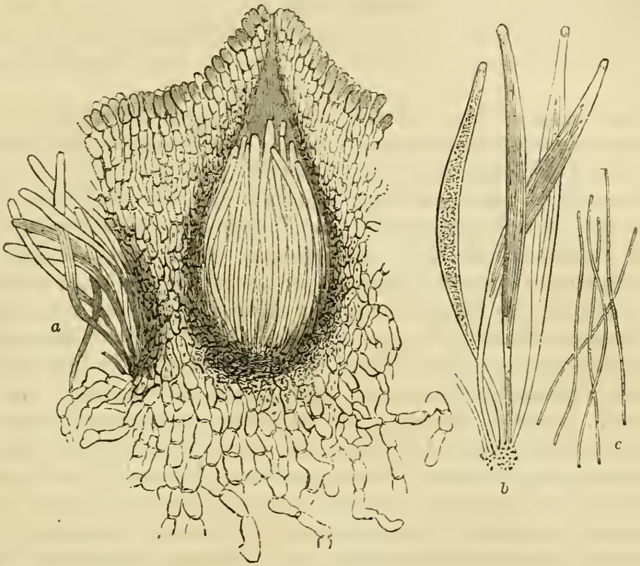
Fig. 17.



a. Ergot of Wheat producing the small Fungus, *Claviceps purpurea*, Tul. *b.* One of the heads magnified. *c.* Section through a head, to show the cavities containing the spores. (From Tulasne.)

plant is a small purplish fungus, with a spherical head, supported on a short firm stem, with a somewhat downy base. The globose head is rough with small prominences, which are the openings of the cavities or conceptacles in which the spores are produced (Fig. 17, *b* and *c*). One of these conceptacles, highly magnified, is shown in Fig. 18, *a*, representing the oval cavity filled with the long slender spore cases (asci) springing from the base of the cavity. The mouth of the conceptacle opening through the conical swelling is obvious; this gives the granular aspect to the head of the fungus. Four of the sacs or asci are represented at *b*, still more magnified. They are seen to be

Fig. 18.



a. Magnified section of a Conceptacle, showing the slender spore-cases, and the tumid mouth of the cavity. *b.* Spore-cases magnified. *c.* Single spores. (From Tulasne.)

filled with slender needle-shaped bodies, which are the ultimate and perfect reproductive spores of the ergot. A few of these spores are represented still more magnified at *c*.

Having traced the history of the ergot, we may now inquire how and at what time the crops get infected, with the view of seeing whether it is possible to discover any means of alleviating, if not of destroying, this injurious parasite.

At two different stages in the life of ergot, bodies are produced which have the power of propagating the disease, namely, the spores of the perfect fungus developed from the ergot, or the "spores" (spermatia or conidia) of the early sphacelia state of the parasite.

The plant is carried over the winter in the dormant ergot condition. A large proportion of the ergot in a field, when it is fully ripe, falls to the ground during the operations of the harvest, or by the friction of the spikes against each other through the action of the wind. These ergots remain on the ground during the winter without undergoing any change. They are dormant, like the seeds of plants, until the following spring or summer, when they produce crops of the perfect fungus (*Claviceps purpurea*, Tul.). The spores of the *Claviceps* are ripe about the time that the cereals come into flower, and by the action of wind or rain they obtain access to the flowers.

In 1856 Durieu communicated ergot to rye by placing the spores of the *Claviceps* on its flowers. Roze has since confirmed and extended these observations ('Bulletin Soc. Bot. de France,' 1870).

It is, then, by these minute needle-like spores that the disease is communicated at first to all crops; and the principal effort of the farmer who desires to free himself from this pest should be to secure clean seed, perfectly free from ergot. The ergot is too frequently overlooked in the barn from its resemblance to the dung of mice; but it is worth special pains in examining the seed to secure immunity from this parasite. Tulasne states as the result of his experiments that if the ergot does not produce the *Claviceps* during the first year after it has fallen to the ground, it loses its vital powers. One might hope to find in this observation of Tulasne the means of coping with the disease; and certainly it is most desirable not to follow an ergotted crop with another crop of cereals. But it must be remembered that the same species of fungus produces an ergot in most of our grasses, and that the spores belonging to the *Claviceps* of these grass ergots will as readily communicate the disease to cereals as those produced by the cereals themselves. We may, therefore, have in ergotted grasses growing in the margin of fields or along hedgebanks the means of maintaining and spreading the disease in cereal crops. No trouble should be spared to collect and destroy the ergots on such grasses. To permit them to fall to the ground is a certain method of securing the appearance of the disease on any cereal or grass crops in the neighbourhood in the following year.

But the disease having once appeared in a field of growing grain, or amongst hay or grass, easily spreads itself in its early sphacelia state. Every one of the "spores" (spermatia) has the power, as we have seen, of germinating, and so spreading the disease. The striking of an ergotted head against a healthy plant will communicate the disease. This has been experimentally tested by Bonorden, and confirmed by Roze. It is not possible, however, to interpose at this stage of the malady with the view of arresting it. The diseased grains are difficult to discover in the field, and it would be hopeless to attempt to pick them out. The disease can only be effectually dealt with while the plant is in its dormant state as an ergot, as already pointed out.

XVIII.—*Observations on Inoculation with the Virus of Contagious Pleuro-Pneumonia of the Ox, chiefly in reference to the local and systemic Changes which are induced.* By G. T. Brown, Professor of Physiology in the Royal Veterinary College, and Chief Inspector to the Veterinary Department of the Privy Council.

[With Four Plates.]

Inoculation with the products of an infectious or contagious disease must, in the first instance, have been a purely speculative proceeding. There is absolutely nothing in the natural history of contagious maladies which suggests the probability of an attack assuming a milder form when the poison is introduced artificially into the system, than when it obtains an entrance in the ordinary way while sick and healthy animals are herded together.

It is quite conceivable that the chief intention of the operator was to facilitate the progress of a disease, which experience taught him was almost certain to attack all the animals within its reach, and thus to concentrate the results in a short space, instead of permitting them to extend over an indefinite period. Nothing would be lost by this measure in any case, and at least time would be gained, while the recovered animals would be protected from a second attack to the same extent as they would be if the affection had been taken naturally. There would be one further result, which to most minds would appear a manifest advantage, the avoidance of suspense, at the cost of precipitating the impending mischief. Observation, it may be imagined, would soon establish the important facts which are now fully realized, viz., the milder character of the inoculated disease, the shortening of the period of incubation, and the marked influence of sanitary conditions on the course of the malady. Small-pox was most probably the first disease which was intentionally transmitted by inoculation with perfect success as far as the individual was concerned, but with disastrous results to the unprotected persons who came in contact with him. The substitution of the vaccine virus, which is the small-pox poison passed through the system of the ox, at once removed the objection which was urged against inoculation, and provided a safe remedy for a deadly disease.

Among the lower animals, cattle-plague, foot-and-mouth disease, and sheep-pox, have been made the subjects of experiments in inoculation with varying results. The virulent cattle-plague occasionally loses something of its deadliness when artificially induced; but the degree of risk to the animal operated on, and also to others in its vicinity, is too high to encourage the prosecution of the investigation, even in permanently infected districts.

Sheep-pox, which stands next in order of severity, may be artificially induced with certainty and comparative safety to the inoculated animal.

Foot-and-mouth disease can also be transmitted from a diseased to a healthy animal with safety, although the artificial disease is not much milder than the ordinarily benign form of the natural affection.

Pleuro-pneumonia stands alone among contagious diseases of stock as an affection which cannot be transmitted from the diseased to the healthy animal by the introduction of the exudate from those parts of the body in which the characteristic products of the affection are deposited. I do not intend to insult the common sense of owners of stock by the statement that inoculation produces pleuro-pneumonia in the inoculated part, but content myself with quoting the following sentence from my Report of last year to the Veterinary Department: "Inoculation with the matter of pleuro-pneumonia induces a disease in the part resembling in its results the disease in the lungs."

In no other contagious disease of the lower animals are the effects of inoculation limited to the part where the virus is introduced; the poison of cattle-plague, even when used in minute quantity, is multiplied, and rapidly passes from the point of puncture over the whole system and produces all the morbid changes which are characteristic of the disease. A slight scratch with a needle which has been dipped in the virus of sheep-pox is followed by the development of pimples (papulæ), which pass through the various stages exactly as they do in the natural disease. A little of the saliva from an animal affected with foot-and-mouth complaint, if applied to the membrane of the mouth of a healthy cow, causes the development of vesicles and the general febrile symptoms which are distinctive of the affection. Inoculation with the virus of glanders produces the identical disease perfect in all its characters.

Accurately stated, the question of the effects of inoculation assumes this form: all contagious diseases of stock, with one exception, can be artificially induced by introducing a minute quantity of the virus of the disease into the system of a healthy animal. This fact is so perfectly well known, that the operation is commonly accepted as a test of the character of the disease. If any doubt or dispute arise as to the existence of cattle-plague, sheep-pox, foot-and-mouth disease, or glanders, the doubt can be resolved and the dispute adjusted by the simple expedient of inoculating a healthy animal with the products of the disease. The results are palpable in each case. It is not necessary to resort to special pleading to give force to the evidence. The experiment either fails, or the disease is developed in a form which can be identified without hesitation.

Doubts and disputes as to the existence of pleuro-pneumonia cannot be determined in this way. Contagious lung-disease of cattle cannot be produced by inoculation with the exudate from a diseased lung. Thousands of cattle have been inoculated; large quantities of the morbid products of the disease have been introduced into the system, not only by means of puncture, but by deep incisions; portions of a diseased lung have been placed under the skin of a healthy animal and retained there, and yet no development of lung-disease has resulted; the effects produced have always been confined to the part in the first instance, and when the local disease has extended to the adjacent tissues, causing their destruction, the special site of pleuro-pneumonia, the lung-tissue, has still remained unaffected. Death from the poisonous action of the virus has followed in repeated instances, but the animals thus killed by the virus of lung-disease have always presented the anomaly of healthy respiratory organs. Nothing in these statements admits of doubt or discussion; the facts are universally accepted. So far as our present means of observation extend, we are justified in asserting that inoculation with the matter of pleuro-pneumonia, as ordinarily practised, produces local inflammation, followed by exudation, into the tissues, of a fluid which is identical in its characters and properties with the fluid exuded from the diseased lung; both being identical in their microscopic structure with the serum of healthy blood in which putrefactive changes have commenced.

It is objected with good reason that inoculation with the virus of cattle-plague, sheep-pox, and foot-and-mouth complaint, is dangerous to the stock in the vicinity of the inoculated animals. From the centres thus intentionally established the disease may spread to other herds and flocks which are not protected from the infection. No such objection can be urged against inoculation with the matter of pleuro-pneumonia. The most violent advocates of the operation have never suggested that a cow which has been inoculated is as likely to communicate the disease as one which is suffering from the natural affection, or is indeed more dangerous than a perfectly healthy uninoculated animal would be.

The failure of all experiments to produce pleuro-pneumonia by the introduction of the morbid products of the disease into the areolar tissue beneath the skin led to the more severe operations of injecting the fluid into the structure of the lungs, into the bronchial tubes, and also into the circulation and into the digestive organs; but before these experiments are referred to it will be advantageous to describe the changes which occur when the exudate from the diseased lung is introduced into the system in the ordinary method of inoculation.

Local and constitutional Effects of Inoculation.

Inoculation with the virus of pleuro-pneumonia is performed in various ways. The matter employed is either the serous exudate from the diseased lungs, the fluid from the deposit on the surface of the membrane which lines the cavity of the chest, or that from the sac in which the heart is enclosed. Generally the fluid is obtained from the lungs when the disease is in the early stage. Some operators contend that the only effective lymph is found in the meshes of the fibrinous deposit on the lining membrane of the chest; others assert that the fluid which is found in the membrane which invests the heart of a diseased animal is the most effective and the safest material for inoculation. It may be conceded at once that all these fluids will be equally active. In their general and microscopic characters they cannot be distinguished, and the effects which follow their introduction into the tissues of a healthy animal are the same in each case.

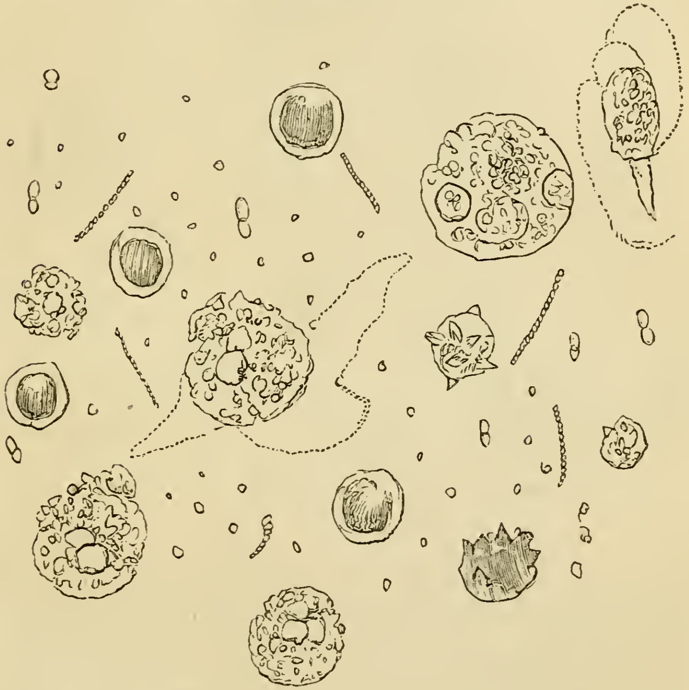
The exudate which was employed in the experiments which are to be referred to was taken from the lungs of animals which had been slaughtered on account of pleuro-pneumonia: a portion of the diseased lung was selected and suspended over a jar, into which the exudate gradually flowed.

When in its best condition the fluid is clear, yellow or light-red in colour, the tint depending on the number of blood discs which are present, viscid; and if allowed to remain at rest it coagulates, that is to say, a mass of fibrin is deposited; the solution of which, however, can be effected by agitating the bottle in which the material is contained. Under high powers of the microscope the fluid presents the appearance which is depicted in the following illustration (Fig. 1).

The chief features of the object are masses of germinal matter, two of which are shown in the figure, the dotted lines indicating the changes of form which occurred while the specimen was under examination. Red blood discs are also seen at various parts of the field; some of these are circular in form, some oval, and others have numerous small processes projecting from the surface. In other parts of the field bacteria, bacteridia, and vibriones are seen.

Bacteridia, which are long dotted rods, having no independent motion, are not always present in the exudate from a diseased lung, but they are very commonly seen; and it is worthy of remark that they are constantly found in the blood of animals which have died from certain forms of blood-poisoning. And the experiments which were performed at the Royal Veterinary College by Assistant Professor Axe, a few months ago, show that inoculation with blood containing bacteridia is fatal to rabbits, guinea-pigs, and goats in a few days, the blood of the inoculated animals quickly becoming loaded with the same organisms.

Fig. 1.—*Fluid exuded from lungs of a Cow affected with Pleuro-Pneumonia, magnified* 1300 *diameters.*



What is the precise signification of these bodies has not yet been determined; but it has been observed that their existence in the exudate from a diseased lung does not intensify the effects produced by that fluid on an inoculated part.

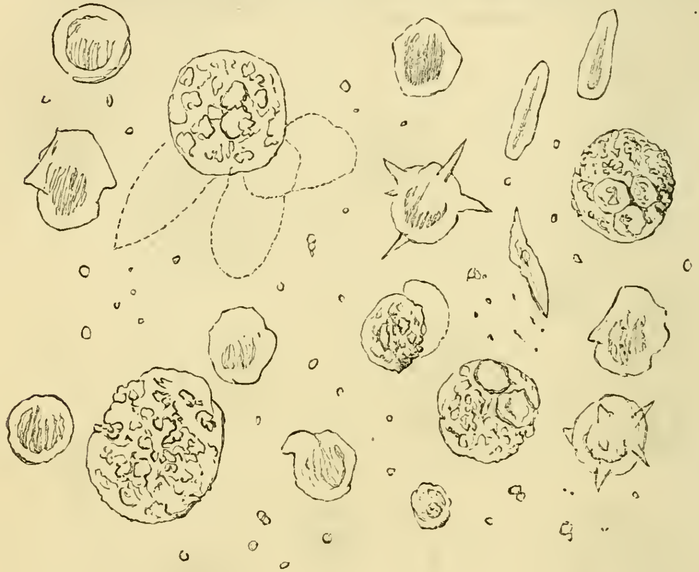
The exudate which occurs, in large amount, in the cavity of the chest, in advanced cases of the disease, contains the same elements as that from the diseased lung.

In the next illustration (Fig. 2, p. 464) the germinal matter is more abundant thanit is in the figure No. 1, otherwise the appearances are identical.

In this case a large quantity of germinal matter was also found in the exudate from the diseased lungs.

The fluid having been selected, inoculation is performed by making an incision about an inch or rather more in length in the skin of the tail, three inches from its termination. Into this incision about a drachm of the fluid may be poured; the tail is

Fig. 2.—*Fluid from the cavity of the chest of a Cow affected with Pleuro-Pneumonia, magnified* 1300 *diameters.*



held in a fixed position for a few moments, and then released, when the greater part of the fluid escapes. Some operators prefer to saturate cotton threads with the exudate and introduce them beneath the skin of the tail in the form of a seton; much less fluid is thus introduced, and it might be supposed that the operation would be more safe than the ordinary one; but it is certain that the method of inoculation by incision does not produce too positive results, and it is probable that so long as a careful operator conducts the experiment, the precise manner of introducing the exudate into the system is a matter of indifference. No immediate effects follow the operation of inoculation by incision. The wound on the following day will be filled up with coagulated blood, and there will be no more swelling ordinarily than would have occurred if the part had been simply incised and no morbid matter had been introduced.

Plate I. represents the appearance which the inoculated part presents for some time after the operation. At the end of a week

PLATE I.

Portion of a Cow's Tail shewing
the condition of the inoculated part
a few days after the operation.
Del ad Nat G.T.B.

Dangerfield Lith

PLATE 2.

...rtion of an inoculated tail showing spreading of the

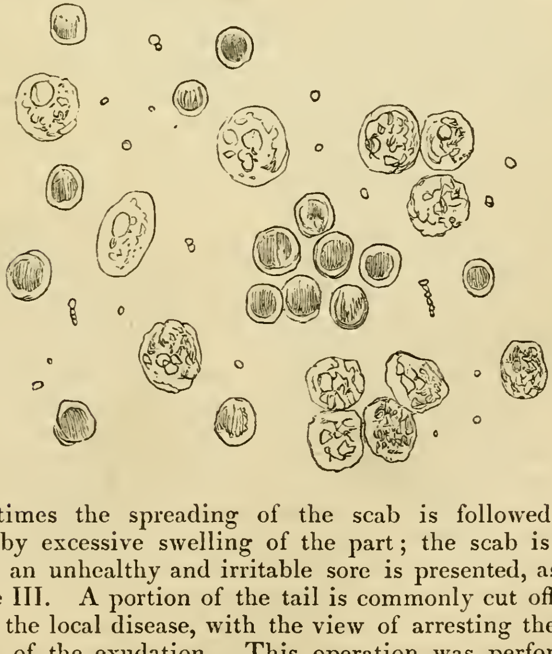
...th three weeks after the operation.

Del. ad nat. G.T.B.

the wound will have become contracted to about half the extent of that shown in the plate, and instead of a level surface there will be a dry hard scab somewhat elevated above the skin. Sometimes at this period the scab is accidentally rubbed off, leaving an imperfectly healed wound. The surface, however, is very soon incrusted again from the drying of the exudation which takes place.

After the lapse of ten days to a fortnight from the time of inoculation, the part will indicate what may be called the characteristic signs of a successful inoculation. There will be considerable swelling from the top of the tail to three or four inches above the point of inoculation; but the chief peculiarity is the "*spreading*" of the incision—a condition which is represented in Plate II. Very often at this period a small quantity of matter exudes from beneath the scab, as shown in illustration on the left side. Under the microscope this is seen to consist of ordinary pus corpuscles, with numerous blood discs, as depicted in the subjoined drawing.

Fig. 3.—*Fluid exuded from beneath the scab covering the inoculated part, magnified* 500 *diameters.*



Sometimes the spreading of the scab is followed immediately by excessive swelling of the part; the scab is thrown off, and an unhealthy and irritable sore is presented, as shown in Plate III. A portion of the tail is commonly cut off at this stage of the local disease, with the view of arresting the further progress of the exudation. This operation was performed in the case from which the drawing in Plate III. was taken. A section through the centre of the inoculated part presented the appearance which is shown at Fig. A, Plate III. Congestion of the vessels, with exudation of serous fluid into the areolar tissue of the part, give a somewhat peculiar aspect to the cut surface, and it can be understood how a fervid imagination would recognise some resemblance to the marbled appearance of the cut surface of a diseased lung; it may be doubted, however, if anything is to be gained by the comparison.

Amputation of the swollen part of the tail is sometimes successful in preventing the upward progress of the inflammation; but occasionally, in spite of every precaution, the swelling extends up the whole length of the tail to the hind quarters; much suffering is occasioned, accompanied with sympathetic fever, and it becomes necessary to amputate the tail close to its origin. This operation does not, in such severe cases, always succeed in saving the animal's life. Fatal blood poisoning is, however, so extremely rare as a result of inoculation, when proper care is taken, that it need not form an important element in the discussion.

When the first amputation is effective in staying the course of the disease, the exudation of serous fluid from the surface of the wound is often considerable; and when the part is perfectly healed a mass of dense fibrous structure is left, covered with scaly cuticle, producing the appearance which is depicted in Plate IV.

The fluid which exudes from the swollen tail has all the characters of the exudate from the diseased lung. The germinal matter is quite as abundant as in the fluid from the chest in the advanced stage of the disease (see Fig. 2), as the next illustration (Fig. 4) will indicate.

The description which has been given of the local effects of inoculation may be accepted as the expression of the sum of the results which are obtained. Variations are observed in the intensity of the action, and in the periods which are occupied in the development of the phases of the local disease, but the ordinary and characteristic effects may be thus described:—For about ten days after the operation no morbid action is apparent: this period may, therefore, be taken to represent the time of incubation. Then exudation commences, and continues for several days: this period may represent the development of the local disease. Then the swelling gradually subsides, and, by the end of a month after inoculation, a narrow dry scab only remains: this period may represent the natural cure of the affection.

It must be allowed that the only remarkable thing in the whole process is the fact of the virus remaining dormant in the inoculated part for several days. A similar swelling, the result of exudation, may be induced by the aid of any irritating material,

A.

...ion of an inoculated tail the scab removed.

...Section through the centre of the inoculated part.

Del ad Nat. G.T.B. Dangerfield Lith London

Varty Excrescences on the end of the stump after amputation

f a portion of the Tail

G T B

but the action is established immediately on the introduction of the agent.

Fig. 4.—*Fluid exuded from a section of a swollen tail, near the inoculated part, magnified* 1300 *diameters.*

Beyond the local irritation which follows the operation of inoculation with the exudate from a diseased lung, no morbid action has been observed. From the moment of introducing the fluid to the completion of the healing process the animal, under ordinary circumstances, remains in good health, the internal temperature does not rise, the appetite continues good, and the secretions are not affected.

The Question of the Protective Effects of Inoculation considered.

Arguing solely on the basis of the evidence which has been adduced of the action of the virus of pleuro-pneumonia on healthy animals, it cannot be logically assumed that inoculation with the morbid products of that disease will protect the system from a natural attack, because the one essential condition on which the success of inoculation in all other contagious diseases of stock depends is not present.

Contagious lung disease does not follow the introduction of the so-called virus into the organism of a healthy animal. Nothing short of association with living diseased cattle suffices to induce the affection, so far as experiments have yet been conducted. This fact is brought prominently forward in the Report from the Royal Veterinary College, published in the present number of the 'Journal.' The details of various important experiments are given in that Report, and it will not be necessary to repeat them here; but, for the purpose of the argument, reference may be made to the chief points which are there discussed.

In the earlier experiments, exposure of healthy cattle to contact with the diseased lungs, and the introduction of a sponge into the nostrils immediately after its removal from the nostrils of a cow affected with pleuro-pneumonia, failed to produce the disease. More recently the fluid exuded from diseased lungs was injected into the circulation, into the bronchial tubes, and into the lung tissues of healthy animals. In two cases fatal effects were produced, but no signs of disease of the lungs were present. Extensive exudation of serum, with abundant granular deposit, occurred in these instances, but only into the subcutaneous areolar membrane and the superficial muscles. The one remarkable feature was the absence of any signs of disturbance for periods varying from fourteen to twenty-one days.

Injection of the virus into the circulation produced no result. The introduction of a small quantity of the exudate into the stomach of a calf caused death in a few days from blood-poisoning, without exciting any disease in the lungs. When local disease becomes severe, as it did in some of the cases referred to, and as it does in some instances when inoculation is performed in the usual way, symptomatic fever is indicated by rise of internal temperature and other characteristic signs, which differ in no way from the symptoms of fever resulting from a severe injury of an ordinary kind. Inoculation is not attended with constitutional disturbance except in cases where the local disease is excessive.

Numerous carefully conducted observations have established the fact that the ordinary results of successful inoculation are purely local. Science, in short, offers no evidence in favour of inoculation as a preventive of pleuro-pneumonia. This conclusion is practically accepted by all who are most enthusiastic in favour of the operation. Experience is the ground on which they rest their claims, and it is perfectly reasonable that on this ground only the efficacy of the practice shall be affirmed or denied.

At first, however, it is necessary to remark on a peculiar character of contagious lung disease, the existence of which renders it at times extremely difficult to decide whether the progress of the malady is cut short by the operation of ordinary preventive measures, or by the protective action of inoculation; and this doubt can only be resolved by the aid of experiments on an extensive scale.

It is well known, and every year adds to the number of instances of the fact, that an outbreak of pleuro-pneumonia in a herd is sometimes arrested after the loss of a few animals, even when nothing has been done beyond removing the sick beasts as soon as they are observed to be ill, and using ordinary care in the treatment of the rest of the herd.

Further, it is well known that inoculated animals are liable to become the subjects of a natural attack of pleuro-pneumonia, and that the disease in them is not less virulent than it is in uninoculated cattle. These propositions are illustrated so perfectly by two instances of outbreaks of pleuro-pneumonia in different parts of the country, that it is worth while to refer to the details of each case.

The first outbreak occurred in the summer of 1871 among some dairy cows, Alderneys, on the estate of the late Marquis of Camden, near Tunbridge. The herd consisted of twenty-two cows, which were kept together in pastures near the homestead, whence they were driven twice daily to a large shed to be fed and milked. Four Irish oxen were also at the same time driven to the shed to be fed. These oxen were subsequently slaughtered on account of pleuro-pneumonia, and there is no doubt that they communicated the disease to the Alderney cows with which they were brought in contact during milking time. On the occasion of my first visit I ascertained that all the Irish cattle, when slaughtered, were found to be affected with pleuro-pneumonia. Of the Alderneys one had died, and one was suffering from the affection. The disease had also extended to some calves, which need not be further noticed, as they were all infected when I examined them, and were shortly afterwards slaughtered and buried. There were also working oxen and a number of stores on the farm, but they were at a considerable distance from the cows, and had not been exposed to infection.

The cows were carefully examined ; and two of them, in which the internal temperature was above 104°, were removed and isolated. Both these animals were afterwards attacked with pleuro-pneumonia in a severe form. On a subsequent visit two more animals were removed, and, after the lapse of a fortnight, two others were selected and separated from the herd. In all of the isolated animals evidence of the existence of pleuro-pneumonia was observed in a few days after their removal, and nearly all of them died or were killed. Another examination of the herd was made a few weeks after the last two animals were removed, and in every case the temperature ranged from 100° to 102°. From this time no signs of pleuro-pneumonia were apparent, and the disease ceased with the loss of six animals out of twenty-two. But the chief feature of the narrative is yet to be introduced.

Early in the outbreak of the disease, when only two or three of the cows had been attacked, the owner was advised to have the whole of his stock inoculated. The operation was performed on the calves, which have been alluded to as infected with the disease, by the veterinary surgeon in attendance, and in this case the progress of the disease, instead of being cut short, was accelerated—a result which has been noticed in similar instances by Continental observers. Mr. Priestman inoculated the remainder of the stock, which had not at the time been in any way exposed to infection. The cows, however, among which the disease really existed were left untouched, as it was feared that the milk would be rendered unwholesome by the introduction of the virus of lung disease into the system.

If inoculation had been performed on these cows, the only cattle on the farm on which its protective effects would have been fairly tested, the cessation of the disease would, undoubtedly, have been ascribed to its influence.

In the next instance the outbreak occurred among thirty-five inoculated cows in a London cow-shed. All the animals had, at different periods, been inoculated by Mr. Priestman, and I had the opportunity of watching many of the animals for some months, both before and after the operation. During October, 1873, three fresh cows were purchased, and, after being inoculated, were kept in a shed by themselves until they had recovered from the operation. In the following month a second lot of six animals was purchased, and similarly treated before being placed with the herd. Mr. Priestman suspected that some of these animals had been taken from an infected herd, and events proved that his impression was well founded. A third lot of six cows was purchased towards the end of the year, completing the number. In the early part of February, 1874, one cow of the second lot, which had been placed in the shed about the middle of December, was taken ill and, from the symptoms, it was suspected that the animal was the subject of pleuro-pneumonia. The disease, however, did not assume a virulent form, and, after a fortnight, the cow was put back into her place in the shed. About ten days afterwards, on March 6th, another of the same lot was attacked with pleuro-pneumonia, and was slaughtered by order of the local authority. In this case both lungs were affected. It is evident, therefore, that the disease had existed for some time before it was detected. On March 15th two more cows—one of the old stock and one of those last brought in—were found to be suffering from the disease, and were slaughtered. On March 20th, another of the old stock was attacked. On March 23rd, another succumbed, and at the same time one of those recently purchased was attacked. On March 25th, another cow was attacked, and on March 31st, another; both of them recently-purchased animals. Thus, from March 6th to March 31st, eight cows, which had been successfully inoculated by one of the most experienced operators, had succumbed to the disease. One of these cows was inoculated in January, 1873, and two others in May of the same year, the remaining five had all been inoculated in the latter part of the year between October and the end of December.

From the rapid progress of the disease there was some reason to apprehend that a large proportion of the herd would be sacrificed; and it was not, therefore, to be expected that the usual preventive measures would be neglected, in order to test the effects of inoculation. On the contrary, every precaution was taken to prevent the spread of infection. The premises were conveniently arranged in every respect, and the greatest care was taken to isolate suspected animals as soon as the thermometer indicated rise of temperature; the sheds were frequently and thoroughly washed by means of a hydrant, and the atmosphere was kept charged with sulphurous acid gas.

No attacks of the disease occurred after the end of March, and the vacant places in the shed were shortly filled up by other cows, and the herd has since remained healthy.

If it were allowable to take the results of the two outbreaks which have been described as illustrative of the ordinary progress of the disease in inoculated and uninoculated herds, there would be little to say in favour of the system of inoculation in comparison with that of isolation and slaughter. It would indeed be easy to refer to many similar cases, but they are not sufficiently numerous to afford a basis for the formation of a positive opinion.

Many of the statements which have been advanced relative to the effects of inoculation have no practical significance, on account of their negative character or their vagueness. The assertion so commonly made that inoculated herds have remained free from disease for a long period, is equally true if applied to uninoculated herds; and in both cases the truth is valueless because negative. If in either instance it could be shown that the animals had been exposed to infection, the circumstances would be materially altered; but this important qualification is seldom thought of. Again, considering the different methods of operating, the degrees of skill on the part of the operators, and the different kinds of material which are employed, it is difficult to believe that even a majority of the animals submitted to the experiment have been effectually inoculated. Some persons use a mixture of the exudate with glycerine, a compound which may safely be deemed inert; and yet we do not hear that the results are less satisfactory than when the undiluted fresh fluid is employed.

All these circumstances account for the great differences of opinion which prevail among scientific and practical men on the subject of inoculation as a preventive of lung-plague, and make it more than ever necessary that the attention which has been recently excited should not be allowed to decline without result. The problem is susceptible of solution in two ways. First, by exposing a number of inoculated and uninoculated cattle to the infection, and secondly, by inoculating a number of herds in which pleuro-pneumonia has appeared, while an equal number is left uninoculated under precisely similar conditions. Both these tests may be applied at the same time; but if one be selected, the first is to be preferred, as being more definite in its character and less complicated in details.

Description of the Methods proposed for testing the Efficacy of Inoculation with the Virus of Pleuro-Pneumonia.

In order to carry into effect the first experiment of exposing inoculated and uninoculated cattle to the contagium of pleuro-pneumonia, it would be economical and in every way advantageous to obtain some which had been inoculated by a skilled operator twelve months, and others about three months, before they are placed in contact with diseased animals. Failing this, it would be necessary to devote a period of at least three months to the performance of inoculation.

For convenience in division, not less than forty-eight cattle, dairy cows by preference, should be selected. Of these, twenty-four should be, if possible, taken from a recently inoculated herd, and twenty-four from a herd which was inoculated about a year ago. The forty-eight cows should be divided into groups of four, and branded, so that no mistake as to identity could possibly occur. To each group of inoculated animals an equal number of healthy, uninoculated animals, also marked, and as nearly as possible of the same character and condition, should be added. Each group of eight cattle should then be sent into a shed or field in which there are animals affected with pleuro-pneumonia. It is scarcely necessary to allude to legal and financial difficulties which stand in the way of the suggested experiment; these must be met, or the inquiry cannot be conducted. Nor is it required to insist on the importance of competent supervision being provided in the case of each group of animals, both for the purpose of guarding against the extension of disease and watching the progress of the experiment.

For some considerable time it would be necessary to record the observations which would be made on the several groups of cattle, without attempting to draw any conclusions from the evidence. A year would not be an excessive time to wait for the solution of an important question; and it can hardly be expected that the investigation would be satisfactorily concluded before that period had elapsed.

The second method of testing the value of inoculation as a preventive of pleuro-pneumonia, by operating on the apparently healthy animals in herds which have been attacked with the disease, has to some extent been applied in many parts of the country where pleuro-pneumonia has existed since inoculation was introduced; but the evidence which has been collected is so indefinite that no conclusion based on it can be accepted. So far as can be ascertained, no care is taken in the first instance to separate the animals which are infected from those in which there are no indications of disease, and consequently, unless the action of inoculation were curative as well as preventive, the results would be seriously modified. It is claimed for the operation, by some, that its action is beneficial to the infected animals. With better reason, however, others contend that the introduction of the virus in such cases only adds fuel to the fire.

Another circumstance which militates against the satisfactory prosecution of an inquiry is the very natural desire of the owner of the infected herd to get rid of suspected animals without delay. When the cattle are in good condition, the most trifling symptom of disease is sufficient to consign them to the butcher; the slightest loss of appetite, a little falling off in the quantity of milk, are signs which are surely accepted by the owner as significant of the existence of disease in the incipient form, and he does not feel disposed to wait for any further development of the malady, to his own certain loss. This circumspection on his part leads to the slaughter of many animals which were at the time perfectly healthy, and possibly might have remained in that condition. At least the proceeding interrupts the inquiry and renders it impossible to draw any inference from such incomplete evidence. To carry into effect the second method of investigation properly it would be imperative to prevent any interference with the herds under observation.

Immediately on the appearance of pleuro-pneumonia, or as soon as information of the existence of disease was obtained, the internal temperature of every animal should be ascertained by means of the thermometer before inoculation, and from time to time during the experiment. There can be no objection against the inoculation of every one of the herd; but it is essential that the observer should know whether he is operating on infected or perfectly healthy animals. Presuming that it is intended to discover what amount of protection will be afforded by inoculation of a herd in which an outbreak of pleuro-pneumonia has occurred, it is obvious that the proper course will be to allow the diseased animals to remain in the shed or pasture with the others. The sick beasts would be subjected to treatment, and in the event of the disease advancing so far as to render recovery hopeless, they would be destroyed, as they would be under ordinary circumstances; but no special care should be taken to prevent the exposure of the inoculated animals to the influence of the contagium.

Very commonly inoculation forms merely one of a series of preventive measures, among which slaughter of diseased and isolation of infected animals, with the liberal use of disinfectants, play important parts. To attribute the cessation of the disease, under such circumstances, to the influence of inoculation, is indicative of a desire to evade the whole question. If slaughter, isolation, and disinfection, are sufficiently active preventive measures to arrest the progress of the disease, inoculation is unnecessary. But if by inoculation the system is rendered unsusceptible to the influence of the contagium, other means are not required: indeed, in an inquiry of the kind suggested they are objectionable, as being calculated to mislead.

It is undoubtedly desirable that both the methods of investigation which have been described should be conducted simultaneously on an extensive scale; but there is no reason to doubt that the first scheme, if properly carried into effect, is calculated to furnish more correct evidence of the value of inoculation than any which has yet been obtained.

XIX.—*Report on the Cultivation of Potatoes, with special reference to the Potato-disease.* By H. M. JENKINS, F.G.S., Secretary of the Society.

THE remarkable virulence of the potato-disease in 1872 caused renewed attention to be directed to the phenomena which are known to accompany its appearance, year by year; and it induced many inquirers again to propound their views as to its cause, and the best means to be adopted with a view to its more or less complete prevention.

It will be in the recollection of Members of the Society that, under these circumstances, Earl Cathcart, being then the President, offered a prize of 100*l.* for the best essay on the potato-disease and its prevention. Although 94 essays competed for this prize, the Judges appointed by the Council felt bound to withhold it; but, at the same time, they suggested that the Council should undertake the complete investigation of the subject, from a scientific as well as a practical point of view. Lord Cathcart at once placed the amount of the prize which he had offered at the disposal of the Council, for the purposes of the proposed investigation. A Special Committee was thereupon appointed by the Council, to consider and report upon the recommendations of the Judges. The results, as already reported to the Members,* are (1) that Professor de Bary, of Strasbourg, is at present resuming his studies of the natural history of the potato-fungus at the request of the Council; (2) that potatoes sent in to compete for prizes, for varieties that will resist disease for three years in succession, are being grown in 20 different districts of the United Kingdom; and (3) that the following schedule of questions relating to the cultivation of the potato, and to the influence of different methods of cultivation on the potato-disease, has been sent to a large number of experienced potato-growers in the United Kingdom:—

Questions on the Cultivation of the Potato, with special reference to the Potato-disease.

1. Is the country open or wooded?
2. Is there much hedge-row or other timber on the land?
3. Is the land on which you have grown potatoes level or sloping, and what is its aspect?
4. What is the nature of the soil and subsoil?
5. Is the land drained; and, if so, at what depth and distance?

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* *Vide* Report of the Council to the General Meeting on May 22nd, 1874, *infra*, pp. xxxix. *et seq.*

6. What has been the rotation of crops?

7. What acreage of potatoes has been usually planted, and what has been the usual interval after the last potato-crop?

8. Describe the preparation of the land for potatoes, and give about the dates of the several operations.

9. What quantities and kinds of manure have been applied, and when put on?

10. When have the setts been planted, for early and late varieties respectively?

11. How much seed has been planted per acre?

12. Are the tubers planted whole or cut, or is this regulated according to the sort of potatoes?

13. How wide are the rows? How far apart are the setts planted in the rows? Or what differences are made in width and distance apart for different sorts of potatoes?

14. Describe the after-cultivation of the potato-crop, giving approximate dates for each operation.

15. To what extent have your crops been diminished by potato-disease?

16. Under what states of the weather and other circumstances, have yonr crops suffered most from the potato-disease?

17. Give, if possible, precise dates of the appearance of the potato-disease on your farm.

18. What varieties of potato have you grown?

19. Which of these varieties of potato have you found the least liable to attack by the potato-disease?

20. Have you found a better result from large-sized than from small-sized setts?

21. Is it your practice to renew your stock of potatoes by purchase from Scotland or elsewhere, and for how many years is such stock grown by you without material deterioration?

22. If you have found that differences in the management or manuring of the potato-land, or in the selection or planting of setts, render the crops more or less liable to injury from the potato-disease, be so good as to describe the facts in detail.

23. If you have found that any application of lime, sulphur, or other materials to the foliage or haulm of potatoes, after the appearance of the disease, tends to arrest its spread, be so good as to describe the process adopted, stating the extent of the disease at the time of application, and its subsequent course.

24. What is your experience of cutting off or pulling up the tops immediately on the appearance of disease, and at different stages in the growth of the plant? Does it diminish the extent of the disease? Does it tend to hasten supertuberating or second growth?

25. Have you found it better to harvest as early as possible, or to allow the crop to remain after maturity some time in the ground?

This Report is confined entirely to the answers to the foregoing queries, and does not touch upon either Professor de Bary's scientific investigations, or upon the results hitherto obtained by the growth of the competing varieties of potato on the several experimental plots. The reports on those branches of the investigation will be published as they are received from the gentlemen who have undertaken the duty of compiling them. For the present, I wish to concentrate the attention of those interested in the subject to a summary of the 100 replies which have been received to the foregoing Schedule of Questions. This I have endeavoured to give in the following pages, as well as verbatim extracts, descriptive of the most important or most illustrative practices mentioned by the growers. I have also, in the concluding remarks, endeavoured to point out the most striking features of the replies, as they appeared to me, after more than one careful perusal of them. The result is not, perhaps, very definite; but such as it is, it was entirely unexpected, and may possibly contain the germ of something more important than can at present be inferred.

I.—Lancashire.

Twenty-three reports have been received from this county; namely, six from heavy-land farmers; eleven from occupiers of bog, peat, or black soil, with a varying subsoil; and the remainder from farmers holding various descriptions of sandy land, on a sandy or gravelly subsoil. One of these last replies appears so important that I have printed it, following a similar one from Worcestershire, *verbatim*, on p. 506.

The place of potatoes in the rotation of crops is either immediately after ley, or after ley-oats; but this variation does not appear to be dependent upon the character of the land. The former shift generally consists of, (1) wheat, (2) barley or oats, (3) seeds, left for two or three years and followed by potatoes. Mr. W. Turton, of Burnt Mill Farm, Halebank, Liverpool, prefers this rotation because he considers that the decayed sod is beneficial, not only in supplying the roots of the potato-plant with a certain amount of nutrition, but also in keeping heavy soils, such as his, free and open. For that purpose, Mr. R. Atherton, of Mount Pleasant, Speke, Liverpool, has used sawdust, which, however, though acting very well for potatoes, is not beneficial to the succeeding crops of wheat and barley. Another heavy-land farmer, Mr. R. Whalley, of Mill Green, Bold, Warrington, and a light-land farmer, Mr. W. Longton, of Rainhill, Prescot, achieve the same end by mixing farmyard manure with road sweepings, which they are careful to buy in dry weather.

Mr. William Birch, of Stand Farm, Aintree, Liverpool, whose farm consists chiefly of black and peaty soil on sand, remarks, in reference to the system of taking potatoes after ley:—

"In this neighbourhood there are two methods of preparing land for potatoes, the second of which is considered by the cleverest potato-growers to be the best:—

"*No.* 1 *Plan.*—In the months of October and November, the grass-land (on which the potatoes are to be grown) is ploughed with double-furrow ploughs a depth of 3 inches; it is then left to rot until February, when it is ploughed across from 10 to 12 inches deep; the land then (if ploughed in good order) is dragged and harrowed twice, and rolled, and is then ready for drilling.

"*No.* 2 *Plan.*—In December, January, and February (according to the weather), the grass-land on which the potatoes are to be grown is trench-ploughed, a one-horse plough turning the top sod about 3 inches deep into the furrow made by a two-horse plough following it, and ploughing 8 or 9 inches deep, thus making the whole operation 11 or 12 inches deep. This system is gaining many friends, as it is thought (and not without reason) that the grass-sod lying under acts as a natural drain, and also that the sod by this process is not so much destroyed as by the other, but that it is gradually rotting and feeding the plant in its several stages of growth."

It thus appears that when potatoes are taken after ley, the land is prepared either by thoroughly breaking up the turf, with a view to its rapid decomposition previous to planting, or by completely burying the sod, with a view to its gradual decomposition during the growth of the potato-plant.

The more general system appears to be to take oats after ley, then potatoes, after which the course is more or less extended. In some cases it is but a four-field shift; in others the seeds are left down for two, three, or even four years, and not unfrequently potatoes are succeeded by two successive corn crops, the seeds being sown on the second. The preparation of the heavy land under this system seems to be nearly uniform, the oat-stubble being skim-ploughed in September or October, and deeply ploughed in the early spring. The majority of the light-land farmers plough the stubble deeply in autumn and cross-plough or cultivate in spring.

To assist in keeping heavy soils free and open, it is usual to spread the farmyard manure in the drills immediately before planting the setts, which are placed directly upon the manure. Mr. Turton states that, having watched the results obtained by others, who have spread the manure on the land and ploughed it in early in the spring, he has seen nothing to induce him to change his system. On the other hand, taking the average of some years, the potato disease on this class of land appears to him to have been more rampant under the system of early application and ploughing in of the manure.

The interval between the potato-crops on the same land appears to vary from 4 to 8 years, the crops following each other more rapidly on the lighter soils. The manure applied averages about 20 tons of farmyard manure, with the addition of more or less guano or artificial manure in some cases. On heavy land as much as 30 tons of farmyard manure per acre is applied, and on light land as little as 10 tons per acre, the deficiency being supplied either by guano, guano and bone-dust, or other tillages, to the extent of from 3 or 4 to as much as 6 or 8 cwt. per acre. Generally, it may be observed, that farm-yard manure alone is preferred on heavy land, but that some light-land farmers do not object to supply its place to a certain extent with guano, bones, or other substitutes. Mr. Birch prefers the manure of horses which have been bedded on saw-dust, while Mr. J. Pearson, of St. Michael's Hall, Garstang, who supplements 17 tons of farmyard manure with about 6 cwt. of guano per acre, states that he has found that by using a larger quantity of farmyard manure his crops are more liable to disease; also, that if they cut the setts and do not cover them, or nearly so, with earth before distributing the guano, there is danger that the manure will kill them. The heavier dressings of manure are frequently admitted to produce larger crops, but are as frequently asserted to render the plants more liable to disease. There is considerable variation in the width of the drills, and of the distance apart in the rows. For late potatoes the drills vary from 26 to 32 inches wide, and the plants from 9 to 18 inches apart. The distances are less for early than for late varieties of potato, especially with regard to the width of the drills. These are, in some instances, reported to be as little as 18 or 20 inches wide for early varieties; and Mr. James Hatton, of Southworth Hall, Warrington, who prefers the smaller width, sends the following note on potato-cultivation in his district:—

"In the neighbourhood of Warrington, especially on the Cheshire side, it is the chief aim of the farmer to get his potatoes in the market as early as possible, and the greater bulk are sent to Manchester before any disease appears. As a rule, the early varieties are all sprouted in boxes before planting. The land is manured and ploughed in beds a yard wide; one man makes holes with a setting-stick, two women or boys put in the setts (which are sprouted about an inch long) with the sprouts upwards; and the holes are closed with rakes by women or boys. In the course of a week or two the beds are covered out of the furrows with an inch or two of soil, either by spade or plough, nothing more being done to them, except weeding by hand when required, until got up for the market in June. The land is sometimes replanted with potatoes, for seed the following year. Or it is sown with common turnips to grow all winter, and send to market early in the spring, if not wanted at home, the land being again planted with potatoes of a later variety the second year. Afterwards it is sown with wheat and seeded down. This is only done on good early land, being in the first instance worked [planted with potatoes] off the grass, instead of taking a crop of oats first. This plan requires much manual labour, and the potatoes, of course, are not allowed to grow to maturity; but the high prices got are supposed to pay the grower far better than by allowing the crops to grow to maturity, and run the risk of losing so many by disease."

The two following quotations illustrate the after-cultivation of the potato-land. Mr. Turton, a heavy-land farmer, states as follows:—

"I harrow them down twice with what is called a bow-harrow, then run the scarifier between every row, to loosen well the soil (using two horses for that operation). I follow with the Norwegian or drill-harrow, and afterwards earth them up with a double plough, then level the tops of the drills or rows with a rake or chain-harrow, so as to leave no impediment in the way of the sprout forcing itself through in the proper place. I continue at intervals to scarify and earth up until the tops prevent any further passage between the rows, always taking care to have the drill as narrow or sharp as possible at the top, for I have noticed as a fact, *the flatter the drill the worse the disease.*"

Mr. W. Birch gives his practice on a farm with black or peaty soil on sand, as follows:—

"Soon after the potatoes are planted the drills are harrowed down with bow-harrows; they are then horse-hoed and ploughed up, and then harrowed lightly down with a light harrow, taking care that the drills are not too high, as the potato puts up a stronger sprout if it is not too deep. They are then left till they are nicely up, then horse-hoed and ploughed, and hand-hoed once, the horse-hoeing and ploughing being repeated till the tops meeting prevent it. I find it impossible to give exact dates, but these operations extend from the third week in April to the first week in June, a large grower having generally the horse-hoe and one plough working continually in the potatoes, arranging to have all completed if possible before hay-harvest, say the second week in June."

Other growers give similar details of the work done on the potato-land, until it is entirely covered by the haulm; and Mr. Richard Simpson, of Out-Rawcliffe, Garstang, emphatically expresses his opinion that "a farmer ought never scarcely to be out of the potato-ground while he can get amongst them."

The chief kinds of potatoes planted are, in the order in which they are reported to resist disease, Skerry Blues, Baron's Perfection, Scotch Downs, Paterson's Victoria, Flukes, Regents, Kemps, &c. The two first-named varieties are reported to be the least liable to disease in the majority of cases; but two or three growers in each case have added that they do not take in the market, owing to their inferior quality. Two growers add that Flukes were formerly much more free from disease than they have been of late years. Mr. Atherton, like Mr. Hatton, prefers to rely upon getting the potatoes to market before the time when the disease usually begins to attack the plant, and for this purpose he plants Runcorn Kidneys.

The disease appears in some years earlier than in others, and there is a considerable weight of evidence to prove that, although it is not generally noticed in Lancashire until about the 12th to the 20th of August, yet that in 1872 it appeared on many farms as early as the third week in July. Again, the reports from growers who farm heavy land indicate an earlier appearance of the disease than those from the occupiers of light land.

Most of the growers report that they have never found differences in modes of cultivation and management to have any appreciable effect in checking the disease, except that the more highly the land is manured the more the crop is diseased. There are, however, a few growers who report favourably of the results of their own special methods. For instance, Mr. W. Longton, of Rainhill, Prescot, writes: "Since I have adopted the plan of putting town sweepings from shops, houses, and streets, gathered in dry weather, under my better manure, and all turned over together in spring about one month before I want it, my potatoes have kept sound on this particular land." Mr. Longton describes his land as a "rather gravelly red soil on shelly rock." His testimony is corroborated by Mr. R. Whalley, of Mill Green, who adopts a similar practice, but farms strong land on a clay subsoil; and by another strong-land farmer, Mr. Atherton, who has used sawdust for the same purpose. Mr. John Scott, of Clifton, Preston, says that "the potatoes are less liable to disease when planted with stable manure; we now use little else; when planted with manure from the cattle sheds alone, they invariably are diseased."

Applications of lime, sulphur, &c., to the haulm after the appearance of the disease have either not been tried or have been found of no avail. The same may be said of the plan of pulling up or cutting off the tops on the appearance of the disease, for seven growers who have tried it report unfavourably of their own experience.

With regard to early or late harvesting, opinion appears to be very much divided; but this may be to some extent owing to the fact that many of the Lancashire potato-farms being in the neighbourhood of large towns, it is found most profitable to get the crop and sell it as soon as possible. Several growers add, that although this is their practice, yet if they wish to store any portion of their crop, they prefer to keep them in the ground some time after arriving at maturity, and to harvest them only in dry weather.

One heavy-land farmer, Mr. Atherton, states that on the land belonging to his neighbours, which is light with a sandy subsoil, on the banks of the Mersey, the potato-crops rarely suffer from the disease, and that in 1872 the crops were wonderful.

II.—Cheshire and North Wales.

A dozen reports, equally divided between Cheshire and the northern half of the Principality, may be conveniently grouped together; and as the cultivation and management of the potato-crop in these districts appear very similar to the methods just described as practised in Lancashire, it will be necessary only to notice statements that refer to different agricultural practices, or that throw additional light on those already noticed.

For instance, Mr. William Moreton, of Acton Hill, Weaverham, Northwick, Cheshire, takes potatoes as a first crop after ley. These are got up for the early market, and are succeeded the same year by late turnips sown, or by earlier turnips or mangolds transplanted. The second year the same course of cropping is repeated, and the third year the land is sown with wheat, next oats or barley sown out with seeds, which are boned and left down for pasture from five to seven years. This system requires a special preparation of the land when the ley is broken up for potatoes, which is thus described by Mr. Moreton :—

"In December or January we plough butts four feet wide, a very light furrow, about an inch and a half deep, six or eight furrows to the butt. We spread the manure on the top of the furrows, and soil it under in February or March." For the second-year potatoes (after turnips or mangolds) the land is ploughed "in November or December six or eight inches deep; then when in suitable condition, in February or March, it is cultivated to a fine mould, ready for either drills or butts, whichever way we think best to plant. In drills we plough half the drill just to meet on the manure, make holes with a setting-stick, and put in the setts; then use the scarifier with a small Norwegian harrow running behind; then close up with the plough. In this way the potatoes lie dry, and, as it were, are drained by the drills."

The same divergence of practice as in Lancashire, with reference to quantities of farmyard and other manures applied to the land, is noticeable in the reports from Cheshire. One grower states that he uses from "6 to 7 cwt. of salt per acre," which substance Dr. Voelcker has proved by experiment to act prejudicially on the potato-crop.*

The quantity of seed planted per acre also varies very much; but the variation in this respect is doubtless due in some measure to the fact that early potatoes for the Manchester and Liverpool markets are largely grown in Cheshire. Under this head, Mr. William Moreton, in conjunction with his neighbour Mr. Hough, has sent the following account of the systematic manner in which the sprouting of the setts for early planting is carried on :—

"Nearly all the potatoes planted here are sprouted from one to three inches long before they are set. We have boxes, which we purchase at from 6*d.* to 8*d.* each, 2 feet 7 inches long by 1 foot 9 inches wide, and 3¼ inches deep, with a small space cut in each end to allow the hand in, to carry them by. Each corner is nailed to a piece of wood about 1½ inch square, which projects 3 inches above the sides and 2 above the ends of the box. The ends are stronger and deeper to allow for the hand-hole above the potatoes. Each box will hold half a bushel or more.

"These boxes, when filled with seed to sprout, are put one upon the other in tiers, upon our shippon lofts, or upon framework suspended from the roof or timbers of the building above the cattle. The breath and natural heat of

* 'Journal Roy. Agric. Soc.,' 2nd series, Vol. vi., No. xii., pp. 392–415, *passim*.

the cattle force them and protect them from frost, unless it be very severe, when we cover them with straw, which we allow to remain while keen frosts continue, looking at them occasionally to see that they are not getting too forward. We also reverse the tiers of boxes top to bottom two or three times during the winter, because the lower boxes sprout quicker than the higher ones.

"Sometimes we box some of our seed straight off the field in July or August, and it keeps remarkably well, unless the disease has made its appearance among them before they have been raised. The unpleasant smell from the tops, and the spots on the leaves are the first indications of disease, and this occurs before we can perceive anything amiss with the tubers. When we find this to be the case, we lose no time to get them off to market, because we are fully convinced that when this happens the tubers will go, though they may appear quite sound, notwithstanding that the disease exists in the tops. Unless they can be sent to market at once, we prefer to let them remain in the soil until the tops are quite dead: for this reason—those tubers that may resist the disease lie more separate from those already affected, and therefore stand a better chance of keeping sound."

There appears to be no variation from the Lancashire practices worthy of notice in reference to the distance apart of the setts, the width of the drills, or the after-cultivation of the potato-plant, except that, with reference to "butts," Mr. Moreton states that they are soiled almost immediately after planting, hand-hoed 4 or 5 inches high, and hand-weeded after if necessary.

The preponderance of opinion again appears to be in favour of Skerry Blues, as the best late kind, and next to them Paterson's Victoria. Sir Watkin Wynn's gardener remarks, "Singular to say, the reputed 'Flour Ball' proved last year to be the worst affected with the disease."* Most of the reporters from Cheshire send the greater proportion of their potato-crop to market before the appearance of the disease. They generally concur in reporting that the disease was worse in 1872 than in 1871; but less in 1873 than in either of the two previous years. There is also further evidence that the disease made its appearance earlier in 1872 than it usually does, and that in some years it is not noticed until as late as the middle of September.

Most of the growers prefer their late potatoes to remain in the ground until they are well matured, and to harvest them in dry weather, so as to diminish the chance of storing any that are diseased. But Mr. J. Roberts, of Well House Farm, Saltness, Cheshire, who likes to harvest as early as possible, states:—

"Last year there was a trial of potato-diggers on the 8th and 9th of September. What potatoes were got on the 8th—a dry day—kept beautifully; what were got on the 9th—a wet day—nearly all spoiled, although the greatest attention possible was bestowed upon them.

"In very wet seasons when potatoes were going very badly with the disease, I have left some dry sandy banks without getting in until Christmas. By that time there would be about half a crop, perfectly healthy, and with no

* Compare this statement with that on p. 485.

appearance of disease, which kept well throughout, the diseased portion having entirely disappeared.

"In all my experience with potatoes it has been a question of wet and dry weather, and wet and dry land, in reference to the extent of the disease.

"My experience has also been that most varieties of the potato become deteriorated, and we always stand in need of new varieties to be successful. The Paterson's is not nearly so prolific with me as it was four years ago."

With regard to pulling up the tops immediately on the appearance of disease, Mr. E. Tench, of Croes Newydd, Wrexham, says: "I have found upon two occasions that the pulling up of the tops *immediately* upon the appearance of the disease, *the tubers being fit to be raised*, has saved the crop. Last year it was not so satisfactory, which I attribute to my having left the operation too long, owing to the scarcity of labour." The other growers have either not tried this expedient, or have found no advantage to arise from it.

There is a general concurrence of opinion that the more heavily the land is manured the larger is the crop, but the more prevalent is the disease. As examples of the differences of opinion that prevail in reference to the influence of manuring or management on the potato-disease, I may quote again, on the one side, Mr. Moreton, of Acton Hill, who remarks, "Potatoes planted with artificial manure keep much better than when planted with farmyard or horse-manure; but we cannot get more than half the crop from artificials." Mr. Robert considers that the best plan is "to put the muck on the stubble, and plough it in to mix with the soil." Mr. W. Sheffield, of Oak Bank, Tattenhall, Chester, who makes the very remarkable return for 1872 of a "very light crop but nearly all sound," states as follows:—

"I have not noticed any difference in the manuring of the land; but after planting, and before the plant is up, I subsoil between the rows, and, after earthing the plants up, I open the tops out nearly flat, and fill in soil, which shows like two rows, and prevents the rain-water running down the stem. . . . . The only difficulty is to deal with abundance of top. I find most potatoes diseased near the stem and nearest the surface, and stems that stand straight up most liable to disease."

Sir Watkin W. Wynn's gardener has been so good as to supplement his replies to the queries, which referred to the farm practice at Wynnstay, by the following statement of the experiments in reference to the potato-disease made in Sir Watkin's garden:—

"Various experiments have been tried with lime, soot, sulphur, sea-sand, laying down the haulm, and planting on raised beds and heaps. No perceptible effect could be noticed with the outward applications, but the planting amongst sea-sand had the best effect. The next best, the laying down the tops. Not more than 5 per cent. is lost on the average from disease, as the crops are early planted and early raised—all being 'earlies' and 'second earlies.' The setts are all planted whole; round sorts 2½ inches diameter, kidney sorts 3 inches long. Well-rotted horse-manure is used and deeply dug in in the autumn, and planted with the dipper in the end of March, dropping some sea-sand over the seed to prevent slugs eating it. Three-quarters of an acre is generally planted in this way, always following carrot-crops.

"Here it is considered that there is no cure, but that the disease is climatal, much after the principle of Europeans on African soil; and that, as the climate can be but little changed, neither the constitution of the potato, sanitary laws, so to speak, must be rigidly studied and observed, as preventive measures to reduce the disease to the lowest minimum.

"Here the selection of the freest and driest soils, with the most open situation, early planting and early raising, cool, dry, and airy storage, change of seed from distant localities, and the thorough working of the soil in dry weather, are the best preventive measures, which not only enhance the crops, but reduce the disease to a minimum."

III.—West Midland Counties.

Under this heading I have grouped two replies from Warwickshire, one from Gloucestershire, one from Staffordshire, and a very remarkable one from Worcestershire. With the exception of the last, they do not contain much additional information. Mr. J. Brawn, of Sandhills, Walsall, who has grown "the White Rock, Paterson's Victoria, Fluke, Farmer's Blue, Early Rose, Red-skin Flour Ball and other varieties" of potato, states that the variety least liable to disease is "unquestionably the Red-skin Flour Ball; and so thoroughly am I convinced of its superiority over all the other kinds I have tried, that I have this season planted my whole 70 acres with this variety." Mr. Brawn also states:—

"I have for many years observed that the effectual earthing up of potatoes is of the utmost importance as a preventive of disease; this I attribute to the more perfect drainage and protection to the tubers from heavy rains."

Both the Warwickshire growers insist on the benefit to be derived from the use of ashes. Thus Mr. T. Wilson, of Manor Farm, Wroxhall, replies:—

"The best result I have found is by using a good-sized potato for seed and using burnt earth or any kind of burnt ashes. . . . . The ashes appear to absorb the water and keep the potato dry."

Mr. W. Hutton, of Compton Verney, Warwick, says:—

"Plant as early as possible, on a well-drained soil; never put on farmyard manure in the spring or planting-time, and let it be well rotten when applied in the autumn; where burnt ashes can be had, use them freely."

The Worcestershire report is printed at length on pp. 504-506, preceding the important report from Lancashire already mentioned.

IV.—South and West of England.

This heading includes six replies, namely, two from Hampshire, one from Dorsetshire, and three from Devonshire. Potatoes in this district appear to be taken after a white-straw crop, whether on the four- or six-course system, either of which may be extended to another year by the seeds being left two years instead of one.

The method of cultivation in Devonshire may be gathered from the following description by Mr. T. Wills, of Eastwrey, Lustleigh :—

"If the land is foul after the ley corn-crop, the stubble is cleansed immediately after harvest. In November or December the land is ploughed 6 or 7 inches deep. In February or early in March (choosing dry weather) the land is worked down into good tilth with the scarifier and harrow previous to sowing.

"Where the land is not too steep for cartage, I usually apply from 8 to 10 tons of fresh farmyard-manure before I plough the land in November or December, and about 3 cwt. per acre of the best guano I can get when I plant the crop. If no dung is used, I apply 5 or 6 cwt. per acre of guano at planting.

"I harrow the land every 12 or 14 days in fine open weather until the rows can be plainly seen. The horse-hoe is then used to destroy weeds and stir the land as often as necessary; and the earthing-plough is used for banking up before the stalks get long enough to be broken down and injured by the operation."

The following replies by Mr. J. Blundell, Land Agent, Southampton, give a lucid account of his practice as a potato-grower during 35 years. The numbers prefixed to the selected replies, correspond to those attached to the questions already given on p. 475.

"6. Potatoes have been usually grown instead of mangolds, swedes, and turnips, and have therefore been grown at intervals of about four years; and it has proved very profitable, for on these soils better barley or wheat is grown than after turnips fed off, and the succeeding clover is always first-rate.

"8. The land is usually ploughed immediately after harvest, and when clean (as it should be, there being no time to clean it) it is allowed to remain fallow, ploughed during the whole winter; and about March or sometimes in February, if the weather is favourable, the ground is either dragged or scarified crossways and immediately ploughed and planted.

"9. When town manure or yard dung has been applied, it has been in the autumn and fallowed in, because it does not delay the season of planting, as the potatoes may be planted during the time required to haul the dung if laid on in spring. The system of using artificial manures is found best, as it does not open the land so much as town and yard manure, and in consequence avoids the effect of electricity, one of the chief exciting causes of the disease, the soundest tubers always being found at the bottom of the furrow.

"14. As soon as the leaf shows about 5 or 6 inches above ground, the potatoes are horse-hoed between the rows, and, as soon as the weather will permit, are hand-hoed in the lines; a few days after hand-hoeing, the horse-hoeing is repeated. The time cannot be stated, as it will vary with the early and later varieties. The earthing or hilling is best done with a light one-horse plough instead of a double-mould plough, particularly at the wider width between the rows, and we find it best to hill up one side of the rows first, and after a few days to hill up the other side: this gives time for any haulm buried to rise again.

* * * * * *

"22. We have found that guano, or dissolved bones and guano mixed with peat-ashes or peat-charcoal, produces the soundest crops, applied in the following manner:—The setts having been placed in the furrow, a man follows with a seedlip full of the manure, and strews into the furrow by hand the requisite quantity, say 4 cwt. Peruvian guano, or 6 cwt. of dissolved bones and guano—mixed one-third guano, two-thirds bones—per acre; the plough following, buries the seed and manure in close contact.

"23. We have never found the application of lime, sulphur, or other materials diminish the tendency to disease in the tubers, but we did find in the year 1860 and subsequent seasons that by growing a crop of turnips with the potatoes the roots escaped disease entirely. With our Fluke potatoes, which throw but little haulm, we were year after year so troubled with weeds after the haulm decayed that we were occasionally obliged to mow the weeds before we could lift the tubers; we therefore, thinking we could grow turnips instead of weeds, sowed over the land previous to earthing the potatoes 1½ lb. of turnip seed per acre, consequently when the haulm died off the turnips grew up and were never hoed, but gave excellent crops; in the wet season of 1860 particularly, in which year we grew 28 tons per acre of turnips, pulled off for cattle and market, before digging the potatoes, which were a full produce and quite sound.

"24. We have never found pulling or cutting off the haulm answer, but we have sometimes found advantage from a second earthing, which kills weeds and buries the tubers deeper in the earth.

"25. We like all the late varieties to remain on the land to a late period, so that diseased tubers may decay entirely, as they furnish manure for the succeeding corn crop."

Several growers in this district are of opinion that the earlier planted potatoes are less liable to disease than those planted later in the season.

With regard to early or late harvesting, the practice of Mr. Blundell is confirmed by the replies of all the growers from this district, except the Rev. W. F. Radclyffe, of Okeford Fitzpaine, Blandford, Dorset, who says: "Harvest as soon as the skin adheres to the tuber; never mind about the haulm being dead." On the other hand, Mr. Elias Cuming, of Linscott, Moretonhampstead, Devon, states: "The bulk of my potatoes are never lifted until October, for if dug earlier there are many tubers infected which show no signs of disease, and when caved together are apt to infect the whole." This gentleman also gives the following summary of his recent experience:—

"In the very dry season of 1870 the potatoes of this district were scarcely diseased at all. One field, which was a furze brake three years before, was planted with Russians and Leather Coats (after oats) the middle of April: the produce was absolutely free from disease.

"In 1872 my potatoes, which were planted in sunny dry fields, were very free, although they were cut down early, while in many places the crop was almost destroyed.

"Last season there were Kidneys, Regents, Blues, and Leather Coats planted in one field. The Kidneys were fully matured when the rain came, on the 17th of August, and resisted the disease. The rest were in a growing state, and two-thirds of the tubers decayed.

"The tubers of potatoes grown on land reclaimed from brake or wood are rarely diseased."

V.—South-east of England.

Under this heading I have included eleven replies, namely, one from Hertfordshire; three from Bedfordshire; five from Cambridgeshire; two from Essex; and one from Suffolk.

Potatoes are generally planted in this district after a white-straw crop on the four- or five-course system of cropping; but some growers on the silty lands take potatoes every other year, the intervening crop being generally wheat; and others in the market-garden districts take them after a variety of market-garden crops. Manuring in the autumn, either on the stubble or immediately after the first ploughing, is the usual practice; and many growers add a dressing of artificial manure (generally superphosphate or Peruvian guano) at the time of planting. Mr. J. T. Smith, of Outwell, Wisbeach, has compared the results obtained from the same value of Peruvian guano, superphosphate, salt, soot, lime, blood and fish manures, &c., and has found them much in favour of guano.

The system of cultivation pursued when the farmyard manure is applied in autumn is thus described by Mr. Smith:—

"After cleaning wheat stubbles directly after harvest, manure with ten or twelve loads of yard manure (mellow), till in (say 4 inches) in November; plough crossways in January, 8 or 10 inches deep, with a subsoil plough after a common plough, thus getting from 12 to 14 inches pulverized soil; let it lie till wanted for planting early in March, when go three rounds on each open furrow and harrow crossways to level the land."

The planting and after-cultivation as practised by Mr. Smith are described as follows:—

"After fifteen years' experience I adopt the following system:—Open on the west side of the field with an ordinary plough (with marker attached the distance required) four rows about 4 inches deep; the setters will plant the first row opened, which the plough covers up on the return after opening the fourth: thus continue throughout the field; the land thus lies in ridges well exposed to the sun, to kill all roots exposed. My next step is to subsoil between the rows with two horses attached to a Howard's ridging plough, *minus* the breasts, with a 14-inch share with an upright taunt 6 or 8 inches long, riveted through the share about 2 inches from the point of each wing: this thoroughly pulverizes the land between the rows, without disturbing the setts; makes a beautiful mould for horse-hoeing, moulding up, &c.

"As soon as the potato has sprouted, say $1\frac{1}{2}$ inch, by which time many annual weeds will have started, run a chain harrow over them: this pulls down the ridge, destroys the small weeds, allows the potato to come through a comparatively clean space of land; run the horse-hoe through them as soon as you can see the row, and they will require very little more cleaning than horse-hoeing three or four times over during the summer. As soon as the tops are sufficiently high, mould up with a Howard or Hornsby moulder, and again subsoil with a 4-inch share after moulding. Late-planted potatoes are most decidedly more subject to blight than early-planted ones. My idea is, get your seed in as forward a state in the grave as the chit will allow to be handled, plant them in dry well-pulverized soil, encourage their growth by frequent hoeings (and not check their growth by moulding them up again as soon as they appear, merely to kill the weeds, which some parties do). Commence planting on the *west* side of the field: they will be up a week earlier than if planted on the east side; the setts lying on the warm sunny side of the ridge. I have always found, the nearer maturity the crop has arrived before the blight appears, the less the quantity of diseased ones when we take them up. One little hint may be useful to some one. This season, having no *wheat* straw thrashed, I covered a few graves over with *oat* straw, ventilating in the usual way; but they heated and were for the most part spoiled, whilst those covered with wheat straw kept dry and sound. I omitted to state another great advantage in early planting is, you get the first string chit after planting, instead of the potato being weakened by growth and heat in the grave."

The alternative practice is thus described by Mr. R. Spencer, of Brooklands, Birchanger, Bishop's Stortford:—

"The potato crop generally follows either wheat, barley, or oats. And as soon after harvest as convenient the land is ploughed up on the flat with one of Howard's iron ploughs and four horses to the depth of 9 or 10 inches (the deeper the better); it is then left until the spring, when it is put on ridges at about 2 feet 9 inches apart by two horses, and the farmyard manure spread in the furrows and artificial manure sown. It is now ready for planting.

"After the potatoes are ploughed in, which is done by two horses, the ridges are left for a fortnight or three weeks so as to let the small weeds grow: they are then harrowed down as flat as possible without injuring the setts; are then horse-hoed between the rows, and either hand-hoed or weeded by women, afterwards moulded up with two horses."

With regard to preventive measures, Mr. Henry Green, of High Causeway, March, Cambridgeshire, observes:—

"I have found land deeply ploughed in the autumn preceding the crop, and after the winter frosts harrowed and rolled, and drawn up in ridges with a plough and manured with farmyard manure, to bring better crops than when ploughed just previous to planting. But I quite think, from twenty years' experience on most of our land, the best time to plant potatoes to avoid disease and wireworm and for yield is October, or if dry and open November will do."

Mr. John King, of Broom, Biggleswade, also states:—

"No better plan than manuring in the autumn, as the potatoes will grow more steadily, will not grow so fast and will yield better, and not so liable to take the disease, as they will grow more even. I have tried all the artificial manures, and it tends more to increase the disease than to stop it, as it makes the potato grow too fast; if the disease comes on, it is sure to prove fatal loss."

The evidence with regard to the pulling up or cutting off the tops is eminently unfavourable, and early planting in well-drained lands is several times insisted upon. The evidence as to early or late harvesting is again contradictory, and seems to be based on various experiences with regard to the land, the state of the crop at the time of lifting, and the weather subsequent to the earlier potato-harvest.

Mr. Richard Spencer, previously quoted, sends the following additional notes:—

"The Regent potato we are now using, and have been for the last eight years, was obtained from a London salesman, and I believe came originally from the North. I believe that we increase yearly in our diseased tubers, but as compared with fresh seed I think our old sort is the best.

"The potatoes have always commanded top prices in London.

"In 1871 we obtained through the same salesman some seed from the fen-land near Wisbeach, but they were so attacked by the disease that we immediately discontinued using them.

"There is no doubt that it is best to harvest your crops as early as possible, but at the same time you would have to sacrifice them, as the potatoes would not be matured, and would therefore not yield so great a quantity. Last year we harvested some in August (Regents), and the disease had not then set in. Some of the setts were kept by themselves, and at the present time not a diseased tuber can be found amongst them. These are planted by the side of the trial setts; I shall therefore be able to give some information whether they will resist the disease to any extent.

"There are certain essential points which ought to be more studied as regards the disease. The following are some of them:—Selection of seed; temperature of soil; cultivation of land, and *drainage*.

"In the first place I believe that one sort of potato is able to resist the disease more than another, in the same way that one animal or human being in a certain state of health is able to do so under varying circumstances, and therefore I am making experiments with potatoes selected from roots upon which not a trace of disease was to be found (of which the proportion was very small indeed). These are planted by the side of the trial setts.

"In the year 1871 the Regents obtained from the Wisbeach district were planted in a field upon each side of our own original sort; both of them grew well together until the disease appeared, when the bine of the Wisbeach lot went in a most rapid manner, and when taken up those from the fen-land were diseased to the extent of 75 per cent., whilst our own sort went only to the extent of 25 per cent. This was upon a gravelly soil. But it did not rest here, for upon a light sandy soil on our farm at five miles distant it was visible to the same extent, even to a part of a row where the one sort began and the other ended, with the same result at the time of harvesting. This, I think, clearly shows that it is not entirely atmospheric.

"Also Myatt's Early Prolific planted upon a soapy clay soil by the side of another Kidney gave similar results; the Myatt's Kidney going at the rate of about 30 per cent., whilst the other went at the rate of at least 90 per cent.

"*Temperature of Soil.*—As regards the temperature of the soil, I fancy that the more the temperature is reduced the greater the chance of the disease; and therefore after a great amount of wet, and when land has been worked in a bad season, like the last two or three, when it has been left in a cold and raw condition underneath and heat has succeeded, rapid evaporation has gone on and a great difference of temperature has been produced between the atmosphere and the soil, which is not at all beneficial to the tender potato plant.

"This year I should not be surprised to see very little disease, owing to the land being in such an excellently pulverized and mellowed condition and the subsoil not supersaturated; and should we now get a heavy fall of rain, it will be better able to get away from the potatoes, and if heat succeeds will not be so liable to produce such extremes.

"Lastly, drainage is a very great question to be considered, not only with heavy, but also with light soils, where there is any probability of water concentrating in any particular part of a field and becoming stagnant under the surface. It also assists in the time of drought as well as in the time of wet, for owing to evaporation the moisture in the soil acts by capillary attraction, and if the soil is well drained the attraction would go on in a more uniform and regular manner.

"About the keeping of setts I have said nothing, not because it is of little consequence, but because I believe every one is of the opinion that they cannot be kept in too dry and protected a condition, so as to prevent any weakening of the tuber by sprouting."

VI.—Metropolitan Counties.

Under this heading I have placed three reports from Middlesex and three from Kent, Surrey not being represented by even a single correspondent. The rotations pursued on farms in the neighbourhood of London and other large towns are frequently variable; and there is nothing in the replies from Metropolitan growers under this head, or with regard to the general cultivation of the potato-crop, that need be described at length in this report. I shall therefore transcribe only some remarks that refer more particularly to the potato-disease.

Mr. Robert Cobb, of Higham, Rochester, who plants annually from 100 to 150 acres, observes:—

"I have had the advantage of the opinion of Mr. Scott, of Wouldham, Rochester, one of the most successful and enterprising potato-growers in Kent. His opinion agrees with mine, that no land or sort of potato can claim immunity from the blight. The only way of lessening its ravages is to plant on land having a natural drainage, to change the seed, to plant good setts, to manure with well-matured dung, to cultivate deeply and as long as possible before earthing, and to earth as deeply as practicable."

He also states, that he has applied lime to the haulm after the appearance of the disease, but without success.

Mr. R. Lake, of Oakley, Higham, Rochester, observes:—

"There is no doubt that on this description of land the disease is greatly aggravated by the application of strong nitrogenous manures. I endeavour to grow large crops, but suffer, I think, the more in consequence, especially in the sort of seasons described under the 16th head [viz. wet seasons, and those in which thunderstorms have been most prevalent in July and August]. In the other cases I have seen no difference. Where lime or burnt ashes have been applied in the rows at the time of planting, the disease has usually been somewhat lessened."

Contrary to the usual opinion with regard to the effect of change of seed by purchase from Scotland, or elsewhere, and notwithstanding his own practice of changing seed every two years, Mr. Lake remarks on this point:—

"I have not found change of seed diminish liability to attack of disease. I know a case in which the seed has been saved yearly from the same stock grown in the same field, which has not been found more liable to disease than fresh stock. The sort was Myatt's Prolifics: the time ten years."

The foregoing extracts are from Kentish replies; the following are from correspondents farming in the county of Middlesex.

In both counties heavy manuring is the rule; Mr. Johnston, of Gunnersbury House, Isleworth, applies as much as 30 to 40 tons of stable manure, commencing in March and continuing immediately before planting until the whole breadth has been got in. The alternative practice is described by Mr. Newman, of Hayes Court, who applies about 25 tons of good stable manure in October and November, on the pared stubble, and ploughs it in soon after. He remarks, "Autumn manuring, I have always found a check to the virulence of the disease;" and again, "Previous to autumn cultivation I have lost three-fourths of my crop; *since* I have never lost more than one-third." He also states, "I procure my seed-potatoes from Scotland every year, and my experience has proved that I had better give 10*l.* per ton for this change, than 5*l.* for those grown more than one year in the south, both for quality and hardihood."

VII.—Lincolnshire.

Five reports illustrate the cultivation of the potato in this county, two being from the warp-land district, near Brigg, and the remainder from similar land in the south-east of the county. Some growers take potatoes and wheat alternately for many years in succession, others pursue a three-course shift, consisting of (1) wheat, (2) beans, clover, flax, tares, or turnips, and (3) potatoes, followed again by wheat, being practically the same as the Yorkshire course to be next described.

The preparation of the warp-land is thus described by Mr. G. Moon, of Normanby Grange, Brigg:—

"The seeds I have had broken up before harvest and well worked; after harvest well ploughed again with three horses; and, if the weather will allow, well worked and dragged, and ridged up for the winter. In the spring I split the ridges, and let them remain a little to warm; then plant my potatoes,—I don't mind how early, if the land is in a proper state. I cannot give any dates, as it depends entirely on the state of the weather and your own judgment about the knowledge of the land; in fact, your work depends entirely upon the season. I have been supposing now a favourable season, but should it be anything like the spring of 1872, the splitting, the harrowing down, the rolling and ridging up again, are something too much to describe here. If after flax, I have the land skimmed over before the flax is stacked, then after harvest ploughed as deep as possible with three horses, and left winter-ridged, the same as broken-up seeds."

Mr. J. G. Hobson, of Curlew Lodge, Long Sutton, thus describes his method of cultivating the land for potatoes, before and after the time of planting :—

"Plough in a good dressing of long manure before Christmas; cross-plough as early as the condition of the soil will admit, and if the land is dry enough to bear the horses in March or early in April, cultivate to a good mould, ridge for planting, applying artificial manure, which should be sown by hand down the ridges before closing.

"Afterwards cultivate freely by hand, and horse-hoe as soon as the lines of potatoes are safely discernible, and continue to move the soil repeatedly throughout the summer. Mould up *lightly* with the open-breasted plough when the stems need support and the young potatoes need protection; then subsoil with chisel-pointed cultivator, so as to cut up the soil in detail rather than in large rough slices. As the plant needs still further moulding, hill up *lightly*, leaving a *sharp angle* close to the stems, to throw off the wet. Lastly, run the mole subsoiler between each row, the ground being all along thoroughly clear of weeds."

The preponderance of opinion is in favour of large-sized setts, and on this point Mr. Hobson observes :—

"Large-sized *cut* setts usually bring the heaviest crop of marketable potatoes. Large-sized whole potatoes I have found to produce a large number of small potatoes; small seed sometimes a fair crop, but usually of small potatoes."

On the other hand, Mr. G. Moon gives his experience as follows :—

"I have always planted small-sized setts, excepting one year I had some Flukes I could not sell, as they turned black-ended in the spring. They were very large, and took something like 16 sacks to the acre; but my produce was no better than my neighbours, who planted the usual seed."

With regard to the effect of different systems of management in preventing or arresting the spread of the potato-disease, Mr. Moon states :—

"I have found that when the manure has been ploughed in in the winter, and the land has been deeply ploughed, I have had most sound potatoes. Again, I find where the land has been growing potatoes very often, there is more blight. I think when the air is charged with electricity, and accompanied with thunderstorms, the potato top appears to *inhale* something which causes the disease; but you will sometimes find when the tops are struck with disease, that should the weather come fine, clear, and cold, it stops the progress, and the tubers take little harm.

"With respect to cutting off the tops in a 6-acre field this season, on the first appearance of the disease, I cut off half the field and left the stumps of the haulm standing. Where this was done, *I had more bad potatoes.*

"I also pulled the tops in another field, and left others standing with them on; and where the tops were left and allowed to die of themselves, I had more potatoes. For example, I pulled 12 roots, and left 12 roots with tops on; the former had 14 lbs. sound potatoes and ½ lb. bad, the latter had 15 lbs. sound and 1½ lb. bad, showing, commercially speaking, I was a great loser."

Mr. Hobson remarks, under the latter head :—

"My experience is various. Cutting off tops certainly has lessened the amount of disease; but sometimes, if done too early, it has seriously diminished the yield and injured the quality of the produce. On the other hand, if the crop is tolerably well grown, I think it decidedly advisable, promptly to cut off the tops. I have no proof for or against second-growth."

The following note, with regard to early or late harvesting, by Mr. J. W. Robinson, of Wyberton, Boston, may be fitly added as an illustration of the difficulty of obtaining positive evidence of value as to the effect of any kind of practice upon the origin or spread of the potato-disease. Mr. Robinson states :—

"In some instances I have found it better to harvest later, as those potatoes that are attacked early then return to mother earth, and leave only the sound ones to be picked up. In other seasons (say very wet ones) the opposite effect might be produced; the diseased ones would rot the few sound ones, even in the ground. There are no two circumstances exactly alike. What is right in one case may be perfectly wrong in another."

VIII.—Yorkshire.

Five reports have been received from this county, four of them being from growers in the celebrated marshland district in the neighbourhood of Goole, frequently alluded to as "Howdenshire." The soil is warp, of either natural or artificial formation, and much of it is remarkable for its good quality and suitability for potato-growing. The course of cropping pursued in this district does not appear to be very well defined, but potatoes are taken every second or third year, and sometimes two years in succession. Mr. William Smith, of the Grange, Goole, adopts a definite course, as follows: (1) potatoes; (2) wheat; (3) beans, clover, or flax, and occasionally turnips or mangolds, returning again to potatoes; and this appears to be a kind of standard rotation, though liable to considerable modifications. Mr. W. Burton, of Eastoft Hall, Goole, adopts the following rotation, extending over seven years, and including two courses of potatoes: (1) clover (mown, and eddish eaten, sometimes entirely grazed); (2) potatoes; (3) wheat; (4) beans, flax, or turnips; (5) potatoes; (6) wheat; (7) flax, oats, or barley, sown out with clover.

Mr. W. Burton thus describes his preparation of the land for potatoes, under the varying circumstances which this rotation entails :—

"Manure clover, bean, flax, or wheat stubbles in September as soon as possible after wheat-harvest, plough it in 4 or 5 inches deep. After some time, say in November and December, plough 9 inches deep crosswise with 3 horses; ridged or rowed crosswise, to the last ploughing early in spring, a good depth with 3 horses, and left for the frost and weather to prepare. If manuring is left for spring, the land is ridged or rowed in November or December, as the case may be, immediately after ploughing full depth."

This practice appears to be general in the district, except that some growers plough 10 or 12 inches deep, instead of 9, in the autumn; and others dig or cultivate with steam-tackle instead of ploughing with horses.

From 10 to 15 cwt. of farmyard manure is applied in the autumn, and various quantities (from 3 to 10 cwt.) of artificial manure in the rows at the time of planting; but Mr. W. Coulman, of Eastoft Hall, Goole, does not apply more than 5 tons of manure (partly in the autumn and partly at the time of planting) and 6 cwt. of Peruvian guano. He says that he has had good crops from guano alone.

The quantity of potatoes planted is generally from 10 to 15 cwt. per acre, but Mr. Burton plants from 14 to 21 cwt., according to the sizes of setts and varieties. They are got in as early as possible, but the time of planting extends from the beginning of February to the end of April, according to the season. As a rule the tubers are planted whole, and this practice has become more common than it was formerly. Large-sized setts, especially when purchased from Scotland, which therefore cannot be exchanged for smaller tubers, are necessarily cut. The rows are from 27 to 30 inches wide, and the setts 10 to 15 inches apart, according to the luxuriance of the haulm of the different varieties, but Mr. Coulman prefers to have the rows 34 inches wide and the setts closer together—about 9 inches apart.

Very little additional information is given with regard to the potato-disease; but Mr. W. Smith states, in reference to the liability of certain sorts to be attacked:—

"I have found the Red-skin Flour-ball and Early Rose the least affected by potato-disease, but poor in quality. The Fluke and White Rock stand next in order. The York Regent and Paterson's Victoria have generally suffered the most, especially the Victorias."

With regard to large- and small-sized setts, one grower prefers them of a medium size, three think there is no difference, and the fifth, Mr. W. Smith, remarks:—

"I have never planted very large setts. I prefer a medium size; but I may say that the best crop of York Regents I ever saw was grown from very small seed; and the best Regents I had last season were grown from very small setts, saved from a crop that was gathered and sent to market in the month of August, when the crop was in a growing state, and quite six weeks before they were ripe."

As to the practicability of arresting the spread of the disease, Mr. Smith states:—

"I believe that pulling up or cutting off the tops on the first appearance of the disease does diminish its extent, but I am of opinion that it also greatly diminishes the crop, especially if the disease makes its appearance early in the season. I don't think it tends to supertuberating, as I believe the growth of the tubers is arrested, especially when the tops are pulled up."

In this district opinion is unanimous in favour of harvesting as early as possible after the tubers are sufficiently ripe to bear it without injury; and Mr. W. Burton adds: "I have on two occasions mown off and carted away the tops, when they were in a green and growing state, and both years with a success over and above later gatherings of 50 per cent." In conclusion, Mr. Burton states as follows:—

"The summing up of my experience will lead me in future to adopt the following principles for the cultivation of potatoes with reference to the avoiding of the disease as much as possible:—

"1st. Planting in good soils applicable to the growth (second class and heavy lands are extra-risky);

"2nd. Have good seed direct from Scotland, or what was got the previous year and grown on the farm;

"3rd. Plant as early as the season will permit;

"4th. Apply hand-tillage to hasten the growth; and

"5th. Harvest the crop while in a green and growing state, just before it is matured, taking care to store them so as to let the heat escape."

IX.—The Lothians.

Nine reports from the south-east of Scotland show a tolerably uniform system of cultivation of the potato. A six-course shift is generally pursued, potatoes being taken after ley-oats, and followed by wheat, roots, and spring corn sown out with seeds. The breadth of land planted with potatoes is not rarely one-sixth of the whole arable land. Mr. Samuel D. Shirreff, of Saltcoats, Drem, gives a very lucid account of his mode of cultivating the potato; and I print it as nearly as possible in his own words:—

"Potatoes seem to succeed best after oats, grown after grass. The stubble should be deeply cultivated, *when the ground is dry*, immediately after harvest. If thoroughly clean, it should then simply be harrowed, and afterwards have the drills drawn off. But if at all dirty and sodden with wet, it should be deeply grubbed in spring. Patience is the great virtue to practise in regard to the proper working of the land. As a rule, four weeks should pass after the potatoes are planted, then the drills should be harrowed to check the growth of weeds. After the potatoes appear distinctly in rows the single-horse grubber should be used, then the hand-hoe, then the same grubber as before, but with two horses so as to go deeper, and with a single-horse grubber following to remove the footprints. Then another hand-hoeing if required. I have found it of great value to apply at this period a top-dressing of nitrate of soda and superphosphate immediately before earthing up. This process should be delayed as long as possible, and should be done when the land is a little moist. The grubbing cannot be repeated too often; the second should be done as deeply as possible with two horses. The earthing-up requires peculiar mould-boards and first-class ploughmen."

The land generally receives a very liberal dressing for potatoes, from 15 to as much as 35 tons of farmyard manure applied in the autumn, if possible, and a dressing of from 4 to 8 cwt. of artificial manures applied at the time of planting the potatoes. Mr. Shirreff's practice differs somewhat from that of other Lothian growers, for he applies the farmyard manure in the spring, and the artificials as late as possible—just before earthing up. He states as follows :—

"I have made repeated experiments, and find that farmyard manure should be applied in the drill, after having been, what we call, *middened*, and turned over three weeks before being applied. The manure heaps should be carefully covered with earth on the sides, and old guano-bags used as a covering for the top, after it has been dusted over with salt, which checks the evaporation of ammonia."

From 10 to 12 cwt. per acre is the usual quantity of potatoes planted in the Lothians. As a rule, and preferably, the setts are cut, but small ones are planted whole. Again, on this point Mr. Shirreff differs from his neighbours, for he says: "I have experimented on this, and find the largest crops from whole potatoes. They branch out more, and give more liberty to the hoers to strike both near and deep, seeing it may do good to have a stem or two lopped off." On the other hand, Mr. Scot Skirving says: "Cuts of large potatoes give full-sized tubers, whilst small seed gives a number of small-sized potatoes."

The drills are from 26 to 30 inches wide, and the setts from 10 to 15 inches apart in the rows. The drills for the earlier sorts of potatoes are not so wide as those for the later kinds, and whole potatoes are planted nearer together than cut setts.

With regard to the after-cultivation of the potato-crop, the following quotations, in addition to those already taken from Mr. Shirreff's replies, will give a fair idea of Lothian practice. Mr. James Skirving, of Luffness Mains, Drem, observes :—

"As a rule, I never touch my potatoes after planting until they are pretty well sprung, when on a favourable day I put the circular or drill harrow over them with a double turn. This removes all the weeds, and makes them much easier hoed. By rolling soon after planting, the drills are too much levelled for the drill harrows to catch the weeds, and more hoeing is required. When the plants are fairly above ground, they are hand- and horse-hoed, and earthed up as soon as the plants will admit."

A slight variation in practice is thus described by Mr. Peter Glendinning, of Dulming Bank, Edinburgh :—

"Soon after planting, before the setts are far sprung, the drills are harrowed down, so as to bring the setts near the surface. After the potatoes appear above ground, a drill-grubber is sent up between the rows. The rows are then hand-hoed, a drill-grubber is passed between them a second time, and finally the plough is passed between them to throw the earth up around the plants."

Mr. C. Rintoul, of Kingston, North Berwick, thus describes his method of potato-cultivation :—

"A strong 10-inch furrow in November, which remains without stirring till near planting-time; the land is then grubbed, harrowed, and rolled immediately before planting-time. 30 tons best horse and cattle manure per acre applied in autumn on the stubble before ploughing, with 6 cwt. of portable manure in drills—such as 1 cwt. nitrate of soda, 2 cwt. Ichaboe guano, and 3 cwt. superphosphate, bones, or decayed woollen manure—to suit the class of soil the potatoes are planted on. For early lifting they are planted in the beginning of March; for late lifting, the end of April or beginning of May.

"As soon as the drills are made up, they are rolled with a circular notched roller to break the clods, and, if the land is very dry, followed with a heavy flat roller. As soon as any annual weeds appear the circular or flat harrows are put over the drills: then a regular succession of scraping, as we call it here, between the rows commences with one-horse grubbers, followed by setting up drills again with double-moulded ploughs, and pulling them down with harrows until the plants appear. As soon as they are fully brairded, hand-hoeing commences, and is followed with the one-horse grubber and harrows between the rows; after this another hand-hoeing is given. Then another grubbing, which is followed immediately with double-moulded ploughs, setting up the drills with as much earth as possible to the roots of the plants."

More details are given in some of these reports, with reference to the extent of damage done to the crop by the potato-disease, than in any other set of replies, probably in consequence of the greater importance of the potato-crop in Scotland. Mr. S. D. Shirreff, after stating that in 1872 he obtained only one-fourth of a crop off 60 acres, further remarks in reference to that season:—

"We had many instances of *total* failure; but this was owing to the crop being attempted on soils totally unsuited to it. I may mention that I that year sold my crop of 60 acres for 1200*l.*, and the purchaser gave me 800*l.* and never touched the crop. I sold the crop on the 5th of August; the disease had appeared with great virulence in the stems, and in 3 acres of early ones also in the tubers."

Mr. W. Gray, of Southfield, Edinburgh, gives his varying losses as follows:—

"Sometimes only a few, sometimes free, other years nearly one-half, while in 1846 and 1872 potatoes with me were a total loss, except such as were sold early."

Also, Mr. James Skirving states:—

"I have twice during 30 years put *all* my potatoes in a dung-heap, twice I have never lifted them; and, on the whole, in my low locality, I have suffered more from potato-disease than my neighbours."

Mr. S. D. Shirreff gives an interesting fact in reference to the influence of the weather on the potato-disease. He remarks that the disease appeared in 1871 on the 23rd of August, and was checked by genuine heavy showers and wind before the second week of September. He further observes:—

"To illustrate this, I sold 9 imperial acres at 20*l.* per acre on the 17th of August, and in a few days the disease appeared unmistakeably. I offered 28 acres at 22*l.* to the same buyer. We had some very heavy showers; and in the second week of September the same buyer bought the field, after he saw the disease checked, at 24*l.* per imperial acre."

The general opinion in the Lothians appears to be in favour of a large-sized sett, although the majority of the growers plant cut potatoes in preference to whole ones. Mr. Rintoul has obtained the best results from large setts, with only one eye to spring from. Mr. Shirreff, whose practice is different in this respect, as already observed, is this year making experiments on a large scale, with a view to elucidate this question.

The practice with regard to renewal of the stock is to purchase from a later district either sufficient seed, or sufficient potatoes to raise seed, for the next year. The latter plan has many advocates in this as in other districts, as it allows the crop to be got earlier for market, although sometimes at the expense of a certain proportion of produce, the crop being found to diminish after the first year.

Mr. Scot Skirving says:—

"I once grew a large lot of (Irish) Skerry Blues, and they took no disease, whilst the Regents were badly affected. They were also a very large crop, and were good to eat. Yet I never grew them again, as the public did not know them, and would not buy them; and half of a bad crop of Regents brought more money than a good crop of sound Skerry Blues."

As to early or late harvesting, Mr. Scot Skirving remarks:—

"Disease has *never* struck the early varieties in East Lothian so hard as the late ones. Those ripe in July and August comparatively escape. Therefore, if the potato *will keep*, the sooner it is harvested the better in disease years. In 1872 I realized 15*l.* per imperial acre, while many of my neighbours made a dead loss. I lifted *and sent to market* in August. I could not lift them fast enough, and lost much more the longer I was in lifting. Had I been able to lift faster, I should have made 20*l.* per acre."

With the exception of a prevailing opinion that high manuring renders the potato-crop more liable to disease, little information is given by the Lothian growers in reference to the influence of different methods of cultivation or management on the extent of the potato-disease. Mr. D. W. C. Smith, of Coulston Mains, Haddington, thinks old pasture-land less liable to disease than other soils, and has found spent tan bark in the drill beneficial as regards the disease, but the potatoes were nearly ruined for selling by the ravages of worms and insects. He also believes that dung renders the plant more liable to disease than artificial manure.

The opinion of the Lothian growers appears uniformly in favour of allowing the potato-crop to mature thoroughly before being raised, if it has to be stored; but if the crop can be sent to an early market, it is better to avoid the risk of loss by disease by lifting as early as the crop is fit.

Mr. S. D. Shirreff observes on this point: "Whenever the crop is ripe or ready for lifting, let it be done. When lifted dry, the crop is safer in the pit than in the ground."

Applications of lime, sulphur, &c., to the haulm, find no favour in this district, nor does the practice of pulling up or cutting off the haulm for the purpose of arresting the disease.

Mr. James Skirving sums up his experience as follows:—

"On the whole my firm belief is that until we acquire the art of controlling the elements we must just fight the potato-disease as we learn from experience, and my experience leads me to adopt the following rules:—

"1. Don't manure excessively.

"2. Change your seed every second year at least.

"3. What are early lifted sell off at once.

"4. Those for late sale allow to reach full maturity, and never touch them after being stored until they are dressed for sale."

Mr. Scot Skirving has appended the following note to his replies, in illustration of the difficulty of the subject:—

"After having planted from 50 to 100 acres of potatoes for the last 20 years, and having read anything I thought worth reading on the subject, I profess utter ignorance of the subject of potato-disease.

"Like cholera in man or grouse-disease among birds, it seems to have as yet baffled human research. It is easy to say it is caused by the weather—that close, warm, misty weather, and, above all, *thundery* weather, when there is much electricity in the air, brings it on. But all these conditions of the atmosphere existed long ago, and yet no disease came. *The first thing I would inquire into would be to find out the state of the weather* in 1845 and 1846, when the disease may be said to have been *produced*.* Since then we have only had weakened tubers ever ready to take disease, and unable to resist any unfavourable conditions.

"Take one example: Previous to the great outbreak of disease it was the common practice in Scotland to store the cut tubers (*i.e.* the potatoes cut for seed) in large masses. These heaps were left for days, often in large piles in outhouses, and no evil came of it. Now, if cut potatoes are left a day in a large heap, they heat and lose their vitality altogether.

"Once, a land steward I had (an old man) followed the old practice, and the consequence was that not one sett in twenty vegetated.

"Referring to the question, 'Is your district open or wooded?' of course, every one knows that potato-disease is worst (as a rule) when shaded by trees or high hedges; also all ground that has been much trod and trampled on by horses. Dry, *free soils* resist the disease best; clay worst: I have seen, however, *moss* as bad as any, but it was damp."

The replies from Lothian growers are, as will have been gathered from the summary given in this report, generally in accordance with Mr. James Skirving's four rules; but in contradistinction to Rule No. 1, Mr. Shirreff repeats his opinion that farmers had better limit their acreage of potatoes if they cannot apply as much as 30 tons of farmyard manure, 4 cwt. of guano,

* On this point compare Mr. Carruthers's statement on p. 445, as to the recent appearance of a new fungus extensively affecting Hollyhocks and other plants belonging to the natural order *Malvaceæ* (Mallows).—H. M. J.

3 cwt. of mineral superphosphate, and 1 cwt. of potash, per acre, besides a top-dressing of 1 cwt. of nitrate of soda, and 2 cwt. of superphosphate before earthing up!

X.—North of Scotland.

Under this heading I have classified two reports, neither of which requires detailed notice, as most of the replies to the questions differ only in points of detail from those received from the Lothian growers.

The first of these reports has been sent by Lieut.-Col. Ogilvy, but it describes the experience of Mr. James McGregor, tenant of the farm of Carmichaels, in the parish of Longforgan, Perthshire, and manager for Lieut.-Col. Ogilvy, who since 1870 has occupied the adjoining farm of Millhill.

About 25 acres of potatoes have been grown annually, at an interval of 5, 6, or 7 years from the last potato-crop on the same land, according as the seeds in the following course have been left for 1, 2, or 3 years:—oats after grass, potatoes, wheat, turnips, barley, and seeds left for one or more years as just stated.

The other report is from Mr. T. Yool, of Coulard Bank, Elgin, who grows annually from 100 to 110 acres of potatoes, at an interval of six or seven years, the course being, on clay-loams, the same as that just described, the seeds being left one year only; on the lighter loams the seeds are left two years and followed by oats, then potatoes, &c.; and on the lightest land the potatoes follow the second-year seeds, oats being omitted from the rotation.

The following are notes of a special experiment made last year on Col. Ogilvy's farm at Millhill:—

Notes of Experiments with Regent Potatoes—Crop 1873, *at the Farm of Millhill, Inchture.*

1. Result of the examination, on lifting from the pit on the 17th December, 1873, of the crop of Regent potatoes grown at Millhill Farm on a drill 110 yards in length, and planted in December 1872 with *diseased* uncut seed 9 inches deep; manured with farmyard dung at the rate of 12 tons to the imperial acre:—

Good	235 lbs.
Diseased	107 ,,
Total Crop	342 ,,

2. Result of the examination, on the same date, of the crop from an adjoining drill of equal length, planted at the same time as No. 1 with *sound* uncut seed, 9 inches deep; manured with farmyard dung at the rate of 12 tons to the imperial acre:—

Good	267 lbs.
Diseased	146 ,,
Total Crop	413 ,,

XI.—Cumberland and South-west of Scotland.

The two reports from Cumberland and five from the south-west of Scotland testify to remarkable uniformity of practice on the part of the growers in this naturally defined region. The rotation consists of oats after ley, then potatoes, followed by wheat sown out with seeds, which remain one or two years. The oat-stubble is generally ploughed in autumn and a second furrow in the spring, not long before the drills are drawn out. Mr. R. Wallace, of Braehead, near Ayr, prefers to scarify and clean the land in autumn, and to give a deep ploughing and subsoiling with a combined plough and subsoiler as soon as the land is fit in January or February.

In Scotland the land receives a heavy dressing of manure, viz. from 25 to as much as 40 tons of farmyard manure per acre, with 4 to 5 cwt. of guano, or, as in the case of the 40-ton dressing, 2 cwt. of guano and 2 cwt. of dissolved bones. Under this head, Mr. G. Richmond, of Scotstown Mains, Partock, Glasgow, observes: "Last year I used no artificials and had less disease; I am following the same practice this year." In Cumberland, from 10 to 15 tons of farmyard manure are applied, and about 1½ to 2 cwt. of guano or superphosphate.

The after-cultivation of the potato-crop is described in nearly the same words by each of the four reporters. Messrs. R. and W. Guthrie, of Crossburn, Troon, Ayrshire, may be quoted as fair representatives of their neighbours:—

> "Firstly, saddle-harrowed down before the appearance of any tops, then grubbed between the drills and ploughed up; and in about a week or ten days harrowed down again to let the young growths get up above ground. In about a fortnight or three weeks (but it depends upon the weather) the grubber is again put into the drills, preparatory to weeding or hoeing the plants. If necessary, in about another fortnight or so, the weeding process is renewed, and the potatoes are ploughed up (sometimes twice) before finishing."

Each of these Scotch growers reports on an average of 30 acres of potatoes grown annually, and has experienced a loss of crop, in the case of late potatoes, varying from one-third to two-thirds of the total produce, according to the season.

On this point, Mr. J. Young, of Fulwood, near Paisley, states:—

> "For the last ten years, I would say 50 per cent. of my crop has been blighted on an average; in wet seasons more, and in dry seasons less. I have little or no potato-disease in moss land."

They prefer to grow early potatoes, because thereby this loss is avoided; but it is well known in Scotland, though not mentioned in these reports, that the wheat-crop is better after late potatoes than after those lifted earlier,—a seeming paradox which has not, I believe, been satisfactorily explained. With one exception, all the growers report in favour of large-sized setts ; and the remaining gentleman " knows no difference."

Mr. J. Young (already quoted) contributes the following remarks with regard to the susceptibility of his crops to potato-disease :—

"If the land has been well shortened by frost after being turned up in winter, and if the weather has been dry when working the land before planting, the soil remains more open, the rain passes more readily into the drains, and the crop is less susceptible to disease.

"The Victoria Regent [the sort which he has found least liable to disease] has only been grown here for the last four years or so. It is very much liked, and especially adapted for keeping over for summer use. This last season, however, I had more disease in my Victorias than formerly.

"I have found where the manure was spread on the stubble during winter, and ploughed down, that the crop was less injured by disease than where the setts were planted in the manure; and the very next season disease was as bad in the one case as the other. I believe it depends more on the weather and season than the method of applying manure."

The practice in this district appears to be to renew the seed every second or third year, from moss land ; or in Cumberland, from black soil to red, and *vice versâ.* With the exception of a further statement of opinion that high manuring (especially with farmyard manure) conduces to the greater ravages of the disease, and another record of favourable experience in mixing sawdust with manure, no further light is thrown on the question of what conditions either favour or retard the progress of the disease. It is generally admitted that late potatoes should be raised as soon as possible *after they are matured.* Mr. J. Young observes on this head :—

"I have found it better to harvest early if there is no disease in the haulm, or if it has been checked ; but I have always found bad results from digging while the disease is making way."

XII.—Ireland.

There are six reports from Ireland, but none of them contain much information that is new. The usual rotation is similar to that which prevails in Scotland and the North of England, viz. : oats after ley, then potatoes, followed by wheat or oats sown out with grass seeds, which remain down two or three years. The setts are almost always cut, and the testimony is practically unanimous in favour of Skerry Blues, or " Skerries," as they are sometimes termed, being the variety least liable to disease. Large setts are stated to give the best result in four replies out of six, the answers in the remaining two cases being indefinite. Mr. J. Gargan, Land Steward to J. A. Farrell, Esq., D.L., of Moynalty, County Meath, states that he has found an application of lime to the foliage check the progress of the disease. One grower, who is very sensitive in reference to being thought an authority and to being laughed at in consequence, considers that a great deal of his comparative success is due to his getting a change of seed from mossy land to his clay-soils. Another grower considers "pointed potatoes" very objectionable. Two of the growers express their belief that too large a quantity of manure applied to the potato-crop favours the progress of the disease, while a third expresses his incredulity on this point, which he states to be a prevailing opinion. As to early or late harvesting, the replies are too indefinite to be classified. The preponderance of opinion appears to be in favour of harvesting as soon as possible after the potatoes are ripe, but one grower emphatically remarks, "Potatoes that will not keep in the ground, won't keep out of the ground."

Remarks on the Prevention of the Potato-disease.

In addition to the replies summarised in the preceding pages, two others have been received from growers who do not appear to have suffered any material loss in consequence of the potato-disease. The first of these is from Mr. James Myatt, of Offenham, Evesham, who is well known as the introducer of "Myatt's Prolific" potatoes, and many other esteemed sorts of vegetables as well as of fruits. He usually takes potatoes after savoys or broccoli, though sometimes after wheat; in which case the stubble is generally burned. The second reply is from Mr. Knowles, of East Plain, Cark-in-Cartmel, Lancashire, who takes potatoes after turnips. The results obtained by these gentlemen are so remarkable that I have thought it best to give their replies *in extenso*; the numbers prefixed to them refer to the questions printed on p. 475.

The following are Mr. Myatt's replies :—

"1. Open.

"2. Hedge-row; timber, partial.

"3. Mostly level, with south aspect.

"4. Variable; part gravelly and sandy loam, with gravelly subsoil inclined to red, and part a strong dark loam, apparently washed down from the hills which surround it.

"5. Partially; at a depth of about 3 feet, about 30 feet apart.

"6. Not uniform: garden crops alternated with farming.

"7. From 10 to 15 acres, at intervals of not less than 5 years to 10.

"8. If after broccoli or savoys, which has been my usual practice for a part, no preparation necessary previous to getting on the manure, which I get on in autumn, say before Christmas. If after wheat or other corn-crops, I have the land scuffled or broad-shared, then harrowed well with heavy drag-rollers or iron harrows to bring the stubble to the top, and, if much, burn the longest of it, and then leave it ready to get the manure on in the autumn.

"9. About 15 to 20 loads of good farmyard manure per acre: with the smaller quantity I have used 2 or 3 cwt. of guano with marked effect, sown on the row previous to covering or filling in the holes after planting. If you can get town manure, I prefer it; let it be drawn together, and then turned and mixed well together a month before getting it on. Highly-concentrated manures I find injurious, promoting a too rapid growth, which causes the potatoes to be more susceptible of taking the disease. I find the phosphates much better; they promote a strong robust growth: by that I mean stout, short-jointed, not too rank.

"10. Early varieties I begin planting about the 12th or 14th February: later kinds on into March.

"11. About 15 cwt.

"12. I grow a good many early Kidney potatoes; some kinds will not bear cutting, the Old Ash-leaf, for instance, and some others, but I cut all the large tubers of my early Prolific Ashleaf, which do well when cut. I cut them crosswise, not lengthwise. Middle size I plant whole; the small ones, not larger than almonds, I plant two in a hole, with quite satisfactory results. Round varieties, I cut all the large tubers, making good-sized setts. I do not hold with cutting the setts too small. The middle-size I take a thin slice off the crown. I lay the setts, as they are cut, on an even stone-floor, the barn-floor, and sprinkle quick or caustic lime over them each day as they are cut, and then turn them over carefully with a shovel. The lime being quick or caustic, it riddles among the setts freely and cauterises the cut parts, and so prevents or stops bleeding.

13. Early sorts I plant down the seam of every second furrow, and as the land is ploughed 12 inch-furrow, the rows will be 24 inches apart, and the setts 12 inches in the row. Late varieties, as Regents, Patterson's Victoria, &c., I plant every third furrow, leaving them 36 inches from row to row, 15 inches apart in the row. Skerry Blues, Sutton's Flour-ball, &c., every fourth row.

"14. I use a large potato-dibble or pin for planting; a man making the holes down every second furrow as described, a boy to follow and drop a sett into every hole; they then with a hoe fill in the holes, and the work is complete. I leave the land in that state until the potatoes come up, which will be about the middle of April; I then, with a horse and a set of light iron harrows, have them harrowed across the furrow, which brings the land down to a fine tilth, levels it, and kills the young seed weeds which have now vegetated. In about 10 or 12 days they will be well up in full row; I then send a horse with a small scuffle. I use 'Busbey's' set, about 15 or 16 inches wide and 3 or 4 inches deep, up the middle or between the rows, which breaks the furrow well at bottom; the men follow next day, and side-hoe them and clear the rows of any weeds there may be left in them; in 3 or 4 days, or if cold weather perhaps a week, they will be about 4 inches high. I then follow with the earthing-plough, set 2 or 3 inches deep, down the centre of each row, *i.e.* between each row, which will raise the earth to nearly 4 inches high from the bottom, and the work is complete.

"15. Nominal; as a rule, during the last 20 years I have only once approached 10 per cent. of diseased tubers, and twice during the time approached 5 per cent.; all other years it has been nominal.

"16. Close sultry weather, frequently after a thunder-storm. I like to plant a good distance apart, so that the air can circulate freely among them and dry them off quickly after rain. I have observed where the top or haulm is heavy from too thick planting it falls to the ground, and keeps in a damp state, and is thereby rendered more susceptible.

"17. I cannot give precise dates. About the end of July and on in August, with a close warm atmosphere, a storm is sure to leave traces of it behind. I have observed cottage gardens, where partially shaded with trees, as also their black vegetable mould, to be conducive to the disease; also on wet clay land.

"18. Principally early Kidney varieties, early Shaw and Regents; the Old Ashleaf Kidney and Mona's Pride, another variety of Ashleaf, I find are some of the first to take it. The Lapstone Kidney also seems very susceptible of it. My Prolific Ashleaf resists it well, its top being of a hard woody nature compared with many others.

"19. This, I see, I have partly answered in No. 18. Without intending, or required as 'puffing' it, I have invariably found it the best resister I have grown; and after 20 years is universally acknowledged to be so.

"20. As regards the disease, not.

"21. I renew my stock occasionally, but find them do well for 6 or 7 years without deterioration.

"22. As before stated, I have found the application of highly concentrated manures render it more liable to the attack. As regards the selection of setts, if they have been well kept, and in good condition, you cannot err. If they have been badly kept, and perhaps heated, they would come up weakly, their constitution impaired, not strength to resist an attack; but I have planted diseased tubers, *i.e.* where the half has been sound, and cut off the diseased part, without any visible difference.

"23. I have used lime, sulphur, and soot at different stages of the disease, without any marked effect.

"24. I have no faith in pulling up the tops on the appearance of the disease: if it attacks them early, you get a lot of little half-grown tubers, worthless, which, with a favourable change in the weather, might have come to half a crop, or more, of good-sized tubers. If they have attained their full growth, there is not so much objection. I have tried it on a small scale, but I still hold to the opinion that it is better to leave them until the time for lifting them; and I find it better to leave them in the ground three weeks or a month, or more, after the disease attacks them. The bad ones then show themselves, and you can store the sound ones with confidence; whereas if you lift them too soon after the attack, it is almost an endless job to keep turning them over to pick out the bad ones.

"25. I am an advocate for leaving them some time in the ground, early ones required for seed particularly, as, when the weather is warm, it is difficult to prevent them sprouting."

Mr. Knowles gives the following answers to the same queries:—

"1. This farm is open.

"2. No hedge-row timber.

"3. Perfectly level.

"4. Sand, slightly mixed with clay to a great depth.

"5. The land upon which I grow my potatoes has all been drained at a depth of 2 to 3 feet, no regular distance.

"6. I follow no regular system of rotation, but generally have potatoes to follow turnips; my object in this is to enable me to get my potatoes in early.

"7. For the last nine years from 20 to 30 acres have been planted per annum. I study to separate the potato crop as far as possible. From three to five years.

"8. Immediately after removal of the previous crop. We plough as deeply as possible, and leave it in a rough state through the winter.

"9. About 20 tons of farmyard manure and 5 or 6 cwts. of phosphate to the acre, at the time of planting potatoes.

"10. I get *all* the varieties in as early as possible, and to do this I plant on land that has been green crop the previous year.

"11. About half a ton.

"12. I plant nothing but large potatoes, and in most cases cut them in two.

"13. I plant the rows about 36 inches apart, and from 12 to 14 inches between the setts, this is in order to have plenty of room to cover them up when disease shows itself.

"14. My practice is to plant the setts as near the surface as possible (above the manure), cultivate as deeply as possible between the rows until the final moulding up comes. In the first place I only partly mould them up, then I take the mould-board off the ordinary plough and put this plough between the rows as deeply as I can, to assist the drainage and loosen the soil; it lies in this state a short time, after which, with the double-mouldboard plough, we add a little more to the potato rows. Planting near to the surface and the frequent deepening between the rows are in my opinion the principal reasons why we have so little disease on this farm. Another reason is that when the disease shows itself we mould up until the foliage is almost covered, bringing the ridge to as sharp a point as possible to throw off the water, which prevents the rain carrying the disease with it to the tubers.

"15. For several years we have had no disease at all on the potatoes, though we invariably have the blotch on the foliage.

"16. To no appreciable amount does our crop ever suffer.

"17. The first planted potatoes generally show signs of disease on the foliage at the end of July, the later planted ones through August; in dry weather it does not spread so much, but in wet very rapidly.

"18. Dalmahoys, Patterson's Victoria, Sutton's Redskin Flourball, and Walker's Regent.

"19. I think the foliage of Patterson's Victoria does not become a prey to it so soon; but this may arise from being a later variety, and generally planted after the before-mentioned varieties.

"20. The best results I have found from large-sized setts.

"21. I renew my stock (generally by purchase from Scotland) about every other year, if grown longer the potatoes become smaller.

"22. It is, I believe, by our before-described method of cultivation and planting of setts that we are so little attacked by disease on this farm. I am aware that there are certain varieties of potatoes grown in this neighbourhood that are less liable to disease under ordinary management than the Dalmahoys and other second early potatoes.

"23. My only plan is to mould them up so as to bind them from the prevailing wind, that the water may be prevented from following down the stems and affecting the tubers.

"24. In my case to cut off or pull up the tops upon the appearance ot disease on the foliage would stop the growth of the tubers and deteriorate the quality and quantity. I believe it diminishes the extent of the disease, but at the cost of the crop.

"25. I think it much improves the quality of the potatoes to allow them to remain in the ground some time after they are fully matured; under the ordinary system of management to do this would sacrifice the crop, but if moulded up in the way I have before described they will keep well in the ground. We always keep our seed potatoes very thinly spread on a floor, which I believe strengthens them very much.

Being desirous of ascertaining Mr. Knowles's method of treating the turnip crop which precedes potatoes on this farm, that gentleman has favoured me with the following note on the subject:—

"*Addendum on Turnip Cultivation.*—As early as I can after the removal of the previous crop, I plough as deeply as possible; in this state the land lies through the winter until April: we then put on a heavy harrow, and let it lie again until the middle of April, then lightly plough and grub as often as required until about the first week in May; we again (immediately before sowing the turnips) plough as deeply as possible, then form and split the 'stetches' to receive the seed; we generally use artificial manure for the turnips, as all the farmyard manure goes for the potatoes and other crops. The distance between the stetches is about 3 feet, and between the plants, when thinned, 14 to 16 inches, as near as we can guess. My object in having this apparently wide distance is to enable me to work the land as much as possible between the rows during the summer. I never lose an opportunity of working between the rows. We generally use a 2-horse grubber between the rows after harvest to tear off the dead leaves and give air to the roots; after which we have a small double-mouldboard plough run between them, to cover up the decomposing leaves which the grubber has torn off (which are an excellent food for the roots), and also to afford a little drainage to the bulbs. We store the crop as early in autumn as we can, spreading the leaves on the ground and ploughing them in. This system has generally rewarded us with a very abundant crop of turnips, having no trouble from fly, wire-worm, or any other kind of insect. Perhaps it will be as well to add that through the kindness of the Duke of Devonshire's agent, G. Drewry, Esq., we have had all the land upon which I have grown turnips and potatoes since I came cultivated by steam, which I believe has been one means of keeping us so free from potato disease and returning us such crops of turnips."

A careful perusal of the replies from Mr. Myatt and Mr. Knowles leaves the impression that not only is the exceedingly favourable experience of these gentlemen with regard to potato-disease very remarkable in itself, but that the system of cropping which each of them pursues is altogether at variance with the agricultural practices of most English potato-growers.

Out of exactly 100 growers who have replied to the schedule of queries, 22 take potatoes after clover-ley, 62 after a white crop succeeding clover, 5 after beans, flax, &c., and 19 either pursue no regular rotation, or give no definite information.* The foregoing two replies are the only ones in which it is stated that potatoes are systematically taken after a crop which has allowed the land to be thoroughly cleaned during the previous year; and it seems exceedingly significant that both these growers experience little or no loss on account of potato-disease. Whether this peculiarity in their course of cropping is the true cause of the immunity of their potato-crops from the disease cannot be determined without careful and extensive experiments; but it may be inferred, from the replies of these fortunate growers, that they have not themselves drawn this inference.

Pending the result of experiments which, it is to be hoped, will be carefully made during the next few years, the following

* The excess of these numbers over 100 is due is the fact that some growers take potatoes after both seeds and grain, and are therefore reckoned twice over.

facts which I have collected are given for the purpose of indicating a possible reason why potatoes after a fallow-crop should be comparatively free from disease.

With the exception of Mr. Myatt and Mr. Knowles, all the growers, as stated above, take potatoes either (1) after seeds, which may have been down one or two years, or longer; or (2) after a white crop succeeding the ley. Five growers, however, sometimes take potatoes after flax, beans, turnips, or mangolds. Of these five, one has informed me that the potatoes are most diseased after clover, and another that those planted on a wheat stubble are more diseased than those taken after turnips. The remaining three have not observed any difference.

The question thus suggests itself,—Is it possible that the preceding crop, whether clover, wheat or oats, or roots, beans, flax, &c., can produce any effect, whether prejudicial or beneficial, on the succeeding potato-crop as regards the potato-disease? And if it can produce any effect, in what manner is it done, and what is the *rationale* of the process?

There are some indications that the first question may eventually be answered in the affirmative; and although at present they are slight, I am very hopeful that they point in the right direction?

I have already drawn attention to the practice of taking potatoes after clover; but I have not been able to describe the result obtained in England by taking clover after potatoes; and I am told that in the north it is commonly believed that clover will not grow after potatoes. However, at Grignon, in France (the Government Agricultural College and Experimental Farm), clover was sown, partly with wheat and partly with rye, in 1873, after a diseased crop of potatoes the previous year. This clover was attacked by a fungus which the botanists could not clearly distinguish from the potato-fungus; and it is stated that the clover was most diseased in those parts of the field where it had been sown with wheat. The paper describing this result has been translated by Mr. Carruthers, and will be found on pp. 515–19, immediately following this Report.

Again, with regard to the white crops which most generally precede potatoes, viz. wheat or oats, it is remarkable, when read in connection with the foregoing paragraph, that it is only two years ago that Mr. Carruthers described in this Journal * a straw-blight, which had attacked a field of wheat on the farm of Mr. H. J. Seels, of Wainfleet, Lincolnshire, as "the branching and conjointed mycelium of a fungus, similar to that which has pro-

* Second Series, vol. viii., Part i., No. xv., 1872, p. 213.

duced such havoc to the potato-crop for so many years." This fungus was observed in France as long ago as 1851, on barley and rye as well as on wheat.

Nevertheless, although the sum of the circumstantial evidence is remarkable, it must be admitted frankly that at present we have no proof of the identity of any one of the three fungi (the potato-fungus, the clover-fungus, and the straw-fungus) with either of the others; and the following remark made by Mr. Carruthers, in describing the straw-fungus, applies with equal force to the clover-fungus:—"No observer has yet noticed the fructification of this fungus, and as the classification of this group of plants is entirely based on the organs of reproduction, it is impossible to determine without them the genus, or even the group, to which this mycelium belongs." Yet it is known that this straw-fungus does not belong to any of those parasitic fungi which attack our corn-crops, and the natural history of which has been worked out. It should also be stated that Mr. Seels has informed me that potatoes had never been grown on the land which bore the wheat attacked by the straw-blight in 1871; although this fact is of very little consequence, because the exceedingly minute spores of these microscopic fungi may be carried by the wind very long distances.

If, however, it be granted for a moment, so as to enable me to state the argument, that the spores of the potato-fungus may find a home on clover and straw, and, under a combination of circumstances favourable to their development (such as excessive moisture in the early summer), may even germinate there; or if it be that the potato-fungus has two stages of existence, one of which it passes on the potato-plant, and the other on clover or straw (like the wheat-rust, which has one phase of existence on the berberry and the other on wheat); then, in either case, it will be seen at once that the systems of cultivation of the potato which are dominant in the United Kingdom appear almost expressly designed to enable the potato-disease to produce the maximum amount of injury to the crops. It would also justify the prevailing opinion that farmyard manure encourages the ravages of the potato-disease, especially when applied in spring, because the spores of the fungus would be in the manure on the straw which had been used for litter; and the manure applied in the spring would be more likely to contain those spores in a healthy state than that which had been exposed to the action of the elements during the winter. It would also account for the fact that many potato-growers have an odd-sounding fancy for stable manure when sawdust or tan has been used instead of straw for litter.

Under this supposition, the value of the practice of taking turnips as a preparatory crop to potatoes lies in the facilities which it affords the farmer to thoroughly clean and stir his land for a year and a half preceding the critical period when the potato-fungus usually attacks the haulm. On this point the replies of Mr. Knowles, and his addendum on his method of cultivation of turnips, leave nothing to be desired. They show clearly that no opportunity for stirring the land is lost, and that the land is not allowed to rest long enough together to allow of the growth of any quantity of what is commonly called "filth."

The immunity enjoyed by Mr. Knowles and Mr. Myatt may not be in the least degree due to the fact that they take potatoes after turnips or savoys. "*Post hoc*" is not necessarily "*propter hoc*," as we are continually reminded; and "after turnips" may very likely not be synonymous with "because of turnips," even in their case. Then, even if the protective influence of the fallow crop could be proved, we must be cautious about generalising too hastily; for "one swallow does not make a summer," and there may be other conditions which may contribute very materially to the production of what must, under any circumstances, be considered a very remarkable fact—the immunity of their crops from potato-disease for a number of years consecutively.

It may be suggested that other circumstances, either of soil, climate, locality, or cultivation, might account for the absence of potato-disease from these farms; and, with a view of estimating the probability of this view, I visited both of them. One farm (Mr. Knowles's) is on the shores of Morecambe Bay; the land has been reclaimed from the sea, and is a very light grey soil, containing 86 per cent. of sand, more argillaceous matter than would at first be thought probable, and some lime. It is exceedingly light, and of great depth (but, nevertheless, drained), and, altogether, a very remarkable soil under any circumstances; but it is more remarkable still when seen, as I saw it in July, in a season like the present one, bearing heavy crops of wheat and barley, and most promising crops of roots and potatoes. Dr. Voelcker has undertaken the analysis of this soil, and will, probably, have something to say about it in his next Report. Mr. Myatt's land is a somewhat light loam on gravel (also drained), situated in the vale of Evesham, and presenting no features that call for special remark. The circumstances of soil, locality, and climate of Mr. Myatt's farm are thus quite different from those of Mr. Knowles's. The details of cultivation are also dissimilar, except in one respect, viz., that the drills for late potatoes are 36 inches apart in each case. This, of course, assists the evaporation of moisture from the land, and enables Mr. Knowles to be always at work with the plough deepening the rows, and thus keeping the tubers high above the channels which carry off the water.

A careful perusal of this Report will show that, like Mr. Myatt and Mr. Knowles, many growers attach great importance to early planting as a means of preventing the potato-disease, chiefly, however, because early planting, in the absence of severe spring frosts, means early harvesting. Much stress is also laid by many growers on the importance of effectually earthing-up the plants, with a sharp ridge close to the haulm. Mr. Knowles also especially insists on the importance of this practice.* It also

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* The following extract from the replies sent too late for insertion in the body of this Report, by Mr. John Fryer, of Manor House, Chatteris, Isle of Ely, confirm, in an important degree, Mr. Knowles's replies to queries Nos. 14 and 23:—

"On looking back for nearly a period of 30 years over memoranda respecting the treatment of the potato-crop, with special reference to 'the disease,' I find only one set of experiments that have to any extent lessened the amount of loss. These experiments have all been based on the fact, that covering up the haulm to within a few inches of the ends greatly hindered the progress of the blight; and ultimately it was found that the nearer to a *horizontal* position the haulm was placed in, the greater was the immunity from disease.

"The first occasion on which the plan was tried was two or three years after the first appearance of the disease, when a large field was operated upon, the haulms being deeply moulded-up on one side only; and the flattening down of the earth upon them was completed by hand-labour.

"In that season this field remained green and growing up to Michaelmas, nearly every other field in the kingdom having been blighted in the latter end of August. The plan was continued for a time, until the disease all but disappearing, it was given up. Three years ago a trial of it was again made. A small portion of a field was 'laid down,' and the results were so satisfactory that last year nearly 50 acres were operated upon; and with great advantage, as will be shown by a detailed statement of results at the end of this paper.

"Careful observation brought to notice one important fact, viz., that those rows yielded the most and finest tubers, which were laid down towards the east, thus allowing the sloping side of the ridge to be exposed to the afternoon and evening sun.

"A plough has now been made suitable for 'laying down' all the haulms in one direction towards the east. This plough is about to be introduced to the public by Messrs. Howard, of Bedford. The theory as to the causes of the benefit secured by this process I leave to others to suggest. Whether it be that the descending spores of the fungus which produces the disease drop from the flattened stalks on to the earth instead of descending to the root, and thus lose their power of mischief, or whether the 'laying down' checks for a time the too rapid and succulent growth of the tops, and thus prevents a weak growth of the tuber, it is difficult to decide; at any rate, a large saving is effected by the process. I now give details of results, carefully taken last year from some plots of potatoes specially set aside for the experiment.

seems to be generally admitted that potatoes required for keeping should be harvested when the land is dry, if possible. Other

"Equal lengths of each plot were taken up, all having been cultivated alike, and growing side by side.

		st.	lbs.
1	2 Rows of King of Potatoes not moulded up:—		
	Diseased tubers	4	11
	Good "	3	12
	Excess of bad	0	13
	2 Rows of King of Potatoes, the haulm laid down:—		
	Good tubers	6	1
	Diseased "	1	8
	Excess of good	4	7

Another part of the field:—

		st.	lbs.
2	2 Rows of King of Potatoes not moulded up:—		
	Diseased tubers	4	0
	Good "	2	10
	Excess of bad	1	4
	2 Rows of King of Potatoes, the haulm laid down:—		
	Good tubers	4	9
	Diseased "	1	10
	Excess of good	2	13
3	2 Rows Regents, moulded as usual:—		
	Good tubers	16	8
	Diseased "	14	0
	Excess of good	2	8
	2 Rows Regents, the haulm laid down to within 6 inches of ends (rather *overdone*):—		
	Good tubers	19	5
	Diseased "	4	6
	Excess of good	14	13
4	2 Rows Regents, moulded as usual:—		
	Good tubers	4	0
	Diseased "	1	13
	Excess of good	2	1
	2 Rows Regents, the haulm laid down:—		
	Good tubers	6	0
	Diseased "	0	9
	Excess of good	5	5

statements, as to the protective influence of tan, sawdust, town-sweepings, spent hops, &c., in the manure, and that of the growth of another crop, such as turnips or beans, with the potatoes, may also attract attention, though they command the assent of only a few growers.

The greater or less liability of different varieties to the attacks of the disease is also a matter of interest, and I have, therefore, had the replies to the questions under this head collated and summarised in the following Table :—

Varieties grown (29).	Number of Growers who Report on each Sort.	Considered least liable to Disease by,
American Reds	1	1
American Rose	6	1
Arrowsmith	1	1
Baron's Perfection	4	4
Belgium Kidney	1	1
Bonnie Snowball	1	..
Captain White's Seconds	1	..
Dalmahoys	24	5
Falaroes	4	..
Flukes	26	5
Fox's Seedlings	3	1
Glenburgs	1	..
Lapstones	4	..
Leather Coats	3	2
Myatt's Early Kidney	25	11
Paterson's Victoria	57	21
Pink-Eyed Radicals	3	..
Protestants	1	1
Red-Skin Flourballs	8	4
Regents	66	10
Rocks	54	19
Rough White	2	1
Runcorn Kidneys	1	1
Russian Balls	2	2
Seedling Fluke	1	1
Shaws	5	1
Skerry Blues	20	15
Walker's Regents	6	1
White Kemp	9	..

Possibly the same sort of potato may figure in this Table under more than one name, but, in that case, the reader must forgive my ignorance of potato-synonymy, and add the duplicate lines together to obtain the required total result.

All the information I have been able to collect on the subject is contained in these pages, and, as I have already stated, they seem to me *indications*—in plain language, finger-posts—of sufficient importance to induce us to explore the path to which they point.

XX.—*On a New Clover Disease.* By P. MOUILLEFERT.

[Translated from the 'Journal d'Agriculture Pratique,' 1874, pp. 667-670, by W. CARRUTHERS.]

THE cultivator, after having seen all his food plants in succession attacked by various maladies produced by insects, vegetable parasites, or some conditions unsuited to their constitution, finds also his plants grown for industrial uses suffering from destructive plagues, and his fodder plants yielding gradually to diseases more or less destructive.

Plants are as a rule free from diseases in their natural state.* Does, then, cultivation, by making them more luxuriant, render them also more liable to be attacked by their enemies? I have no doubt that this is so. Indeed the stability of a wild plant can be determined only after its struggle for life—that is, after it has overcome the various difficulties which beset it either from soil, climate, parasites, or neighbouring plants striving for the possession of the same ground: if it did not succeed then, like many others, it would disappear in this struggle. The characteristics whereby the plant has been able to conquer in this fight being possessed by the surviving plants, it follows that, in the locality where it naturally grows, it is in the most robust condition possible, and further that, wherever a plant does not enjoy conditions identical with those of the locality where its particular characteristics were developed, it would be less robust and more liable to the attacks of enemies, diseases, and competitors. Every cultivator is well aware of this, and he therefore ascertains the proper soil, exposure, and care needed by the plants he cultivates, so as to prevent the loss of his crop, and secure all the advantages he wishes.

One cannot, unfortunately, always secure for a cultivated plant conditions similar to those which it had in its natural state; the plant consequently either decays or produces modified varieties suited to its altered condition. We have accordingly among cultivated plants varieties suited to different soils and situations.

On the other hand, the more highly a plant is cultivated, the less it seems to rely on its own powers; it is as if man's care for it enervated the plant and made it unaware of the dangers that surround it. Cultivated varieties are consequently liable to many diseases. As far as plants have retained their natural characteristics, they have not suffered; but where the characteristics produced by thousands of years of struggle for life have

* This is too frequently assumed by writers, without investigation. Wild plants in their natural state are liable to the attacks of, and are often extensively attacked by, parasitic fungi and insects.—*Translator.*

been destroyed or counterbalanced by cultivation, the plants have become more delicate and liable to adverse influences. This is indeed the condition at the present day of the vine, beet, rape, lucerne, &c.

Can man, who causes these evils, do anything to overcome them? Certainly: either by producing new natural varieties or by destroying the causes of the diseases which are the results of cultivation. But, unhappily, when he attempts to remedy the evils, his method is not practicable, and the means he employs are not successful. Should he then be discouraged, and do nothing? On the contrary: by renewed patience and persevering research, he must investigate every detail of the cause of the evil until he discovers some efficient remedy. While waiting for the happy time when science, with the help of experience, shall show us how to overcome all these difficulties, I regret that I have to announce a new disease affecting fodder plants.

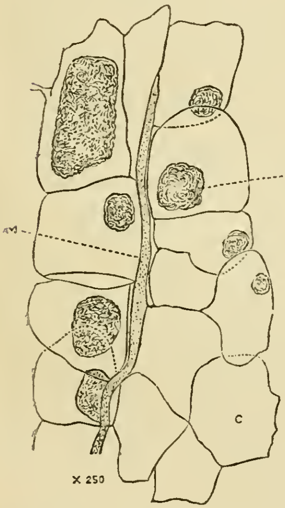
Clover, which up to the present time has suffered only from dodder and some insects, has this year been injured in a remarkable manner at Grignon. The clover was sown in 1873, part with blue winter wheat (*Blé bleu*) and part with rye; the previous crop was one of potatoes. The soil, a valley diluvium, is very good and has a great depth of vegetable mould. The clover grew well on the field, and at the harvest formed a very regular turf. In the month of February last a considerable portion of the plants withered, blackened, and decayed. From this time the evil continued, the number of diseased plants daily increased, and with them the empty spaces in the field. The disease was most injurious where the wheat had grown and in the neighbourhood of potatoes, while only a few plants were attacked where the rye had grown.

The following description is the result of very close observation of the disease:—The diseased stems are not generally contiguous, but are scattered among the healthy ones, sometimes in small groups of from two to six plants. The diseased plants can easily be recognised in walking through the field. When the disease attacks a plant the leaves speedily begin to fade, as if the root had been cut just below the ground a few hours previously; they gradually blacken and then decay. If the plant is pulled up on the first appearance of the disease, the stem invariably breaks just above the ground. This looks as if the root had been destroyed by a worm, a mole-cricket or other insect, or by some kind of larva: but it is not so; for when the root is carefully taken out of the ground, it is found to be perfectly healthy, so that the seat of the disease must be looked for on the stem above the ground.

Nothing can be detected in the blade or stalk of the leaves, or in the branches, to cause their death. The microscopic examination of the blade shows that the protoplasm, instead of filling the cell and having its natural whitish or greenish colour, is detached from the cell-walls, is aggregated together, and has a brownish-yellow colour, indications of the leaf being dead.

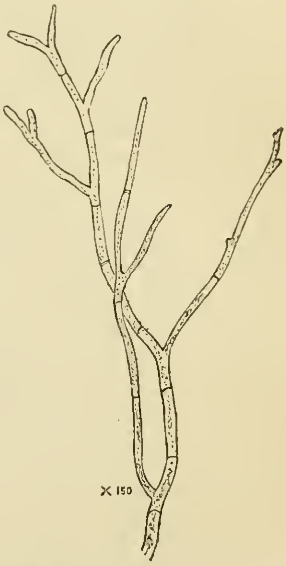
On examining the collar or base of the stem, where it joins on to the root, one finds the protoplasm in a similarly dead condition, and the cells which were filled with starch completely empty. Winding among the cells one can detect a largish filament filled with a clear grey granular substance: this is the mycelium of a fungus. Fig. 1, drawn with the camera lucida from a care-

Fig. 1.



Section of a leaf magnified 250 times.
M. Mycelium of the parasitic fungus.
P. Dead and contracted protoplasm.
C. Empty cellules.

Fig. 2.



External growth of the parasite on the base of the Clover stem, enlarged 150 times.

fully cut section, shows the relation of the mycelium to the tissues of the plant. This mycelium abounds in the base of the stem, but I have not been able to detect it either in the leaves or in the root proper.

I have, then, no doubt that this new disease is due to a fungus parasitic on the interior of the clover-stem. If the diseased stem be left in a dampish place for a day or a night, the whole surface at the collar is abundantly covered with a white down, which the microscope shows to have the same structure as the mycelium in the interior of the stem. Fig. 2 shows the structure of these external filaments. They are larger and are repeatedly branched. The mycelium shown in Fig. 1 appears to be simple and formed of a single cell, whilst in the aerial portion it is much branched and formed of many cells. This distinction does not, however, always hold good ; for I have seen the mycelium branched, and composed of many cells. After frequent searching, I have not been able to discover the reproductive organs of this fungus. The portion growing on the surface of the stem has been always barren. The rapid spreading of the disease among isolated plants shows that the spores must be abundantly produced, although I have failed to see them. Without the fruit I am unable to refer this parasite to its proper genus. As its mode of growth agrees in many respects with the potato fungus, it most likely belongs to the same genus (*Peronospora*), and may perhaps be the same species (*P. infestans*). This supposition is the more probable, as last year a crop of potatoes were grown quite near to the clover, which would supply in abundance the spores that have attacked the clover. But in the potato the spores of the fungus germinate on the leaves, which are the first part attacked ; while it appears to me that the leaves of the clover are unsuited to the parasite, the spores of which germinate in the soil, and the mycelium attacks the base of the stem. If this hypothesis is true—and it is the more probable, because the further the clover was from the locality of the potato it was the freer from disease, and it disappeared altogether at 50 metres' distance (55 yards)—then agriculturists should not grow these two crops near each other.

In the 'Annales des Sciences Naturelles' for 1863, M. de Bary refers to a *Peronospora*, which he had frequently noticed on clover, and on this account called *P. trifolii*. This may be the same as the fungus I have given an account of; but his short description does not enable me to identify it.

But though the origin and name of this parasite are obscure, the disease exists none the less, and without the means of stopping it. I will continue my observations, and, if you have room, will submit the result of them to your readers.

[The disease described above agrees very closely with that which has attacked the bases of straw in our cereal crops in some wet seasons, and which I described at length, under the name of "Straw-blight," in the volume of this 'Journal' for 1872. As the ergot attacks only the growing ears of the different grains on which it occurs, so these diseases on clover and straw attack the same part of the plants, namely the first or second internode. The reproductive organs have not been detected in either case, so that it is impossible as yet to determine the true position of the fungi. The drawings given and the arguments advanced by the author are far from warranting the reference of the mycelium to the genus *Peronospora*. But the relation pointed out by the author between the disease in the trefoil and that in the potato deserves careful investigation, especially as Mr. Jenkins informs me that agricultural observations have been made in England which seem to support it.—THE TRANSLATOR.]

XXI.—*Sir Harry Stephen Meysey Thompson, Bart.* A Biographical Sketch by EARL CATHCART.

BIOGRAPHY is well described as history teaching by example; and it may be that a most instructive branch of literature has been too much neglected in the pages of this Journal. Replete with grand records of practice, and enlightened by the achievements of science, there is in it little of purely human interest—little that appeals directly to man as man. "'Tis pity, and pity 'tis, 'tis true."

> "For duty done oft spreads the seeds
> In kindred breasts of kindred deeds."

A biography, the history of an individual mind, to be perfect should probably answer justly and satisfactorily the essential question—What manner of man was this? But be that which we have written as it may, all men will agree that the journals and records of the Royal Agricultural Society of England would indeed be incomplete without some sufficient memoir of the late Sir Harry Stephen Meysey Thompson, better known to the agricultural world as Mr. Thompson, of Kirby Hall, in Yorkshire. Could we possibly apply an exact mechanical rule to the estimate of his services, their continuity, multiplied by the weight of his practical ability, would certainly produce a highly startling result. A Founder of the Society; as a Member of Council he fostered it in infancy; tended its promising youth; and its giant growth throughout has been sensibly promoted by Mr. Thompson's continuous, devoted, and invaluable services.

A certain coldness of manner, and seeming chill reserve appeared to dull the warmth of a tender heart, and a disposition not disinclined to a sense of genial humour. Nay, even some, who little knew the man, misconstrued unobtrusive modesty, and fancied that they detected a savour of haughtiness. There must have been rare qualities of mind to enable him, notwithstanding marked drawbacks of manner, to achieve, as a practical man of business, a singular success. Of the two great English Agricultural Societies he was a ruling spirit. Under his guidance the

North-Eastern Railway Company became one of the greatest and most successful of commercial undertakings; and, moreover, he founded and guided the ever extending United Companies Railway Association. Mr. Thompson's is a fine example of an honourable and unselfish ambition, by unsparing energy overcoming such drawbacks as natural shyness and reserve; and, perhaps, an invincible tendency towards exceeding minuteness.

By way of further preface, we would sketch in some other undoubted characteristics:—with tact to guide, with gentle wisdom to draw, and with sufficient power of expression to give effect to both, he was a patient man, of clear perception that went straight to his point; passionately fond of work—overwork—he delighted in setting wrong to rights, and establishing order where he found utter confusion. Always ready to help others to bear their burdens, he kept many irons in the fire, and yet allowed none to cool. A careful gleaner of opinion, consequently a good listener, he was never in a fuss or hurry, nor irritable nor boastful. The key to the knowledge of others was in his hands, for in early life he knew himself and recognised the essentially practical bent of his own talent. And "passing show," which he detested, he had above all things an ever-abiding sense of over-ruling Providence.

Let Mr. Thompson's exact position be understood at the outset. He gained honours at college, but was never a literary man. He made a dive into the ocean of science, and brought up one scientific pearl of great price, of which more hereafter, but he was never a man of science. Science and literature he regarded but only as they conduced to his practical objects. In agriculture his position was between the Professor of Science and the man of practice—he stood mid-way—a beneficent interpreter. "The first attempts of the Farmer and Philosopher to run in couples were not encouraging;" these are Mr. Thompson's own words; "they conversed in unknown tongues."

Heir to a fine estate, Harry Stephen Thompson was born at Newby Park, in Yorkshire, on the 11th of August, 1809. A clever, shy child, apt for work, he could read and sum at three, and knew something of Latin grammar at five. Being a delicate boy, his father sensibly thought that the absorption of knowledge was better than the now fashionable cram, so on his pony the boy trotted down every day to the Parsonage, his pockets as well as his memory bulging with the familiar Virgil and Horace—never forgetting, however, to visit by the way to and fro a certain stockyard, where he kept rat-traps constantly going; and a neighbouring barn-wall told of his characteristic energy, for it did many a tail unfold. As a boy, and through life, he was a fine shot and fond of shooting. When eighteen he was sent to a private tutor near London, to prepare for the university; and during two years he made so much progress that, in regard to an academical career, great expectations were raised. He entered at Trinity College, Cambridge, in 1829, at the age of twenty, and found time for entomological study under Darwin; but the allurements of society, and the attractions of the tennis-court were, as concerned studies, sad disturbing influences. He graduated, nevertheless, in honours in 1832—Senior Optime in the mathematical tripos.

We are now brought to the unmistakable turning point in Mr. Thompson's life. With eagerness he longed to turn towards Parliament or the diplomatic service of the country, and undoubtedly in either direction he would have achieved distinction. These inclinations were opposed to his father's wishes.

And here for one moment we must introduce Mr. Thompson, the father—a particular but kind and reasonable man. When not out shooting, he spent his time perhaps with a few scientific friends in his study amongst books and microscopes, or in his chemical laboratory, where, no doubt, young Thompson early imbibed the chemical knowledge which he afterwards turned to practical account. Mr. Thompson, the father, was a liberal-minded man, and though he lived to eighty-three, his mind was ever fresh: to the last he delighted in daily consulting with his son on all matters of family and estate business.

But before settling down at Kirby, and, according to his father's wishes, entering upon the rural life of an English country gentleman, the young Thompson travelled on the continent and in Scotland, and spent a summer in the south of France to perfect himself in French. More or less he understood three modern languages. Very few original papers are at our disposal, but we have before us a bundle of letters written by him when abroad to his father at home in the years 1830, 1831, 1832, and 1834. These, together with some letters addressed to the writer of this memoir, and two other notes of a confidential nature, are the only cut-and-dry materials on which to work; the rest has been obtained by many private gleanings, for which hearty acknowledgments are due, and from public sources. In this foreign correspondence we pass over much *naïve* description, and not a little sunny humour. He says we can live in Holland for 10*l.* a month, and buy there a good-looking riding-horse for 9*l.* or 12*l.* He swam across the Rhine where it was a quarter of a mile broad, the current carrying him down three-quarters of a mile; the time fifteen minutes. At Neuwied an Englishman, named Leith, called the English Hercules, made a bet that in an English "funny" he would skull nine miles up and down all the way before the steam-boat, and did it: the pace then was, steaming up the Rhine four miles, and down stream fourteen miles, an hour. War between Prussia and France was then expected; Mr. Thompson saw Prussian troops, and speaks highly of them. At Rome he had fever, and, with his horse, a bad fall. From Toulouse, in 1834, he writes that there is much agreeable society; as it is one of the retreats of the *ancienne noblesse*. He is working hard at French: all sorts of game abound, and he asks for his English gun. He was introduced to a great French agriculturist, Baron Malaret—a practical man. The shrewd old fellow keeps exact accounts; credits his working bullocks with their hours of work, and charges them for their food. The Baron is an example of what improved agriculture may do in France: chiefly by introducing the English system, he has tripled the value of the family estate. Thompson observes it is satisfactory to see so wide a field for improvement, and people regarding it with eyes wide open. The Revolution of 1830, by forcing French landowners to return to their estates, has immensely improved agriculture; idle hands found congenial rural work, which before was thought below their dignity. The *métayer**—half-holder system, the curse of French agriculture—is fast vanishing. Mr. Thompson says, "there is no fear of my becoming restless and unable to settle down to my duties as a future English country gentleman; the more I know of foreign manners and institutions, the more I appreciate home: there is no place like home."

The following letter, interesting in itself, is more curious psychologically, showing how much the young man of twenty-five was influenced in a direction contrary to his hereditary instincts by the great political events of that day—the French Revolution of 1830, and in England Catholic Emancipation, the Reform Act, and the Abolition of Slavery. There is in this letter evidence of thoughtful independence and originality of mind:—

"My dear Father, "Pest, October 22, 1834.

"A failure of water in the Danube compels us to bring to for awhile at Pest, and I seize gladly the opportunity of retrieving my fair fame as a scribbler. I must needs confess that I am certainly anxious to reach Constantinople before the winter sets in. As fate has decreed that our journey is to be delayed, it could not have happened more opportunely than in the capital of Hungary.

"The Hungarians are a nation who resemble more than any other in existence what we ourselves were between three and four hundred years ago. And it was with feelings of the liveliest interest that I witnessed the sitting of the Diet now assembled at Presburg: there, on an elevated daïs, you observe many a sleek abbot and lordly bishop in his robes of ceremony, looking down with supreme indifference on the comfortable burghers in their

* An occupier supplied with live and dead stock, for which he renders half the produce. See 'Journal of the Royal Agricultural Society,' vol. xxiv., p. 19.

well-lined pelisses and sable caps, who occupied the greater portion of the floor of the room. There, again, you remark a cluster of noble-looking knights with their swords and moustaches, the representatives of the noblesse, *i. e.* of all who have not the privilege of a seat among the magnates of the land, those rich and haughty seigneurs through whose influence feudalism pure and undefiled still maintains its iron sway. The magnates have an upper chamber, but not a veto on the proceedings of the lower house; any measure agreed on by those of the estates must be acquiesced in by the fourth; the four estates being the four classes I have mentioned, viz., magnates, spiritual dignitaries, knights, and burghers.

"There are at present in Hungary two classes—nobles and slaves. The Emperor of Austria has long tried to break through the almost boundless privilege of the aristocracy; but as long as three out of the four estates are nearly all occupied by nobles, I do not see how he is to bring it about. Yesterday I walked over the bridge connecting the two towns of Pest and Ofen or Buda, and, being a stranger, did not observe that toll was or ought to be paid. No one, however, ventured to ask me for it, though the poorest beggar who should attempt to limp over would be immediately stopped for payment. This struck me, and I asked the reason. 'No noble pays toll,' was the answer; and, as every well-dressed man in Hungary is a noble, they never dreamed of asking me. The nobles pay no taxes or imposts of any kind, so that you may form some idea of the state of society. The Emigration Society ought really to provide means of conveyance to Hungary for all bigoted Tories. They complain bitterly that in England the days for gentlemen are passed, and for ever. In Hungary a noble may screw his boor out of his last farthing, and imprison him when he has no longer anything to pay; but if, by chance, he should lose his temper, and hang or shoot him, he must pay a fine to the Emperor of nearly thirty shillings. The noble is considered to be of a different species from the peasant, and, in consequence, is privileged to live as a drone in the hive, feeding on the produce of others' labours, disclaiming all active employments, and feasting on the sense of his own dignity. If this is the golden age of gentlemen, so regretted by our own, I wish them joy of it, and length of days to enjoy it in Hungary.

"Thank God, it can no longer be done in merry England; but as this is constantly repeated (viz., that the age of gentlemen is at an end), it is worth our while to inquire seriously into the losses of these much-to-be-pitied gentlemen of England.

"If among our gentlemen any be luxurious, luxuries abound; if studious, heaps of literary treasure may be accumulated about him at a word; if ambitious, let him show talent proportionate to his ambition, and straightway he will receive that distinction which in England is the rich reward of men of genius of whatever sort or whatever party. What, then, have gentlemen lost, that they should always wear mourning for the times that are past? There is but one answer—they can no longer wrap themselves in the spirit of exclusiveness. They are no longer, because born gentlemen, considered as demigods with the attribute of infallibility, and whose inherent right is absolute dominion over all whom nature has placed a link lower in the chain of society; who now are estimated more by what they are, than by what their forefathers have been. Can any well-regulated mind regret this? Ought we not rather to rejoice at the stimulus thus given to men of every rank and station by the consciousness that rank and station alone are insufficient to procure that high consideration which all court, and by the goading fear of being passed by inferiors and dependents in the great march of intellect? Ought we not to hail with heartfelt satisfaction the prospect held out to us that in this universal cultivation of mind we may, as a nation, attain to a pitch of education and of intellectuality which will make us the objects of an admiration far more to be desired than the stupid wonder with which other nations have been wont to regard us, and the profuse scattering of our ingots?

"I fear, my dear father, that I must have tired you with this long digression, *i.e.*, supposing that you have had patience enough to wade through it. But, I assure you, I am guiltless of premeditating such an infliction. The Hungarian institutions are so closely connected with the English, that they drew me into a train of thought which, with pen in hand, I could not avoid committing to paper.

"To return to Hungary, and the days of gentlemen here. You see at every step the consequences of such a wretched system. No bridges, no roads, no great public works can be undertaken while the only classes able to pay are exempt from the payment of tolls and rates, by which alone the expenses could be defrayed. The wretched boors are in a state of the most deplorable ignorance, and consequent immorality. They tell you to your face that they steal when they can, and even in an hotel you are obliged to lock your door and carry the key in your pocket. For a gentleman stranger who can shut his eyes to such a pernicious state of things it is a most delightful country.

"Farquhar gave us letters of introduction, and we have been most hospitably received. The nobles themselves are highly polished, extremely hospitable, and very fond of the English. If I were not on my way to Constantinople, I should like excessively to spend a few months here, having promise of stag and wild boar shooting.

"Of the magnificence of some of the great nobles you can hardly form an adequate idea. A short time ago (unfortunately about four days before we arrived at Vienna) Prince Esterhazy was installed as premier Count of the Empire, and gave, at one of his chateaux, a magnificent fête on the occasion. The Emperor was present with all his Court, and his guests were as follow:—Two hundred of the élite sat down to a table set out with gold plate alone, six hundred at other tables with silver plate, fifteen hundred ate off the finest china, and in all eight thousand Hungarian nobles dined that day at the prince's castle. The whole of his plate was his own. The rest of the details of the fête, which lasted three days, were equally astonishing, but would be tedious. Pray tell Mr. Pick, from me, that I have seen a Hungarian nobleman (the same Esterhazy) who has two hundred and forty thousand sheep. He kills a thousand stags and five hundred boars every year at the grand battues in his park (the park containing 84 square miles, and all walled in). I have just heard that the river has risen several inches, and that there is little doubt of our being able to start in a day or two. If not, I shall write again in the course of a week; but I expect that my next date will be Constantinople. I hope that is sufficient excuse for my having crossed two pages.*

"Believe me,

"My dear father's most affectionate and dutiful son,

"H. S. Thompson."

To resume the duly appreciated Home life, for the purpose of undertaking important Home duties, and the better to understand them, it is desirable, perhaps, to take a rapid historical glance at the causes which, during many years, led up to the nearly simultaneous formation of two great English Agricultural Societies.

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* He never reached Constantinople, owing to the illness of his travelling companion.

The agricultural state of England immediately after the Great War was deplorable—high taxes and the incidence of local taxation weighed heavily. Over-trading in agriculture was cut short by a disastrous fall in prices, and official documents in 1816 present some such pathetic picture as this: bankrupt squires, pauperised tenants, and starving poor; willing hands idle a-field, empty cattle-yards at home; tradesmen clamouring in vain for money which their customers had not; whilst confidence reigned only on the hardened faces of poachers and of vagrants. The landed interest began to wish for better Parliamentary representation. In 1822 the consolidation of local burdens was refused; next year advance was made in the direction of Free-trade—free-trade in labour was virtually established by the repeal of the Combination laws. The monetary crisis of 1825 still further complicated agricultural difficulties; money was not to be had. Now, in the darkest hour, the dawn was near, for the era of association began with the revolutionary year of 1830. Political Unions, first established in Birmingham, soon reared their heads in every town in England; and distrusted by science, but promoted by association and afterwards nourished by gold discovery, this year saw the birth of the equalising British Railway system—that genii of the West—that was and is destined to produce such incalculable social and political results. The condition of the southern counties was deplorable—the farmhouse divided against itself. A servile war raged; the labouring people looked upon the upper classes as their foes; farm property far and near was fired by the torch of the agrarian incendiary, but he even would gladly pause in his vindictive course to gloat over the wreck of the then recently introduced threshing-machine. Reform agitation followed, aided by the dissatisfied landed interest, and then came the Reform Act of 1832. Two years later the effects of new Currency laws were felt; the spirit of association grew and waxed exceedingly; Joint-stock Banks and their branches were established everywhere, and many Railway Bills were promoted; but the agricultural class still suffered. The price of all rural produce was very low; agriculture was threatened with total ruin. In Ireland the tithe-sheaf of the farmer was literally gathered on the point of the soldier's bayonet. The Irish Tithe Act was followed in 1836 by the English Act; then English agriculture was freed for ever from uncommuted tithe—a tax on improvement unknown in Scotland. A devouring plague of agricultural England disappeared for ever with predial and mixed tithes, together with offerings, oblations, and obventions. Thus in a period of extreme depression an absolutely essential clearing was made for the foundation of high farming, and for the advent of the great English agricultural associations.

One word as to the typical farmer of those days; but there were grand exceptions. There he stands X-ways, like King Henry VIII., crowned with the well-known wide-brimmed long-napped hat. He believes in his father, but more in his father's son, and inseparably connects free-trade with the name of Satan. Innocent of guano and oil-cake; the trickle of a drain-mouth has never refreshed his ears. He never handled a cheque-book, nor fumbled for a "rail-return;" nor did he ever "wire" his cattle-dealer. Fancy his licking a postage-stamp for a letter addressed to Dr. Voelcker! Not even in a vision of the night did that farmer ever see steam-horses, snorting to one another, at either end of a field, or study continuously eleven miles of agricultural objects, as presented by a National Agricultural Society. The leaven of the old Adam was in him; his maxim was this: "I gain by desolation, I lose by improvement."*

The Yorkshire Agricultural Society—the legitimate offspring of the Society of Scotch Improvers, 1723,† and of the Highland and Agricultural Society—was born in 1837, the first year of the happy reign of the Queen. The circumstances attending the birth of the Society are thus recorded by one who was then present. A country house party assembled at Kilnwick-Percy, at that time the home of the late Mr. Denison; after dinner, Mr. Thompson remarked in reference to the subject of conversation—some local cattle shows, "Don't you think we could form a Yorkshire Agricultural Society movable from place to place throughout the county?" The next morning a small meeting was held at Pocklington—Thompson rapidly and clearly sketched a scheme—he obtained the aid of Lord Spencer and of others; the thing was done. Curiously it was at first contended that tenant farmers and farming landlords could never compete on equal terms: Thompson vigorously opposed this narrow view, and there was no restriction. The leadership of this important and most flourishing Society was virtually in Mr. Thompson's hands, until the year 1870, when the pressure of other work, and perhaps failing health, to the regret of all, led to his virtual retirement. We should here refer to that which all his friends will recognise as very characteristic. Mr. Thompson

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* See, in regard to this and the immediately preceding paragraph, 'Board of Agriculture's Account of State of Kingdom, 1816,' 'Report of House of Commons Committee on Agriculture, August 19, 1833,' and 'Edinburgh Review,' 1834, Art. "Corn Laws," wherein this old proverb is cited:—

> "He that havocs may sit;
> He that improves must flit."

† Consult, as to 'The Society of Improvers in the Knowledge of Agriculture in Scotland,' 1723, Chambers' 'Domestic Annals of Scotland,' vol. iii., p. 484, and Burton's 'History of Scotland from 1689 to 1748,' vol. ii., p. 393. Also the Transactions of the Society in question.

had an agreeable theory that "all truly British Institutions commence with a dinner," which sociable theory he much delighted to extend and to carry into practice both at Kirby and at his town house in Mansfield Street. His hospitalities—and he was truly hospitable—he liked to make conducive to his practical views. He was President of the Yorkshire Agricultural Society in 1862, and one of the last acts of its Council must have been highly gratifying to Mr. Thompson—by authorising the Secretary of the Yorkshire Society to become an *ex-officio* member of the Royal Agricultural Society, an intimate connecting link was established between these great sister societies.

The Royal Agricultural Society of England was founded in 1838. Two eminent men, now no more, have in a remarkable degree influenced the fortunes of this national society, Mr. Pusey* and Mr. Thompson. The agricultural life of both these distinguished men may find a fitting monument in its journals. Mr. Pusey edited the Journal from the first, and until his lamented and premature decease in 1855, when its conduct was confided to Mr. Thompson, who more or less is responsible for its management for a like period of seventeen busy years. And what is the Journal? A half-yearly epistle from Hanover Square to the agricultural world; the record for the focus of the widest possible induction—a bond of union that unites the members of a great national society. Consider the circulation of the Journal, and the influence its county reports have had in securing happily prevailing uniformity, and say with us, may those who manage it never forget all these essential considerations; without jealousy may they ever, like Mr. Thompson, be judicious in the selection and promotion of young men; and thus the Society shall never know "the curse of nations, an inability to wrestle with difficulties." A man of high character and sober judgment, Mr. Pusey was at once a philosopher and a man of business; a man in advance of his age. Practice with science, the motto of the Society, his characteristic and oft-repeated words, even he thought more desirable than probable. If to the unreflecting these two pregnant words appear trite, the pondering student sees in them the key to the agriculture of all future time. It is fit, it is essential to draw some parallel, to suggest some contrast between men so united in kindred labours in the same cause, so distinguished in the same agricultural field of

* See further, as to Mr. Pusey, and much other instructive matter, 'Quarterly Review,' 1844, Art. "Agriculture." Also Index 'Journal of the Royal Agricultural Society,' vol. i. to xxv. And especially Sir T. D. Acland's Letter, vol. xvi., p. 608. Mr. Pusey mainly assisted in "the elevation of English Agriculture to the rank of a liberal art."

action. Indeed, in 1864, Mr. Thompson in his 'Essay on Progress,' virtually invites some such comparison. Mr. Pusey and Mr. Thompson were in no sense rivals, they were altogether complementary the one to the other. When the dying man relinquished the lamp of agricultural progress to the hands of another, it was with the full assurance that it would be safely and rapidly carried forward on the path that he himself had indicated from the first and carefully mapped. Pusey was a natural leader of men, endowed by nature with that indescribable essence called genius. Thompson on the other hand was a man of highly cultivated talent. What the one grasped by flash of instinct, the other followed patiently and laboriously with true British pluck and painstaking. Pusey boldly led the way by the force of dominating character; irresistibly Thompson pushed men on by the gentle and modest suggestion of superior knowledge of every subject and question in issue. Mr. Thompson was essentially a practical man.

The good seed practically sown by those good husbandmen Sir John Sinclair, Arthur Young, and others, bore good fruit in the shape of practical agricultural tours undertaken by Mr. Thompson accompanied by Denison, afterwards Speaker and subsequently Lord Ossington, Mr. Lawes, and others. Most of the farms worth seeing in Great Britain were visited and much valuable information gained. At this time also, the writings of Baron Liebig directed attention to the practical application of chemical science; Mr. Thompson's thoughts turned towards the chemistry of agriculture.

His Irish tour, in 1839, is interesting, especially in connection with the subsequent visit he made with a political object to that country. The following is an extract from an article contributed by him to 'Tait's Magazine,' for April, 1840:—

"No one, with the eye of a farmer, can travel through the counties of Tipperary and Limerick, and, in short, the whole province of Munster, without remarking the great natural capabilities of the soil. A mild, moist climate, with innumerable springs at various elevations, offering the greatest facilities for artificial irrigation, point it out as eminently fitted for the breeding and rearing of cattle; whilst the lower lands are equally adapted to the growth of wheat. Yet, with these great natural advantages, what is the present aspect of the country? Small shapeless fields, in which no implements can be worked to advantage; land of first-rate quality covered with stone, and so saturated with water, that no crop can be grown without devoting a third of the land to deep furrows, for the sake of elevating the remainder into comparative dryness. These are but a fraction of the errors which might be pointed out. But it is foreign to orr purpose to write an agricultural treatise, and we turn at once to the remedy which is luckily as self-evident as it has hitherto been unattainable. Capital applied to agriculture, and bringing in its train the mechanical and scientific improvements of the sister kingdom, would, in a very few years, double, nay treble, the produce of this fertile portion of the island; whilst the great amount of unappropriated water-power, and the low rate of wages, offer every inducement to the manufacturer. But what capitalist, it will be urged, will risk his wealth in a country where life and property are notoriously insecure?"

Turning to the 'Journals of the Royal Agricultural Society,' in the first volume we unwillingly pass over Mr. Pusey's paper on the 'Present State of Agriculture;' indeed a bird's-eye view of no ordinary vision: as yet railways were not, and common roads were dry ditches in summer and wet ones in winter: agricultural intercourse there was almost none: in many districts the English talent for developing animal form was conspicuous by its absence. Yet Mr. Pusey's trained eye saw coming improvement written over the face of the country.

'Subsoil Ploughing' from the pen of Mr. Thompson appears in the second volume; this paper is taken from the, 'Journal of the Yorkshire Society.' It is not very practical; youthful science vainly striving to gain a footing on a slippery spot. There was a tendency in those days for the heroic uplifting, transposition and intermixture of soils on the earth's crust, which operations, in days of dear labour, appear to us moderns heavy undertakings. Reference in this volume is made to the advance of the mechanics of agriculture, the village smithy giving place to the great manufactory. There is a remarkable novelty, a portable steam engine. A sensible desire is also expressed for co-operation as well with Farmers' Clubs at home as with the Colonies and foreign countries.

Two suggestive propositions worthy of remark may be culled from the third volume of the Journal. It is stated that drainage is to a farm what a foundation is to a house; and the Society avoids all inter-landlord and tenant questions.

The study of farming, unlike that of pure science, requires not only great practical experience, but many means and appliances to boot; a museum and model room was about to be established on a government site, but the project failed. From the pen of Mr. Pusey there is another paper on Progress—an encouraging milestone on the hopeful way—evincing grasp of principle and appreciation of method. Full of the faith that moves mountains, the Report of the Council says "the Royal Agricultural Society has sown good seed, and ere long a crop will be plenteously gathered."

The outbreak of the potato-disease occupies the sixth volume of the Journal, 1846; it contains an exhaustive paper on that subject, contributed by Mr. Thompson, his then theory was that curl, dry and wet rot were various symptoms of the same disease, that with large tops the tubers were small, and that over ripening caused the disease, and consequently the remedy would be found in unripe setts. We may value facts, and admire arguments, where in the conclusions we do not agree, in fact these are disproved. We gather further from this volume a reference to Liebig's discovery, soluble-superphospate. Mr. Thompson was selected to speak on the subject of thick and thin sowing of wheat. The Report of the Council calls the Royal Agricultural Society a "Parent of Societies," and refers to the total money implement award at Oxford in 1839, which was covered by a five-pound note.

The Implement* department at York, 1848, and at Norwich in 1849, was reported upon by Mr. Thompson; these two admirable papers enrich the ninth and tenth volumes of the Journal. In these thoroughly practical papers the practical man of business peeps out everywhere; there is forecast, there is grasp, together with close reasoning on methodically arranged facts, and all brought home to the reader by a style, both clear and concise; exact mechanical laws and tests applied by the master hand of Amos produced their natural results; agricultural shows ceased to be mere bazaars; good testing made good implements, and as regards them, cultivated that plant of slow growth in the agricultual bosom—confidence.

And now courteous reader, with your consent, we will make a convenient digression.

In an ancient corner of the ancient city of York, where old beetle-browed houses with quaint carved beams overhang the narrow foot-pavement, there lived, in the summer of 1845, a chemist and druggist of capacity, a shy and retiring, but able and exact member of the Society of Friends—his seal a pestle and mortar, underneath the letters J. S.—Joseph Spence. He was also managing partner in the York glass-works. The Thompsons of Kirby were old customers. Spence knew nothing of agriculture but what young Thompson told him; and often he came to and fro. An agricultural laboratory was fitted up-stairs. Thompson suggested amongst others, an experiment, the power of the soil to absorb and assimilate ammonia. A glass tube to be afterwards filled was made at the glass works, it represented down to the drain a four-foot section of earth. Spence, much interested, worked early and late, he ground down turf to fill the tube. The result of the percolation of a solution of ammonia fairly startled them all, it was not filtration but a new chemical action: Spence threw up his hands in astonishment and called up Holden his assistant to see the unexpected result. Friend Spence! did it at that moment occur to thy practical mind that mere money might be made of this discovery? No,

* "The classification in natural order of implements for trial, we are told by Mr. Wren Hoskyns, was due to Mr. Pusey."—'Journal of the Royal Agricultural Society,' vol. xviii., p. 415.

not in the coin of this work-a-day world, but it is most negotiable in the universe of science. The eleventh volume of the Journal contains Mr. Thompson's modest account of his discovery; the paper is a model of lucid exposition; the guiding idea flashed upon him when observing the escape from manure heaps of quantities of ammonia. In the words, specially addressed to us, of a great living authority, "It is remarkable that this slight experiment contains the germ of what I should consider to be one of the most important, if not the most important of all the scientific investigations connected with the practice of agriculture."

Farm-buildings also are reported upon in this eleventh volume. Mr. Thompson was a Judge; he says, never were so many good papers sent in for one prize. We mention only, Mr. Pusey's Encyclopedic paper, "Agricultural Progress during eight years, to 1850," arranged under no less than 28 heads, and especially interesting here as having no doubt suggested Mr. Thompson's paper written in 1867. We find in the Report of the Council he is thanked for his reports on Implements. The twelfth volume of the Journal contains Mr. Pusey's report on the Implements at the Great Exhibition of 1851. He speaks of scattered rays of realised knowledge, and further he says, the Royal Agricultural Society's trials have, in 10 years, done more for agricultural mechanics than had been attempted anywhere in all former time.

The exhibition of implements at Lewes is described by Mr. Thompson in the thirteenth volume for the year 1852. He speaks of the average amount of red and blue paint, and goes on to tell of progress—satisfactory progress. Reapers and mowers are of national importance in the difficult state of labour market; 1400 ordered in one year from four leading makers, the value over 30,000*l.* Great difficulties in the way of their use—the master unfamiliar and the men inimical. The demand for implements in three years has increased fourfold; foreign orders, since the Great Exhibition, have considerably increased.

This is a valuable paper. The Report to the Council of this year contains an obvious but important observation: "The Council should represent the varied wants and wishes of the agricultural community." Mr. Pusey, President for the second time, was prevented from taking his place at Lincoln. The sixteenth volume of the Journal for the year 1855 contains the record of his early and lamented death at the age of fifty-four years; and so ends what we may venture to call the Pusey period of the Royal Agricultural Society.

The Journal of the Society was now conducted by Mr. Thompson. The new editor added half-yearly valuable statistical tables. The Report to the Council contains the suggestive phrase, "international agriculture." In the next year, 1857, there is a curious reference to American public judging in the ring, to "prevent favouritism." Mr. Thompson contributed a paper on Road-making. In 1858 he wrote his first paper on Grass-land, so much neglected, and yet so grateful: "Effect should be produced at once, rather than by application little and often." He speaks of his twenty years' experience as a grass-land improver. A professional editor was appointed in 1859, but Mr. Thompson, M.P., as Chairman of the 'Journal' Committee, continued to control the policy of the Journal. The twenty-second volume, 1860, contains a letter from Lord Palmerston, admirable in point of style. There appeared in 1864 Mr. Thompson's exhaustive paper on the 'Progress of the Royal Agricultural Society.' If reprinted, this might well be entitled an Agricultural Handy-book.

This Handy-book, an index to its writer's character, shows us what practice with science has effected during twenty-five years. If the imagination may suggest and fancy personate, what a procession of the agricultural virtues now rapidly unfolds itself! Free-trade, and the butcher clamouring for meat; railways, drainage, steam-cultivation;* the talented implement-maker, and numerous inventions and improved implements; associative activity, steam, cheese factory, and other companies; the migratory principle of agricultural meetings, large receipts, and the "splendid shilling," with increased usefulness and sound management, attended by growing popularity; steady progress and simplified agreements; chemistry, assisted along by commerce and pushed by interest, and all driven by necessity; farm-buildings, farm-cottages, farm-consolidation; and last, but not least, with more money in his pocket and more knowledge in his head, see there comes proudly in the place of honour the improved farmer himself. Mr. Thompson tells us with ordinary roads and fixed meetings receipts were small and usefulness limited. All permanently useful societies, he says, must be self-supporting. Justice is rendered by Mr. Thompson to the memory of "that capable and accomplished writer," Mr. Pusey. The paper further tells of the implement trophy, not trial system that will never work;

* Refer to Alison's 'History of Europe,' 1815–52, vol. i., chap. i., paragraphs 42–46. The respective marginal notes are to this effect:—"Steam power can never be applied to the cultivation of the soil."—"Decisive proof."—"What, if the case had been otherwise?"—"Influence of this law of nature." The historian of 1852 relies upon the united evidence of "a boy from the turf-clad mountain," —"a milkmaid tripping on the grassy mead,"—"an old man delving in his cottage garden," and—oh, honoured shade of Fowler!—they would prove that "Steam and Mechanics have left untouched the rural marriage of Industry with Nature; and in the last as in the first it is in the garden of Eden that man is to find his earthly Paradise." The 500*l.* prize for Steam Cultivation was awarded to the late Mr. Fowler at the Chester meeting of the Royal Agricultural Society in 1858.

but as a whole this paper must be studied, it cannot be epitomised. When so much is admirable, criticism seems almost out of place. But perhaps the foundation was too large for the superstructure, which has never been completed; the style is rather diffuse, enormous pains were taken to collect information, and the statistics may appear crude and Blue-bookish. The general conclusions from this important and exhaustive inquiry appear to be these:—Free-trade has fed an increased population, promoted trade and manufacture, and so created increased demand for meat; thus good farming has been encouraged by stimulating the production of stock and green crops. Mr. Thompson mentions his own chemical discovery, the power of the soil to decompose and retain ammonia, but places this discovery as secondary in interest as compared with the extensive and all-important scientific investigations, elaborately conducted during so many consecutive years at Rothamsted.

In agriculture scientific men become practical, and practical men scientific. Men of science are usually positive in the inverse ratio to the possibility of testing their respective theories. The chemist and—for example—the theologian, sit on opposite poles of the world of science. Men often bow to the latter, and respect his honesty, even where they ridicule the inconsistencies and absurdities of his views: but on the other—the chemist—practical men rush at once to test and turn him inside out, to seize the good seed to bring forth much fruit, and to scatter the chaff of his theories to the winds of heaven.

Long may it be ere any posthumous biographer "attempts the life" of the Squire of Rothamsted! When in the fulness of time it is written, there will be a noble record of a vast work done, as the Temple was built, without noise; the munificent sum which Mr. Lawes has devoted to the certain continuance of his practically scientific and life-long investigations, would alone entitle him to our utmost gratitude. Mr. Thompson speaks of "the ill-appreciated labours of Mr. Lawes and Dr. Gilbert," of which the important results enrich so many pages in so many volumes of the Journals of the Royal Agricultural Society. Boussingault and Liebig paved the way for Lawes: they were analytic; he was in addition synthetic: they took to bits; in recombination Mr. Lawes built up again. He has taught us that, self-contained, all land holds a certain continuous flow of natural productiveness. This discovery puts in a clear light the terms "condition" and "high condition." Land run out is land reduced to the original standard of fertility, for the natural standard is fixed, and can hardly be destroyed. Condition, on the other hand, is variable, and more or less quickly it may be restored. Amongst many other things, he has taught us that, in pasture, if you do not regard cost, you may at pleasure, by different applications, regulate the herbage; and that suitable artificial manures are not mere stimulants, but may be depended upon with certainty to feed a crop. Busy as Mr. Thompson was, he rarely failed to pay a seasonable visit in order every year to study the uncut experimental crops: the practical man felt that then, and for years and years to come, the scientific agriculturists would tread on classic ground at Rothamsted.*

Covered foldyards claim a moment's attention here. Mr. Thompson's letter, describing those designed and constructed by him, appears in the second series of the Journal, vol. i. There is also a detailed account by another writer. The cost is small, and the design simple and satisfactory. Tall posts of home-grown timber support a wide central-span roof and the inner ends of surrounding pent-houses, all covered with pantiles and glass—the span roof, with a wide interval for ample ventilation, sails over umbrella-like, and overlaps the lower pent-house roofing.

"Grass land and its management, with especial reference to the production of meat"—1872—is the title of a paper completed by Mr. Thompson after much sweat of the brain. It is considered one of the best practical papers that ever appeared in our practical Journal. Full of ripe experience and thought, both in point of style and method, it is the best of his agricultural writings. This paper has been published separately, it has been widely distributed, and it should be in the hands of everyone interested in its especially important subject.—The agricultural problem of our day—no ignoble object—milk and meat in due season—the essential food of an ever-increasing people.

As President of the Society, the Presidential Address delivered by Mr. Thompson at the end of the year 1866 comes as a fine close to the history of his long literary career in connection with the agriculture of England, as represented by the Royal Agricultural Society. He taught the lesson of his life —Press on!

Peace and good-will towards men the President teaches at the outset of his address. Stand on common ground; forget class interest; landlord and tenant in the future, as in the past,

* Within the limits of a paragraph it is impossible to do adequate justice to this branch of our subject. For an account of the Experimental Farm and Laboratories at Rothamsted, we must refer the curious reader to the 'Journal of the Royal Agricultural Society,' vol. xxv., p. 285. See also vol. xvii., p. 55. The late Speaker Denison (Lord Ossington), in speaking of the progress of Agricultural Chemistry, says: "To Mr. Lawes must be assigned by English farmers the place of honour."

must, between themselves, by friendly intercommunication and regard for mutual interest regulate their own affairs. Land will always be valuable in proportion to the tenant's security and confidence. The farmer, who from sentiment gives more than market wages, would soon be bankrupt: so, on the other hand, it is unbusiness-like to expect the labourer to be content with less than the market value of his labour. The President would have it clearly appear that there is an essential difference between the Royal Agricultural Society and Chambers of Agriculture, farmers' clubs, and other kindred societies. The aim of the Royal Agricultural Society does not exclude other charter subjects, but virtually the essential aim of Society, from its commencement, has ever been to encourage the production of the most food on the least space—leaving the wealth so extracted to be apportioned between landlord, tenant, and labourer, as may be settled between them—man with man. The President was not likely to lose sight of the fact that labourers' earnings have an important influence on the moral character of that class. Firm belief is expressed in the vitality of the Society; in the steady and continuous progress of improved agriculture; and he speaks encouragingly of the expansion of trade, and improved transport by sea and land opening out to us nations of new customers, and all creating demand for agricultural produce. The President points to a boundless region for scientific improvement, stretching away, far away before us, and lost in the dim, inscrutable distances of the future. A fitting and characteristic conclusion refers gratefully to God's good providence, and to His promise that so long as the world endures there shall be a bountiful return of seed-time and harvest.

The following letter, at the close of the year 1873, was addressed by Mr. Thompson to the Council of the Royal Agricultural Society, and read at a numerously attended Council meeting:—

"My Lords and Gentlemen,—It is with great regret that I have to request that at the reconstitution of committees, which takes place next week, you will not place my name on the list of members then appointed, as my health will not permit me to attend any business meetings at present.

"After taking an active part in the affairs of the Society for thirty-five years this sudden severance causes me deep disappointment, but my illness is too serious to be trifled with, and I take this opportunity of offering my best thanks to all my colleagues on the Council for the kindness and courtesy which I have received from them from the original formation of the Society to the present time."

Whereupon the Council recorded an expression of unfeigned regret and sympathy, and of just appreciation of continuous services rendered to agriculture—as President of the Society, as a Member of Council, as Chairman of the Journal Committee, and as the author of writings of the highest and most practical value.

As with agriculture, so with railways; in the one case there were old prejudices to be fought, old customs to be uprooted; so in the other there was culpable mismanagement, if not fraud, there was wrong to be righted, there was confusion to be reduced to order, and therefore, with characteristic energy and moral courage, Mr. Thompson, being a practical man, advanced to a practical attack. It is always the case, the cruel demon of greedy speculation was devouring indiscriminately the substance of the innocent and of the guilty—unworldly clergymen, widows and orphans, were sufferers as well as the mixed mob of gamblers—the dirty, the fashionable, and the vulgar. He moved the resolution which removed the late Mr. Hudson from office; the immediate object being to rescue the property of the shareholders by introducing sound and honest management, and by restoring to rival companies the blessings of peace. This labour at first was well-described to us as "night and day work!" Mr. Thompson was not actuated by any motives of self-interest. Owing to his mistrust and by his instigation the greater part of the family interest had been removed from the suspected undertakings. His motives were the highest, as is proved by the following familiar note, intended for no eye but one. We venture to think this familiar note is one of those little literary chinks that often admit floods of light upon the character we study—it is just one of those things to make us proud of our countrymen, and hopeful as regards the future of our country:—

"I send you the 'Times,' containing the Eastern Counties Report; I wish for your opinion as to my joining the direction of the railway. I have said no to many people, but I am so pressed. Give this the best attention you are able, and, being Sunday, consider it with special reference to my duty as a Christian and a gentleman."

As Chairman of the North-Eastern Railway Company, Mr. Thompson saw the good seed he had sown bring forth good fruit most abundantly; that which he undertook to lift from its state of abject desolation, became under his hands one of the most highly appreciated and greatest of English commercial undertakings. He proposed and organised, in 1852, a Railway Companies Association, of which he was Chairman; but after several years it was torn asunder by the Battle of the Gauges, and long territorial contests. A second attempt, however, which, like all truly British institutions, commenced with the characteristic dinner, was more successful, and has not only introduced moderate and give-and-take feeling between the Companies, but also between the Companies and the great public it is their interest to serve. He continued until almost the last to be Chairman of this Association. Suffice it here further to say that when the railway history of Great Britain shall be written, the railway-direction career of Mr. Thompson may well fill many an instructive page, and every line will convey the impression of a policy pre-eminently successful, because it was thoroughly honest, and admirably straightforward.

The political career, so much desired in early life, came, but it came late: at the age of 50, in the year 1859, Mr. Thompson entered Parliament as Member for Whitby. Seven years afterwards he lost his seat in consequence of a dramatic but unfortunate circumstance, for which in no way whatever was he responsible—during the election contest, his opponent, Mr. George Hudson, was arrested by his creditors. The originator of improvement schemes, the founder of the water-works, Mr. Thompson did much to encourage art in the jet trade, and he will long be remembered at Whitby as a public benefactor. At the next election, in 1868, he was brought forward for the Eastern Division of the West Riding of Yorkshire; after a severe contest he was defeated by a narrow majority.

The Parliamentary position Mr. Thompson speedily gained has been estimated and summed up by two thoroughly qualified political friends, to whom we are specially indebted. By no means an ardent politician, the cool administration of Lord Palmerston was not calculated to add fuel to any political fire that may have smouldered. On agricultural and railway subjects Mr. Thompson, from his conspicuous knowledge and accuracy, was soon recognised as an authority. As a speaker, with a mastery of detail, he was always clear and definite; he never attempted oratorical flights—his was a thoroughly House of Commons style, full, ready, and conversationally flowing. If in early life his inclinations had not been diverted, had he entered Parliament whilst yet his dispositions and habits were plastic, he would, no doubt, have risen high in the Government of the country. Coldness and reserve of manner were serious drawbacks in electioneering, more than compensated, however, by the good sense and tact which often induced compliance, and never failed to command respect.

Referring to *Hansard*, we gather that in the Church Rates Bill (1860) he was in favour of some provision for maintaining fabrics. In the same year he spoke in favour of the 6*l.* householder, believing him to be of the flower of the working-class. He warmly advocated the Highway Bills (1860–4). The ratepayers that had the worst roads were always the most self-satisfied. He wished the Government to deal also with turnpikes. On Ecclesiastical Compensation Bill (1860), Mr.

Thompson was anxious to look to the comfort of the working clergy, now struggling with poverty. On the subject of Railway Accidents (1861), he urged that Railway Directors were impressed with the grave character of their responsibility; influenced not only by pecuniary penalties, but still more strongly by that natural regard for life and limb which was common to all human beings. He supported the second reading of the Accidents Compensation Bill (1863). He spoke on educational subjects, on parochial assessment; and opposed Game Law Inquiry (1863); spoke on the subject of Agricultural Statistics (1864), in which he took deep interest; on Cattle Disease Prevention (1864); and against Repeal of Malt Tax (1865)—bad tax, but its repeal would not benefit the great majority of farmers. Himself a great barley grower, he opposed repeal from conviction that if carried, repeal would disappoint expectations of its warmest supporters. In favour (1865) of the principle of Union Rating. The able pamphlet which Mr. Thompson published in 1870, entitled 'Ireland in 1839 and 1869,' was a patriotic labour of love; no pains were spared to collect and to methodise information. Though agricultural in its substance, it is clearly political in its essence, and therefore it is fitly considered in this place. It has been suggested to us that the Irish Land Act bears traces of Mr. Thompson's opinions; but whether or not this impression is correct, we are unable to express any confident opinion; but he says, in effect, let the Irish turn their backs on the past, and march forward to a hopeful future; and for the rest, with confidence we may rely upon even-handed justice, and upon Time the reconciler.

The place is vacant, the voice is hushed,—where the familiar face?—Often it is then, only then, that worth is fully realised, character justly appreciated. The best gloss on Mr. Thompson's parliamentary career is to be found in the fact that immediately after his defeat for Whitby in 1865, and during the cattle-plague debates, frequent references, from both sides of the House, were made to him as an authority on agricultural questions, and many unavailing regrets followed him into his ever-busy retirement.

"Home! there is no place like home." We have followed Mr. Thompson from boyhood to youth; we have traced with care the more important highways of his public life; it remains for us just to indicate the lesser paths of duty, which he trod with so much benefit to his family, his neighbours, and the public, and it is as pleasant as it is essential to the completeness of our biographical sketch, to conclude with a rapid glance at the home life at Kirby. We have seen that the two great Agricultural Societies were founded in the years 1837–8; two years afterwards Mr. Thompson established his home farm, and devoted much time, and his surplus income, in extending the use of machinery, and in otherwise improving agriculture: and in promoting education, as well upon his own estate as in the management of the diocesan training colleges of York and Ripon—and this at a time when those educational institutions had few supporters and scanty means. Afterwards Middle-class education interested him; and during many busy years he found time on Sundays to visit his farm to teach the farm-lads. We may not do more than refer to his happy marriage in 1843, and to the numerous and promising family by which he was subsequently blessed. Charity, melting charity, claimed from his busy life many a well-spent hour; from 1845, for 20 years he acted as Chairman of the House Committee of that admirable institution, the York County Hospital; and during his chairmanship the new hospital was built. The railway directorship, as we have seen, commenced in 1849; he succeeded at his father's death to the family estates in 1853; and six years afterwards Parliamentary business for a time somewhat interrupted home duties. Early in life an acting Justice of the North and East Riding of Yorkshire; in 1865 he served the office of High Sheriff of that great county; and, as we know, in 1867 he was President of the Royal Agricultural Society. We fancy we gather in Mr. Thompson's writings much that is autobiographical *—he sketches a man so hungering for knowledge, that he is never satisfied until he could ascertain all the causes of failure. "The management of an imaginary farm" savours greatly of his own experience. Mr. Robson, hale and hearty, his bailiff from the very first, is still at Kirby to speak much of his late master and little of himself; he can tell of the exceeding minuteness that regarded every minute detail of the estate, of the household, and of the farm—no turnip sown, no sheep bought, without his master's knowledge. As a landlord Mr. Thompson is autobiographical when he says, "there exist personal ties which, if rudely severed, would be most inadequately replaced by additional rent." Safe tenants may crop as they please—simplify agreements, and regard good stocking and thorough manuring. Give plenty of notice; so combine freedom for the incoming with justice to the outgoing tenant. Routine, he adds, cannot be broken through without a pang, which never, however, survives a favourable balance-sheet.

In the somewhat flat country of the vale of Ouse, Kirby Hall is pleasantly situated, exactly in the centre of a circle of park and other lands, which have been cultivated and improved by Mr. Thompson. The garden front commands a distant view

* 'Journal of the Royal Agricultural Society,' vol. xxx. p. 44.

of the grey towers of York Minster. To the north you may see wonderfully improved park land—in June yellow with the butter-cup. At no great distance, embowered in trees, there is the ancient parish church. Westward, following the home circle of cultivation, the new approach, crossing a serpentine lake, leads through a grass-field, on deep hazel loam, to the Kirby home farm. Beginning with 250 acres, this home farm, in 1867, had grown to 670 acres, of which 300 acres was grass. At first he maintained a pure herd of shorthorns, but this was sold in 1848; he always, however, had a well-bred bull. The sheep, of the Leicester breed, were also carefully selected. There is here a characteristic of the Kirby estate—a covered foldyard. In every direction may be traced the hand of the improver—he was no mere paper farmer—drainage, which he thoroughly understood—marling—enlarged fields. Towards the south point on the home circle of cultivation, there is the new home farm of 340 acres with its covered fold-yard. Many of the buildings, with corrugated tiles, are only just finished. Some land here is poor clay, much cracked; two large fields have been recently laid down to permanent grass: thanks to artificial manure, the ground is pretty well covered, and there is clover; still the general impression is, that on this bad land the good grasses say to the farmer, "Wait a bit." There is close by an old pasture, of which its late improver was very proud—a triumph of skill in old grass cultivation. Previously the quaint old tenant of this "deafish" field used to say: "the grass came a week afore Barnaby fair!—June 22nd—and went a week after!" Difficulty has been experienced in getting good grass seed—some has been lately got from the hay-crop of Wensley Dale, some from the neighbourhood of Knaresborough. Circling eastwards, and entering the park from the east, there is a fine field of grass, laid down thirty years ago: thirty-two Irish cattle, bought in May, were in June feeding here, and many cribs about told of other food than grass. Passing by experimental grass-plots, interesting only as showing the interest to the last which the careful experimenter took in his latest practical study, we regain the front park—our point of original departure—to admire, beneath the well-cared-for plantations, 40 fat bullocks; as sleek, fat, and restful as a rich pasture and rich artificial food could possibly make them. Stay—to complete our landscape, we want a foreground figure. It is more than imagination that enables us to dash him in—an ancient tenant and neighbour—he will tell us that Sir Harry was respected and influential elsewhere, but in addition, around Kirby Hall he was much and generally beloved.

Health failed—gradually, very gradually. A sojourn in the south of France. A welcome return to Kirby. More illness;

and, as before, tended with domestic devotion. Honours came. The Queen, by the hand of her Minister, conferred an hereditary distinction. Commercial gratitude was shown in the shape of a magnificent testimonial. Political addresses gratefully acknowledged. But as he stood on its brink, and looked steadily into the black gulf—probably next to a mental onlook—an humble onlook—towards the promised land—he found comfort in the doubting retrospect of 65 years, of a busy, a well-spent, and an unselfish life, which, on the 17th May, 1874, death came to close in peace.

Last scene of all—the funeral train—wending on foot through the meadows he so much loved to cultivate. We may not draw the veil which shrouds domestic grief; but men stood around that open grave—many in person, more in spirit—hard men of business, used to weigh and estimate the gold of character, without regard to its glitter—they desired to render a just tribute to the memory of a true and tender-hearted friend, an able and trusted colleague. The grave has closed, but the memory lives, and shall live, it may be throughout all the world, as the memory of one of a goodly fellowship—the patriotic benefactors of British Agriculture.

XXII.—*Report on the Composition of Thirteen Samples of Peruvian Guano, sent by the Secretary of the Admiralty to the Royal Agricultural Society of England.* By Dr. Augustus Voelcker, F.R.S., Consulting Chemist to the Society.

These samples were sent to England in sealed bottles, in Her Majesty's ship *Petrel*, from Callao. The bottles were opened by me on the 9th of June, 1874, and submitted to careful analyses.

Five of the samples were taken from the guano-deposits of Pabillon de Pica, three from the guano-deposits of Punta de Lobos, and five from the deposits of Huanillos.

The samples were labelled as follows:—

Pabillon de Pica Guanos.

1. Guano deposit of Pabillon de Pica at La Cueva, taken at 25 feet below the surface.
2. Guano deposit of Pabillon de Pica at San Lorenzo, taken at 15 feet below the surface.
3. Guano deposit of Pabillon de Pica at La Barloventa (white guano), taken at the surface of a large deposit not yet marked.

4. Guano deposit of Pabillon de Pica, Cueva del Rinconada, taken on surface over deposit of probably more than 100 feet.

5. Guano deposit of Pabillon de Pica, Cueva del Rinconada, taken from about 50 feet lower than No. 4.

Punta de Lobos Guano.

1. Guano deposit of Punta de Lobos, taken at 5 feet below the surface, above boring of 20 feet.
2. Guano deposit of Punta de Lobos, taken at 40 feet below the surface.
3. Guano deposit of Punta de Lobos, taken at 8 feet below the surface.

Huanillos Guano Deposits.

1. Guano deposit of Huanillos, taken at 5 feet below the surface.
2. Guano deposit of Huanillos, taken at 10 feet below the surface.
3. Guano deposit of Huanillos, taken at 19 feet below the surface.
4. Guano deposit of Huanillos, taken at 13 feet below the surface.
5. Guano deposit of Huanillos, taken at 40 feet below the surface.

According to a report given by Mr. Thierry, C.E., the estimated quantity of these deposits, which lie to the south of Iquique, are :—

	Tons.
Huanillos	700,000
Punta de Lobos	1,601,000
Pabillon de Pica	5,000,000
	7,301,000

These are the chief deposits recently surveyed, and, according to Mr. Thierry, the additional minor guano deposits bring up the estimated total amount to 7,680,500 tons; so that there are only 379,500 tons more than the estimated quantity in the three large deposits from which I received samples for analysis.

Pabillon de Pica Guano.

The following is the Composition of the Five Samples labelled as above:—

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Moisture	3·20	5·45	4·13	9·23	6·70
*Organic matter and salts of ammonia	46·17	49·40	59·01	41·32	55·10
Phosphates of lime	25·51	27·01	21·82	23·80	24·55
†Alkaline salts	15·49	15·99	9·00	23·30	12·10
Insoluble siliceous matter (sand)	9·63	2·15	6·04	2·35	1·55
	100·00	100·00	100·00	100·00	100·00
*Containing nitrogen	9·81	9·15	15·08	6·63	11·02
Equal to ammonia	11·91	11·11	18·31	8·11	13·38
†Containing phosphoric acid	1·81	1·70	1·68	·67	3·48
Equal to tribasic phosphate of lime ..	3·95	3·71	3·66	1·46	7·59
Total phosphoric acid	13·49	14·06	11·67	11·57	14·72

All these guanos, it will be seen, contain very little moisture. They are of a light brown colour, and in a fine powdery condition. No. 3 has a lighter colour than the rest, and is remarkably rich in ammonia. It is evidently a comparatively-speaking recent guano deposit, and compares favourably with the best old Chincha Island guano.

The amount of ammonia in the four other samples varies from 8 to 13 per cent. in round numbers, and that of sand from 1½ to 9½ per cent.

Excepting No. 4, the samples from Pabillon de Pica do not contain so much ammonia as Chincha guano, and although dry and powdery, without hard lumps, are inferior to the latter, whilst as regards composition three of the samples nearly came up to the standard of Guanape guano, and are greatly preferable to the latter as regards condition.

Punta de Lobos Guano.

The following is the Composition of the Three Samples from these Deposits:—

	No. 1.	No. 2.	No. 3.
Moisture	14·53	14·06	4·79
*Organic matter and ammonia salts	35·77	49·74	17·14
Phosphate of lime	26·50	21·40	23·09
†Alkaline salts	20·35	13·45	27·04
Insoluble siliceous matter	2·85	1·35	27·94
	100·00	100·00	100·00
*Containing nitrogen	6·55	9·99	2·64
Equal to ammonia	7·95	12·13	3·21
†Containing phosphoric acid	3·20	1·21	·38
Equal to tribasic phosphate of lime	6·98	2·64	·84
Total phosphoric acid	15·34	11·01	10·95

The deposit taken at 8 feet from the surface (No. 3), it appears, is mixed with a good deal of sand; it contains also a large proportion of alkaline salts, and in consequence is poor in ammonia. At 20 feet the Punta de Lobos sample yielded 8 per cent. of ammonia, and at 40 feet below the surface, 12 per cent.

The 40 feet deposit is a dry and fine guano. It is much drier than Guanape guano, and contains as little sand and as much ammonia as good Guanape guano on an average.

Huanillos Guano.

The Five Samples, labelled as above, on analysis were found to contain in 100 parts:—

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Moisture	8·23	5·25	12·67	15·39	8·66
*Organic matter and salts of ammonia	46·46	41·90	34·83	34·21	47·09
Phosphate of lime	22·45	30·21	33·20	24·71	24·20
†Alkaline salts	19·22	16·73	15·69	23·09	16·65
Insoluble siliceous matter (sand)	3·64	5·91	3·61	2·60	3·40
	100·00	100·00	100·00	100·00	100·00
*Containing nitrogen	10·40	7·45	6·72	6·65	8·81
Equal to ammonia	12·57	9·05	8·16	8·07	10·69
†Containing phosphoric acid	5·33	1·47	1·44	1·62	3·26
Equal to phosphate of lime	11·63	3·21	3·14	3·53	7·11
Total phosphoric acid	15·62	15·30	16·65	12·93	14·35

The Huanillos guano samples were all dry and powdery, and of a light brown colour.

The amount of ammonia in the several samples varies from 8 to 12½ per cent., and that of sand from 2½ to 6 per cent., in round numbers.

The proportion of phosphoric acid in combination with alkalies, and present in a state soluble in water in sample No. 1, it will be seen, is considerable, as it corresponds to about 11½ per cent. of soluble phosphate of lime. The samples No. 2 and No. 3 are also richer in phosphate of lime, but poorer in ammonia, than Chincha Island guano.

It will be noticed that several of the samples analysed by me contain a large proportion of alkaline salts. These salts I find consist principally of chloride of sodium, sulphate and phosphate of potash and soda, with more or less nitrates.

As the agricultural and commercial value of manures is much affected by the proportion of nitric acid which they contain, I have carefully determined the percentage of nitric acid which occurs in these recently surveyed guano deposits, and have discovered that whilst some of the samples contain mere traces of nitric acid, and others quantities varying from ¼ per cent. to 1 per cent., a few contain as much as 2½ to 3½ per cent. of anhydrous nitric acid.

The following are the results which I obtained in determining the nitric acid in the 13 samples:—

Guano, deposit from.		Percentage of Nitric Acid in.
Pabillon de Pica,	No. 1	·01
,,	No. 2	·61
,,	No. 3	·04
,,	No. 4	·90
,,	No. 5	1·20
Punta de Lobas,	No. 1	3·40
,,	No. 2	3·50
,,	No. 3	·29
Huanillos guano,	No. 1	2·87
,,	No. 2	2·46
,,	No. 3	·35
,,	No. 4	·25
,,	No. 5	1·10

The occurrence of nitric acid in these deposits is no less interesting from a practical than from a theoretical point of view, for it throws some light on the formation of the large nitrate of soda deposits in the province of Parapaean and other localities in South Peru.

Nitrate of soda probably owes its origin to the nitrogenous organic matter of guano deposits, which in the course of time have been subjected to the action of sea-water and the oxidizing influence of the atmosphere. The search for guano deposits may probably lead to the discovery of extensive nitre beds in the southern parts of Peru.

All the samples, with the exception of one, which is evidently a surface deposit, mixed with much sand, are unquestionably valuable guanos which will command a ready sale in England, especially as they are dry and in a fine powdery condition; but, as they vary in composition, it will, in my opinion, be found necessary to have each cargo carefully sampled, and to fix the price of the cargo according to the intrinsic value of the guano as ascertained by analysis.

AUGUSTUS VOELCKER.

Laboratory, 11, *Salisbury-square*, *Fleet-street*, *E.C.*,
June 1874.

[This Report was presented to the Council at the July Meeting, and was ordered to be forwarded to the Secretary of State for Foreign Affairs, together with a recommendation of the Council, which is embodied in the following communication from Earl Cathcart (acting for the President of the Society in his absence) to the Earl of Derby, Secretary of State for Foreign Affairs.

"MY LORD,—The Council of the Royal Agricultural Society have the honour to submit to Her Majesty's Secretary of State for Foreign Affairs the enclosed report from their consulting chemist, Dr. Voelcker, on the samples of guano sent to the Council by the Secretary of State.

"The Council desire to call the attention of the Secretary of State to the great difference in the samples submitted, and the varying proportions of ammonia and phosphates contained in them. British agriculturists have for some years had to complain that all the guano delivered by the Peruvian Government has been sold by their agents at an uniform price, irrespective of its value as determined by analysis, and the Council take this opportunity of respectfully urging upon the Secretary of State the desirability of impressing upon the Peruvian Government the necessity of adopting a standard analysis for Peruvian guano, and regulating the price of the guano delivered in proportion to this standard analysis.

"The Council beg to tender their cordial thanks to the Secretary of State for his courtesy in sending to the Council a communication of so much interest at the present moment to the agricultural community.

"I have the honour to be, my Lord,
"Your most obedient servant,
(Signed) "CATHCART."]

XXIII.—*Quarterly Report of the Chemical Committee, June* 1874.

THE COMMITTEE have to report that Dr. Voelcker has submitted to them the following cases of inferior manures which have been sent to him for analysis during the past quarter :—

The first three cases reported, again show the advantage of testing manures by independent analysis, in order to ascertain whether they are of equal quality with the analyses furnished by the vendors—more especially in cases where the mixture is sold as special manure prepared for some particular purpose.

1. A sample of barley manure was sent by Mr. W. G. Duncan, of Bradwell, Stony Stratford, who had bought it of an agent at 8*l.* 10*s.* per ton. Dr. Voelcker reported as follows :—

"Analytical Laboratory, 11, Salisbury Square, Fleet Street, E.C.,
"London, March 9, 1874.

"SIR,—I beg to enclose a copy of an analysis of the sample of barley manure which you sent me a short time ago. The manure is too wet to be readily applied to the land. I do not put a precise money value upon manures which are sent me for analysis; but may observe, in a general way, that a manure containing the constituents mentioned in the enclosed copy of analysis, and in the same proportions, can be bought in most places at about 6*l.* 10*s.* per ton.

"Believe me, yours faithfully,
"AUGUSTUS VOELCKER.

"W. G. DUNCAN, Esq."

Composition of a Sample of Barley Manure, sent by Mr. W. G. Duncan.

Moisture	19·66
Water of combination and *organic matter	15·30
Bi-phosphate of lime (mono-basic phosphate of lime)	11·14
Equal to bone phosphate (tri-basic phosphate of lime) rendered soluble by acid (17·45).	
Insoluble phosphates	4·45
Sulphate of lime } Alkaline salts and magnesia }	42·05
Insoluble siliceous matter	7·40
	100·00
*Containing nitrogen	1·71
Equal to ammonia	2·07

Mr. Duncan communicated this analysis and report to the agent from whom he had bought the manure, and received the following reply, which the makers addressed to the agent, after having had a sample of the manure for analysis by their own chemist :—

"April 2, 1874.

"Dear Sirs,—I got the sample, and last night got our chemist's report, which I regret extremely to say quite confirms Dr. Voelcker's. Nothing but carelessness on the part of the men at factory could have made it possible for such manure to be sent out, as it is evident they have not used the ingredients in their proper proportions. We have severely reprimanded our foreman, and told him that, if anything of the kind occurs again, he will be instantly dismissed. To yourselves and customer we must express our sincere regret, and can only add that we shall be most happy to take back the manure, pay all expenses he may have incurred, and supply him with other manures in its place.

"We are, dear Sirs, yours truly,
* * * Manager."

2.—Another sample of manure, invoiced as "Phosphatic Cereal Manure," at 7*l.* per ton, was also sent by Mr. W. G. Duncan, of Bradwell, Stony Stratford, who had bought it of an agent.

With regard to this manure, which was guaranteed to contain 25 per cent. of phosphates, in soluble form, and about 2 per cent. of ammonia, Dr. Voelcker reported as follows :—

"Analytical Laboratory, 11, Salisbury Square, Fleet Street, E.C.,
"London, April 13, 1874.

"Dear Sir,—I beg to enclose a copy of an analysis of the sample of manure which you call a 'cereal manure.' This is a misnomer, for you will notice that the manure contains but little ammonia, an essential constituent of every good cereal manure—ammonia, or at all events nitrogen in some form or other. The sample of manure which you sent me for analysis is also poor in soluble phosphate, and in point of fact is essentially a badly dissolved superphosphate, containing but little nitrogen. A manure of the composition of the sample analysed by me, in my opinion, is not worth more than about 4*l*. 15*s*. to 5*l*. per ton. I should feel obliged to you to inform me at what price this manure is actually sold, and by whom it is manufactured and sold.

"Believe me, yours faithfully,
"AUGUSTUS VOELCKER."

"W. G. DUNCAN, Esq."

Composition of a Sample of "Cereal Manure," sent by Mr. W. G. Duncan.

Moisture	17·16
Water of combination and *organic matter	18·09
Bi-phosphate of lime (mono-basic phosphate of lime)	8·32
Equal to bone phosphate (tri-basic phosphate of lime) rendered soluble by acid (13·03).	
Insoluble phosphates	15·78
Sulphate of lime / Alkaline salts and magnesia	32·87
Insoluble siliceous matter	7·78
	100·00
*Containing nitrogen	·73
Equal to ammonia	·89

On receipt of this letter, communications took place between the several parties, with the result that the following letter, dated April 16th, from the makers, was handed to Mr. Duncan:—

"London, April 16, 1874.

"DEAR SIRS,—We regret much to learn the result of Mr. Duncan's sending to Dr. Voelcker, and at first were much surprised. On enquiries, however, the matter was cleared up, as we are able to connect the complaint with one particular parcel, which was sent out under the following circumstances:—On going to dig out of bulk the Phosphatic Cereal for this order our foreman discovered that, through our acid tank having sprung a leak, a large quantity of acid had run down into the bin in which the manure was, and had made it very wet; so he set to mix, with the shovel, enough ground coprolite with the manure, as he thought, to dry up the excess of acid. Of course the mixing was most imperfectly done, and was in random proportions. This will fully account for the deficiency in ammonia, the excess of insoluble phosphate, and the general bad character given by Dr. Voelcker to the manure. Fortunately it was the only parcel sent out; for, on discovering the matter, we immediately stopped any more going out, and made a fresh bulk, from which we are now delivering. We had no idea, however, that the value of the manure had been so much reduced, or would have taken steps to prevent its being used. As it is, we can only say how much we regret the circumstance, especially happening as it does with a customer of yours who had complained of another make. We shall leave it entirely in your hands to settle with him as you think right, and beg that you will express our unfeigned regret for the annoyance and trouble it has given to him, as well as make a fair and liberal allowance in money. Should he, fortunately, have not used all, will you please have what remains returned to us, and we will replace it with what we are now sending out, and of the quality of which we are perfectly satisfied. Meanwhile, we remain yours truly,

* * * ."

3. Soon afterwards, on April 22, Dr. Voelcker sent the following report on a manure, invoiced as "Best Superphosphate of Lime," to Mr. Duncan, at 5*l.* 10*s.* per ton, and guaranteed by the makers (the same firm as in the "Phosphatic Cereal Manure case") to contain 28 per cent. of phosphates, in soluble form, and a small percentage of ammonia:—

"Analytical Laboratory, Salisbury Square, Fleet Street, E.C.,
"London, April 22, 1874.

"Dear Sir,—I have the pleasure of enclosing a copy of an analysis of the sample of superphosphate which you sent me a short time ago. I notice in the circular of Messrs. * * * their best superphosphate is stated to contain 28 per cent. of phosphates in a soluble form, and a small percentage of ammonia. I find, however, only 19¼ per cent. of soluble phosphate, and the small percentage of ammonia really amounts to merely a trace. This superphosphate would be worth 5*l.* 10*s.* if it contained 28 per cent. of soluble phosphate; but as the insoluble phosphates in it occur as mineral, they are not worth much to the farmer, and in my judgment the sample of manure which you sent me is worth about 25*s.* less per ton than Messrs. * * * best superphosphate guaranteed to contain 28 per cent. of soluble phosphate.

"Yours faithfully,
"Augustus Voelcker.

"G. W. Duncan, Esq."

Composition of a Sample of Superphosphate, sent by Mr. W. G. Duncan, Bradwell, Stony Stratford.

Moisture	18·60
Water of combination and organic matter	9·32
Bi-phosphate of lime (mono-basic phosphate of lime)	12·29
Equal to bone phosphate (tri-basic phosphate of lime) rendered soluble by acid (19·25).	
Insoluble phosphates	10·50
Sulphate of lime } Alkaline salts and magnesia }	43·89
Insoluble siliceous matter	5·40
	100·00

Mr. Duncan having thereupon communicated again with the makers, received from them a reply, dated April 29, and containing the following statement:—

"Our firm has been too long established, and has for too many years held an honourable reputation, for us to condescend to any action which was not perfectly straightforward, and if through any misfortune we get into a difficulty, we are always ready and anxious to do what is right to get out of it. We will not again refer to the matter of the 'Cereal' Manure, as Mr. * * * told you just the simple truth about the way in which the mischief occurred, and we have nothing to add to what he stated, except to express our unfeigned regret that ever that parcel left our establishment.

"And now as regards the superphosphate. This was made, as we represent, from the very best materials, and as we believe in the best manner. The difference, however, between the statement of its composition in our circular and in Dr. Voelcker's analysis, arises mainly from two circumstances—(1).

That rightly or wrongly we include as 'soluble phosphate' the 'precipitated phosphate,' of which there are always from 2 to 3 per cent. present; these we find Dr. Voelcker classes with the 'insoluble.' (2). The superphosphate has evidently 'gone back' since it was made, as it will do sometimes when certain substances such as iron are present in the original coprolite. Putting these two points together will fully account for the difference. The analysis shows that the phosphoric acid is present, although not in the form represented by us, which will relieve us from any imputation of having 'adulterated' the manure, which is the point about which we are anxious; as we have honestly gone into the business with a determination to sell only good articles, and have resolutely abstained from anything in the shape of adulteration.

"You are probably aware that this is a new trade with us, and we must learn wisdom by experience. We see in Lawes's circular, that superphosphate is stated to contain from 23 to 27 per cent. of 'soluble phosphate,' and that the minimum only is guaranteed. We unfortunately, in getting out a circular, from want of experience overlooked the fact that manures are liable to 'go back,' and did not leave any margin for any such accident happening.

"As regards what you have left, Messrs. * * * will arrange with you about sending it back. With respect to what you have used, we have no fear of the result; for although the analysis shows only 19·25 per cent. of really 'soluble' phosphate, we are certain that the 10·50 of 'insoluble' (according to Dr. V.) contains a large proportion of 'precipitated,' which, practically, is just as useful to the plant as the 'soluble,' and in a very wet season more so, as it is not so liable to be washed down into the subsoil, and is, nevertheless, as good 'food' for the roots as the fully 'soluble' phosphate. We do not in the least fear the loss of the turnips, and venture to hope, on the contrary, that in spite of the unsatisfactory 'analysis,' you will find the manure produce really satisfactory results.

"Under any circumstances you shall not have cause to complain of our treatment, and we indulge the hope that though our first transactions have been so very unfortunate, we may have the pleasure of doing business with you in a perfectly pleasant and satisfactory manner for many years to come.

We are, Sir, yours faithfully,
* * *."

Mr. Duncan, in sending these documents, stated, "I think it only fair to both Messrs. * * * and * * * to say, that the first-named firm supplied me, gratis, with 3 cwt. of nitrate of soda, and that the barley where their manure was sown looks as well, if not better, than any other barley within miles of my farm; that when I sowed the nitrate of soda, I left out a strip of barley *unsown*, and that I can at present see no difference in that portion of the crop. As regards the second firm, they make no charge whatever for the 'cereal manure,' which was sown on 4 acres of oats, and have given me 6 cwt. of nitrate of soda gratis. The superphosphate, or turnip manure, is not charged for either. I used half of it with some early turnips, and the other half Messrs. * * * fetched away. The oats where the 'cereal manure' was sown, looked well, but they have been helped by the 6 cwt. of nitrate. I cannot speak fully on this crop yet, because, being later sown than the barley, there is not yet much shown, neither can I say anything of the effects of the manure on the turnips, as they are not yet hoed out. No doubt I was very unfortunate with both these firms, but I hope there was nothing but neglect in their dealing, and not cheating." Under these circumstances the Committee withhold the names of the firms in question.

4. A sample of "English nitrate of soda" was sent by Mr. Charles Cock, of Hamshead, near Birmingham, who had bought it of Messrs. Padley & Co., of 40, Toll End, Tipton, Staffordshire, at 12*l.* per ton.

This so-called "nitrate" yielded on analysis, the following results :—

Moisture and water of combination	32·55
*Sulphate of iron	40·98
Sulphate of lime	·32
Sulphate of soda and a little chloride of sodium (common salt)	22·42
Insoluble siliceous matter	3·73
	100·00

*Equal to crystalled sulphate of iron (green vitriol) 74·95

Mr. Cock states, "this order was given because a gentleman (who stated himself to be a partner with Padley & Co., and was accompanying their agent soliciting orders) informed me it was better manure, and would produce better results than the imported nitrate under 5 per cent. refraction" [impurity]. The preceding analytical results, however, show that this so-called nitrate is merely salt-cake and green vitriol, and that it possesses no manurial properties whatever.

5. A sample of oil-cake was sent by Mr. George Liddell, Jun., of Chilton, Ferry Hill, Durham, who obtained it from Messrs. T. & G. Marley, of Bishop Auckland, to whom it had been invoiced by Messrs. Pearson & Bailey, of Hull, as ▽P B pure linseed-cakes at 12*l.* 15*s.* per ton, each cake being also branded with a triangle and the initials P. B.

This cake yielded the following results on analysis :—

Moisture	14·07
Oil	13·50
*Albuminous compounds	26·31
Mucilage, &c.	27·22
Woody fibre	9·89
†Mineral matters	9·01
	100·00
*Containing nitrogen	4·21
†Sand	4·97

Dr. Voelcker reported that this oil-cake was not a pure linseed-cake, but was made from dirty linseed, containing many small weed-seeds, and 5 per cent of sand.

6. Another sample of oil-cake, which had been sold at 13*l.* 10*s.* per ton, was sent for analysis by Mr. T. T. Porter, of Baunton, Cirencester, and proved to be not a pure linseed-cake, but made from dirty linseed, full of small weed-seeds, and starchy matter which does not occur in pure linseed-cake.

The following results were obtained on analysis :—

Moisture	14·06
Oil	10·41
*Albuminous compounds	25·94
Mucilage, starch, &c.	29·07
Woody fibre	13·49
†Mineral matter	7·03
	100·00
*Containing nitrogen	4·15
†Containing sand	3·11

This cake, although sold at so high a price, was not invoiced as pure linseed-cake. The Committee therefore withhold the name of the vendor.

7. A sample of soot, which was sent by a member who had bought about 10,000 bushels of it, of a common sweep, at 6*d.* per bushel, yielded on analysis the following results :—

Moisture	2·11
*Organic matter	24·62
Mineral matter	73·27
	100·00
*Containing nitrogen	·42
Equal to ammonia	·51

Dr. Voelcker reported as follows :—" This sample contains but little soot, and consists principally of ground coal-dust, ashes, and rubbish, and is barely worth 10*s.* per ton. Good soot yields from 3 to 4 per cent. of ammonia, and is worth about 2*l.* 2*s.* per ton."

XXIV.—*Report of the Health of Animals of the Farm.* By Professor J. B. SIMONDS, Principal of the Royal Veterinary College, and Consulting Veterinary Surgeon to the Society.

It will be in the remembrance of the Veterinary Committee that in my last Report on " The Health of Animals of the Farm " (p. 269), a detailed account of some experiments, which had been instituted for the purpose, if possible, of diminishing the obscurity which still enshrouds those diseases ordinarily known as blood-diseases, was brought to their notice. Since then the following additional experiments have been carried out with reference to the malady known as

"Splenic Apoplexy."

January 24th, 1 p.m. Inoculated a guinea-pig (No. 1.) One needle puncture on the inner part of each thigh. Needle soiled with some blood which was found effused beneath the lining membrane of the heart of an ox which had died from an attack of splenic apoplexy. The blood was examined microscopically, and found to contain bacteridies in immense quantities.

On the morning of the 27th, about 65 hours after the inoculation, the guinea-pig was found dead. No indications of ill-health had been previously observed. Its blood contained bacteridies in abundance.

27*th*, 9.30. a.m. Inoculated a guinea-pig (No. 2) with blood of guinea-pig (No. 1). Two needle punctures. Animal found dead 46 hours after inoculation. Bacteridies in blood.

February 3rd. Inoculated a rabbit with blood of guinea-pig (No. 2). Rabbit died very suddenly on the following day, about 13 hours after the inoculation. No indications of illness were in this case recognised prior to death.

4*th*. Inoculated a second rabbit with blood of guinea-pig (No. 2), diluted with eight parts of water. *Negative result.*

Same day inoculated a small terrier dog with blood of rabbit (No. 1). Two punctures.

5*th*. Animal dispirited. Shows much pain and stiffness of the inoculated limbs.

6*th*. Local suffering increased. Animal refuses food and is very restless. The indications of illness increased during the day. By night the restlessness had, however, passed off, and the animal now maintained a recumbent position, and could scarcely be made to move.

7*th*. Early this morning the animal was found to be sinking. Died at 8.30, about sixty-four hours after the inoculation. The blood was very carefully examined, but no bacteria nor bacteridies were detected. All the structures of the body were free from organic lesions.

9*th*. Inoculated guinea-pig (No. 3), with blood of dog. Two punctures. *Negative result.*

Same day inoculated guinea-pig (No. 4) with blood of guinea-pig No. 2, which died January 29th. *Blood eleven days old.* Guinea-pig died within forty-two hours of the inoculation.

14*th*. Inoculated guinea-pig (No. 5) with blood of guinea-pig No. 2. *Blood fifteen days old.* Guinea-pig died during the night succeeding the inoculation.

These experiments correspond in their chief results with those previously reported. Nevertheless, in the present state of the subject of blood-poisoning, it would not be right to draw any positive deductions from so limited a number of experiments, beyond the fact of the easy communicability of this class of diseases from animal to animal. It may, however, be remarked that, in one set of experiments, local effects only followed inoculations with diseased blood which had been kept from *four to five weeks;* and in the other, that death of the inoculated animals took place when the blood had been preserved for the space of *fifteen days.*

It would also appear that carnivorous animals are less susceptible to the deadly effects of diseased blood of the kind employed than herbivorous.

With regard to outbreaks of Splenic Apoplexy, they have been fewer during the past six months than is ordinarily the case. Two instances of the occurrence of the disease have, however, been investigated; but in neither were the losses so serious as often happens. The particulars of these cases are described by the Assistant Professor Axe, whose Reports are appended hereto.

Pleuro-Pneumonia.

Some additional experiments to those reported on a former occasion have been instituted with a view to determine whether or not Pleuro-pneumonia could be produced by means other than the cohabitation of healthy with diseased animals. It was first determined to ascertain whether any portion of the *serous exudation* from the lung of an animal which had died of Pleuro-pneumonia could safely be injected into the lungs. For this purpose two sheep were selected, and a *drachm of the serum* injected into the left lung of each by puncturing the upper part of the chest with a small tubular stilet fitted to a syringe. No difficulty was experienced in performing the operation, and on withdrawing the stilet the animals did not give any evidence of acute suffering or pain. Indeed, they presently began to feed with quite a natural appetite. They were kept under close observation day by day, and their temperature registered, but no indications of disturbed health were detected. Weeks passed away, and during the whole time they remained healthy.

Other experiments were now determined on, and on April 10th of the present year, *two drachms of serous exudation* from the lung of a cow, the subject of Pleuro-pneumonia, were injected into the left lung of an eight-months-old heifer-calf. At the same time a like quantity was injected into the left jugular vein of another calf of the same age; and to a third calf *seventeen days old, half-an-ounce of the same fluid mixed with two ounces of milk was given as a draught.*

The temperature of each animal was taken prior to the performance of the experiments, and found to be nearly equal in all, varying only from 102·4° to 102·8.°

April 12th. As no ill effects had been recognised in either animal up to this time, *an ounce* of the same serous exudation was given to the young calf, mixed with milk as before. A microscopic examination of the fluid on this, as on the former occasion, showed the presence of bacteridies in large numbers.

15*th.* The young calf gives evidence of blood-poisoning. It is remarkably dispirited, and refuses to suck. The temperature, however, registers only 101·5°.

Since the 10th, the temperature has fluctuated in all the animals to a slight extent, but has never risen above 104,° a point it has now attained in the animal into whose blood the serum had been injected.

16*th.* The indications of blood-poisoning are more aggravated in the young calf. Indeed it is fast sinking. It lies in a semi-comatose condition, and is constantly moaning. Temperature 103°. Died at 7.30 p.m. No lesions, other than those belonging to ordinary blood-poisoning, were met with on a *post-mortem* examination in any organ of the body.

23*rd.* Since the 16th, the health of the two eight-months-old animals has been uninterrupted; to-day, however, a slight swelling has shown itself around the site of the punctured wound of the vein.

The inflammatory action giving rise to this swelling increased day by day, and ultimately ended in the detachment of a small slough on May 5th. With the exception of this local affection, no ill consequences resulted from the injection of the serum into the blood.

The other calf also remained proof against the injection of the fluid into the lungs.

Both animals are still (July 31st) in the College Hospital and in perfect health.*

Notwithstanding these negative results, it was determined to repeat the experiment of injecting pleuro-pneumonia exudation fluid directly into the lungs of two other calves, and in much larger quantities.

The animals selected were about ten months old, very healthy and in good condition.

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* Up to the time of this Report being sent to press—September—these animals continued in perfect health.

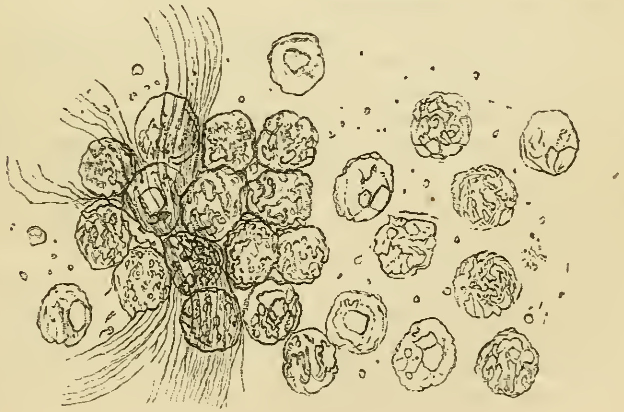
On *June 20th*, six drachms of serous fluid from the diseased lung of a cow were injected, as in the former instance, into the left lung of one of the calves, and the same quantity into the trachea of the other, by puncturing the tube in its lower cervical portion. No bacteria or bacteridies were detected in the fluid.

The temperature of one animal registered 103° and the other 103·3°. The injection of the fluid into the trachea produced an immediate cough, by which a small quantity of it was driven upwards and expelled by the nostrils. Little or no pain seemed to attend the injection into the lung. Careful observations were daily made down to July 6th, and the temperature noted from time to time without any deviation from health being detected in either animal. On this day—the sixteenth from the date of the experiment—a swelling of the neck came on in the animal into whose trachea the serum had been injected. It somewhat rapidly increased, and in the course of a couple of days extended from the angle of the jaw to the chest. It was remarkably hard to the touch, but not very sensitive or hot. Symptoms of sympathetic fever set in, and the temperature rose to 106·4°.

In connection with the progress of this case, and also with the other, it is important to notice that the weather had now become excessively sultry, and continued so to nearly the end of the month, with very slight variations. This, doubtless, had much to do with the untoward result of both experiments, but at the same time it gives additional interest to them pathologically, and confirms the experience of persons who have recourse to inoculation as a preventive of Pleuro-pneumonia during the prevalence of a high temperature.

During the next two days the neck of the animal increased so much in size as mechanically to interfere with respiration. The animal's appetite likewise failed, and the febrile symptoms became more aggravated. The temperature, however, only rose $\frac{2}{10}$ higher, viz., to 106·6. So far as attention to dietetics and protection from the rays of the sun could afford relief, every attention was given to the animal ; but, with the exception of fomentations to the neck, nothing was done medically to arrest the progress of the disease : indeed it was all important, to the end sought to be obtained, that the malady should run its natural course. The animal bore up better than was expected, and remained much in the same condition up to July 20th, when it was determined to kill it for the purpose of making a *post-mortem* examination. This resolve was influenced by the circumstance that the other calf—whose case has to be mentioned more in detail—died this day.

The *post-mortem* examination showed that the swelling of the neck was entirely due to the exudation of an enormous quantity of lymph into the areolar tissue, not only as connecting the cervical muscles together as a whole, but as uniting the fasciculi of each muscle the one to the other. This infiltration of yellow-coloured lymph contrasted greatly with the red fibres of the several muscles, and gave to them a peculiar striated appearance, not very dissimilar to that which is present in the lungs of an animal affected with Pleuro-pneumonia. Contrary, however, to expectation, *no disease whatever was found either in the windpipe or in the lungs.* Even the lining membrane of the windpipe and the bronchial tubes did not give the least indication of any abnormal fluid having been brought in contact with it; nor was there the slightest trace of disease to be detected in any organ, either of the chest or abdomen. A microscopic examination of the lymph showed that it was almost entirely made up of cells, both granulated and nucleated. Only a few fine fibres were to be detected. Under the 25th objective the exudation matter presented the appearances represented in the annexed engraving. The fasciculi of the muscles were pale, swollen, and disintegrated, presenting an appearance from the soddening effect of the exuded lymph very similar to that which is seen in stewed meat.



To return to the case of the calf into whose left lung six drachms of the serum were injected. It has been stated that up to July 6th, the date of the attack of illness of the other calf, this one continued well. On July 9th—a very hot day—the temperature of the body rose to 107·5°, and the animal gave evidence of general excitation. On the 10th, the upper part of the chest on the left side—the site of the puncture—was swollen and painful to pressure. The pulse was high and the breathing increased, and all the ordinary symptoms of sympathetic fever were present. The swelling rapidly increased, and although it partook of the hardness which belonged to the other case, the more fluid portion of the exudation matter gravitated to the inferior part of the abdomen and produced considerable œdema. The progress of the disease was more rapid than in the other calf, and the sufferings of the animal more severe.

Death took place during the night of the 19th. The *post-mortem* examination showed extensive effusion of yellow-coloured lymph, as in the other case, into the areolar tissue external to the chest, the muscles being in precisely the same condition.

The lungs in this instance also were found to be perfectly free from disease, and the only change which had taken place in the thorax was an effusion of a very small quantity of reddish-coloured lymph on the external surface of the pericardium. The viscera of the abdomen had, however, suffered to some extent. Partial peritonitis, associated with adhesion of the rumen to the diaphragm, existed on the left side. Slight ascites was also present; but a lesion which attracted more attention was an effusion of nearly colourless lymph into the *structure of the spleen.* Deposits also of the same material existed here and there upon the surface of the peritoneum.

These experiments must be regarded as of considerable importance in determining the question, By what means does Pleuro-pneumonia extend the area of its existence? That the disease cannot be produced by any artifical means—so to speak—every experiment carried out by Professor Brown and myself has fully established. So conclusive are these proofs that further investigation in this direction seems quite unnecessary.

By cohabitation of healthy animals with the diseased, Pleuro-pneumonia has alone been found to spread.

It only remains for me to add that several investigations of various diseases have been made by Assistant Professor Axe, during the past six months, on the respective farms where they occurred, and that his Reports are attached as an *addendum* to this communication.

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1. *Report of an Investigation of a Disease in a Herd of Cattle, the Property of* Colonel Coryton, *Pentillie Castle, Cornwall.*

On the 2nd of April I visited Pentillie Castle, and examined a herd of cattle, the property of Colonel Coryton. Three animals (milch cows) had already died, and four others I found to be suffering from the effects of the malady. The symptoms exhibited by the affected cattle, as well as the lesions observed after death, fully established the identity of the affection with that form of blood-poisoning which is termed "*Splenic Apoplexy.*" This view of the nature of the affection was strengthened by microscopical examination of the blood, which exhibited the usual minute organisms (Bacteridies) in large numbers, which are ordinarily present in this affection. This opinion is further confirmed by the inoculation of a rabbit with the diseased blood, death following in thirty-six hours.

From a careful inquiry into all the circumstances relating to the general management of the herd, I am of opinion that the disease had its origin in the too free use of succulent and innutritious food, in the form of sprouted turnips, and coarse and badly-got hay. This conclusion is supported by the fact that those animals which were receiving a fair amount of cake in addition to their other food, although in other respects under similar management, were free from disease. The measures adopted for arresting the further progress of the malady consisted of an entire change in the character of the food, substituting for the sprouted turnips—cake, corn, and bran; and the administration of antiseptic and tonic agents. At the same time due regard was had to every precaution relating to the disposal of the carcases, and such other matters as were calculated to keep the disease in a state of activity.

J. Wortley Axe,
Assistant Professor.

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2. *Report of an Investigation of an Outbreak of Splenic Apoplexy among some Bullocks belonging to* Mr. F. Freeman, *Springwell Farm, Woburn.*

On the 16th of June I visited Springwell Farm, and investigated the circumstances relating to an outbreak of splenic apoplexy in a herd of cattle belonging to Mr. F. Freeman. The herd to which the outbreak refers consisted of ten steers, ten heifers, and two milch cows. The former were pastured in a field adjoining the farmstead (Home-Close), which is remarkable for the richness of its herbage, and good feeding properties. Besides grass, these animals were receiving about four pounds of linseed-cake daily. The heifers and milch cows were pastured in a field contiguous to the Home-Close (London-Close) until the 5th of June, on which day one of the steers was found dead. A change of pasture being considered advisable, in consequence of the death of this animal, the remainder of the steers were removed from the Home into the London-Close, and at the same time the heifers and milch cows were placed in the Home-Close, from which the steers had been taken. On the 12th of June, one of the heifers died after a few hours' illness, and on the 16th of the same month one of the milch cows also succumbed to the disease. The nine heifers and remaining milch cow were now removed from the Home-Close into an adjacent pasture. A *post-mortem* examination of the cow which died on the 16th was made by me. The lesions observed were such as are usually found in connection with the malady known as *Splenic Apoplexy*, and from the information I obtained, I am of opinion that the death of the steer, and also of the heifer, arose from this same disease. The original cause of the malady, probably, depended on a too liberal supply of nutritious food, following upon the removal of the steers from a moderate pasture into the Home-Close. It is also highly probable that the extension of the malady was due, in part, to the herbage of the pasture becoming impregnated with the excretions of the diseased steer.

With a view of arresting the further progress of the malady, it was suggested that no animal of any kind should be allowed to pasture in the Home-Close for two months at the least; that all the fresh manure, as far as practicable, should be removed from this pasture, and that the stables in which the diseased animals had been placed should be thoroughly cleansed, disinfected, and lime-washed, and that the manure should be burned. In reference to the future feeding of the animals it was ordered that no more cake should be given for the present. The prophylactic treatment also consisted of the administration of mild aperients and antiseptics.

A short time after my visit Mr. Freeman informed me that no other cases of the disease had occurred.

J. Wortley Axe,
Assistant Professor.

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3. *Report of an Outbreak of Disease in a Herd of Dairy Cows, the property of* Lady Churchill.

On the 26th of June I visited Cornbury Park, Charlbury, Oxon, and examined the above-mentioned herd, which I found to consist of forty-six milch cows, thirty-six yearling calves, and thirteen steers and heifers. The disease had reference to the milch cows only, three of which had died previously to my visit and three others I found to be more or less affected. The malady first appeared on the 4th of June, and since that date had continued to spread. The cows and other stock were pastured on park-land, some parts of which, and especially that portion allotted to the milch-cows, is thickly wooded, the herbage in consequence being inferior both in quality and quantity. The latter especially was very short, from the dryness of the present season. Among the trees are many oaks and beeches, and beneath these I found large quantities of the husks of acorns and beechnuts.

The symptoms observed during the progress of the malady were characteristic of that form of blood-disease, termed *Hæmo-albuminuria*, or as more commonly called "red water." The origin of the affection was, in my opinion, entirely due to a deranged condition of the digestive system, arising from large quantities of indigestible matter, such as the husks referred to, being partaken of with the ordinary herbage. The means adopted for arresting the spread of the malady consisted of removing the cows into a fresh pasture and administering to them aperient and antiseptic medicines. It was also suggested that, so far as practical, the husks of the acorns and the beechnuts should be removed from beneath the trees. With reference to the medical treatment of the animals already affected, diffusible stimulants, with mucilaginous drinks and tonic agents, were prescribed, according to circumstances. These means, both preventive and curative, I am since informed have proved beneficial.

The urine obtained from one of the diseased animals was submitted to a careful examination. When evacuated it presented a dark-red colour, and in a short time became nearly black. It had a clear and bright appearance, and, after standing for some time, only a very slight sediment was deposited. This sediment, when examined microscopically, was found to consist of epithelial scales, apparently from the bladder and vagina, with granular matter and some lime salts. The urine had an alkaline reaction to test-paper. On boiling, a copious flocculent precipitate of albumen was obtained, and a similar result followed upon the addition of nitric acid; at the same time considerable effervescence was produced. The following determinations have been made at my suggestion by Mr. Neison, Demonstrator of Chemistry in the Royal Veterinary College:—

Normal Urine.

Sp. Gr. 1·040.	Per cent.
Residue dried at 212° Fahr.	8·2
Ash upon incineration	2·7
No coagulum.	

Abnormal Urine.

Sp. Gr. 1·046.

Residue dried at 212° Fahr.	10·8
Ash upon incineration	3·1
Coagulum formed on boiling; after being dried at 212° Fahr.	1·8

Practically the main difference in the two samples of urine has chiefly reference to the albuminous compounds present in the abnormal specimen. The examination, both chemically and microscopically, fully confirmed the conclusions which were arrived at some years since at the College.

J. Wortley Axe,
Assistant Professor.

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4. *Report of an Investigation of a Disease among some Lambs on the Farm of* Mr. Abel Smith, *Woodall Park, Hertford.*

On the 6th of March I visited Woodhall Park, near Hertford, and examined a flock of lambs, the property of Mr. Abel Smith, the produce of 150 ewes of the Southdown breed. The ewes began to lamb on the 14th of January, and on the date of my visit only sixteen had still to lamb. The lambs at birth presented a fair average condition, and were apparently perfectly healthy. About the second week in February, however, some of them gave evidence of a disease to which forty had succumbed at the time of my visit: and thirty others were in a precarious condition. The ages of the animals affected varied from one to twenty-one days, and the duration of the malady ranged between five days and three weeks. The early indications of the disease were associated with a faulty gait, which gradually developed into acute lameness, and resulted in many instances in an inability of the animal to stand.

Some of the lambs at the commencement of the attack are affected with enlargements of the joints of various sizes, which soon assume the form of fluctuating tumours, and, unless opened by artificial means, they break, and pour forth a quantity of thick, yellow, pus-like matter. The joints most frequently affected are the hocks and knees; similar enlargements, however, also show themselves on the fore-arms and thighs; and others occur about the belly, flank, arm-pits, and throat. In reference to the last-named situation of the tumours, it may be observed that suffocation is by no means an uncommon result. The tumified parts are hot, red, and acutely sensitive to the touch. In several of the cases some of the local symptoms above referred to are variously modified, or altogether absent. In the latter case the constitutional symptoms are most marked and severe; but the duration of the malady is not so long. In these cases all desire for food ceases, the animal is very dispirited, mostly recumbent, and evinces no desire to move; the pulse and breathing are much accelerated, the mouth is dry and hot, the bowels constipated, and the visible mucous membranes are of a reddish-yellow hue. In some few cases a defluction of tears from the eyes, and a mucous discharge from the nostrils, are seen early in the attack, and continue, to a greater or less extent, throughout the duration of the malady. With the progress of the disease the symptoms become much intensified, and end almost invariably in death, chiefly as the result of extensive morbid changes affecting the internal organs.

Several *post-mortem* examinations were made of those lambs which I found dead, and also of others in various stages of the disease, which I had destroyed for the purpose. The lesions exhibited varied as to situation and extent; but they were identical in their nature in every instance. On removing the skin from the body, tumours of various forms and sizes were found in the several situations mentioned above. Some of them contained a watery fluid, while others were filled with a pale-yellow, pus-like matter of various degrees of consistence. The tumours in connection with the joints were associated with a distended condition of the joint-capsules. Others, which were situated beneath the fibrous coverings of the muscles of the extremities and between the muscles of the belly, consisted of thin, fibrous cysts, filled with a similar material. Most of the lymphatic glands were either hæmorrhagic or reduced to a soft, cheesy mass. Some were larger than natural. The abdominal cavity contained a greater or less amount of turbid serum, mingled with small fragments of soft lymph; the peritoneum was inflamed in patches, and also covered with thin flakes of inflammatory products. The liver was spotted over with various-sized masses of cheese-like matter of a whitish colour. On section similar deposits were also noticed in its substance. The gall-bladder was full of thin bile of a greenish-yellow hue. The alimentary canal gave no evidence of disease. The contents of the chest were free from structural change; but the lungs of all were of a very pallid hue. The result of my examination of the organs of the chest was in accordance with that of the shepherd, who had made many *post-mortem* examinations, and said the lungs were sound in every instance. In those cases where enlargement of the throat existed, the lymphatic glands appeared to be primarily affected.

From the history of the outbreak of this disease, together with the symptoms presented during its progress, and the lesions observed after death, it is evident that the cause, whatever its precise nature might be, originated in the system of the ewes. Attention was, therefore, directed to their condition and general management. I learned that, for eighteen years at the least (how much longer could not be ascertained), the ewes had been in-and-in-bred, and that no fresh blood, save occasionally on the male side, had been introduced into the flock during that period. The condition of the ewes was by no means good, and they presented a dwarfed aspect; but, nevertheless, appeared free from any positive disease. With regard to their general management it was ascertained that, from the first week in November to the second week in January—at which time they commenced to lamb—their food consisted of turnips, with a small quantity of hay, chaff, and malt-dust. After this time they were pastured on park-land, and received, in addition, a liberal supply of turnips. It may here be observed that the turnips were not only much grown, but many of them were also very much decayed, and in a state totally unfit for food for sheep. The disease appeared in the flock about the second week in February, and continued to increase in extent and severity up to the time of my visit.

A careful consideration of the foregoing facts suggests the following deductions, viz.:—*First.* That the long-continued use of one family of ewes through successive generations had established in this flock a serious constitutional weakness.

Second. That the watery and decayed condition of the turnips upon which the ewes were fed had had the effect of impairing the health and vigour of the lambs, by diminishing the nutritive properties of the milk of the ewes, and otherwise altering its qualities. It may, however, be remarked that, from the time of their birth, the lambs were carefully protected from wet and draught.

With reference to treatment, it was suggested that all turnips should be withheld from the ewes, and that grass, with a liberal supply of crushed oats, cake, hay-chaff, and bran, should be allowed in their stead, and that alternate doses of tonics and salt should be administered daily in the food.

The following is a copy of a letter from Mr. Smith's agent, which was received by me on the 15th of March, nine days after my visit. It is satisfactory to observe, from his statement, that immediate beneficial effect followed upon the treatment suggested.

"Dear Sir, "Woodhall Park, 14th March, 1874.

"I am happy to inform you that there is a decided improvement amongst the lambs; very few fresh cases having occurred.

"*J. Wortley Axe*, "Yours truly,
Assistant Professor." "J. Noble.

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5. *Report of an Investigation of a Disease in a Flock of Ewes and Lambs, the Property of* Lord Braybrook, *Audley End, Essex.*

With reference to this investigation I have to report that the flock consisted of 193 ewes, and a fair average number of lambs. The ewes commenced lambing on the 4th of February, and by the 25th of the same month nearly all of them had produced their lambs. On the 4th of March the lambs were attacked with a disease (*Aphtha maligna*), which continued to spread, so that by the time of my visit (March 26) forty had died, and thirty others were more or less affected. Subsequently to the outbreak of the disease in the lambs a pustular eruption was observed on various parts of the body of some of the ewes, and more particularly on the teats and mammary gland; but, beyond an inability in some instances to suckle the offspring with comfort, the ewes did not materially suffer. The ages of the lambs attacked varied from fourteen days to three weeks, and the duration of the malady from six to twenty-one days. The weaker lambs were first and most severely affected.

The disease manifested itself by an accumulation of frothy saliva in the mouth, and a pustular eruption on the tongue, lips, and gums, of the lower jaw in particular. In some instances the eruption extended beyond the mouth to the nose and chin, the accumulated matter drying into a dark, blood-stained scab. The appetite was but little impaired; but, in the majority of cases, the operation of sucking was much interfered with, or altogether prevented, by the sore and painful condition of the lambs' mouths. The constitutional symptoms were but slightly marked in the early period of the disease; as it advanced, however, the emaciation and weakness gradually increased. The pulse became quick, and the breathing hurried and painful; and in some cases an occasional sore-cough was heard, which was accompanied with a muco-purulent discharge from the nostrils.

The lesions presented on a *post-mortem* examination were chiefly centred in the lungs; occasionally in the liver. In the first-named organs large abscesses were met with, and in the latter, deposits of cheese-like matter of various sizes and of different degrees of consistence. Ulcers and pustules were present in and around the mouth. The body in all cases was much emaciated. Previously to parturition the ewes were fed on swede turnips and trefoil-hay by day, and grass by night; subsequently, however, they were folded on turnips alone, which were much grown.

A careful consideration of the circumstances relating to this outbreak of disease furnishes the following deductions, viz.:—*First*. That the disease in the lambs originated in an altered condition of the milk of the ewes.

Second. That this condition was the effect of the exclusive use of badly-grown turnips as food for the ewes subsequently to parturition.

The truth of the first deduction was verified by the following experiment. Two lambs from a healthy flock were fostered upon one of the diseased ewes, and in three days both of them became affected with the malady, and subsequently died.

The withdrawal of turnips, and the substitution of cake, corn, and grass, soon produced a marked effect in arresting the further spread of the malady.

J. Wortley Axe,
Assistant Professor.

XXV.—*Report on the Farm-Prize Competition of* 1874.

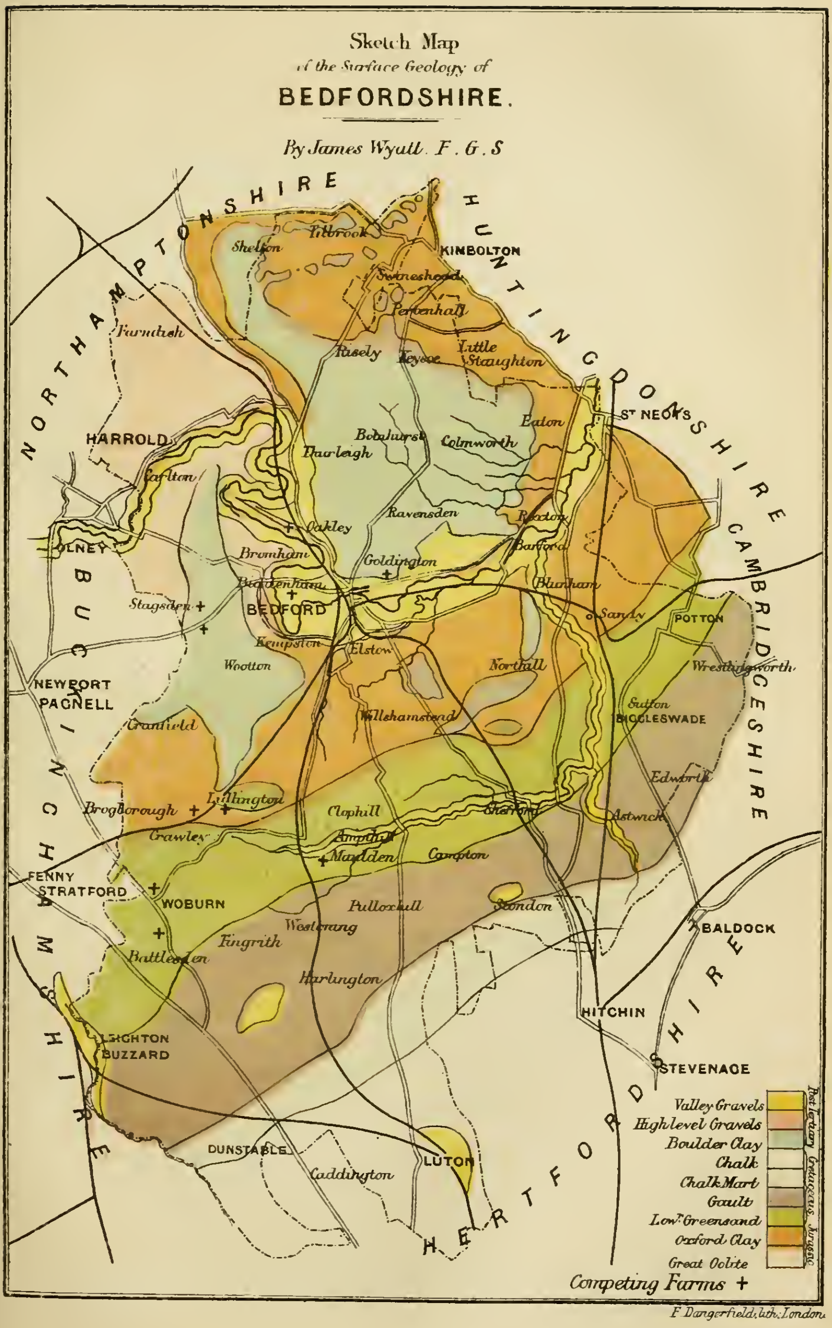
By G. H. Sanday, of Wensley House, Bedale.

[With a Geological Map and Notes on the Geology of Bedfordshire, by James Wyatt, F.G.S.]

Geology of Bedfordshire.

The surface configuration of this county presents a series of gentle undulations and an entire absence of abrupt escarpments or sudden elevations, the whole of the strata being comprised within the series of the Secondary formations. Crossing the county from north to south there is a gentle inclination to the centre—the Ouse Valley—and from this part to the extreme southern limit there is an uniform gradient to the Chalk range of the Chilterns; but even at the highest point in the latter region the elevation above the sea-level does not exceed 500 feet. At the town of Bedford, which is nearly in the centre of the county, the land-surface is only 100 feet above the mean level of the sea. But although, geologically speaking, the stratification of this county is confined to narrow limits, the surface displays a great variety of soils, as well on account of the oolitic and cretaceous systems here uniting, as of the physical changes brought about by denudation, and the phenomena of the Post-tertiary drifts. It will be seen by the Map annexed that westwards the Great Oolite extends nearly to Bedford; but northward and eastward there is a large breadth of Oxford clay which extends across, south-westward, into Buckinghamshire. A few miles south of Bedford the range of the Lower Greensand, forming an elevated plateau, runs across the county from east to west; and in parallel lines, further south, there follow other beds of the Cretaceous series, viz., the Gault, Chalk-marl, Totternhoe Clunch, Lower Chalk, and Upper Chalk with flints.

A great portion of the Northern area is covered with the tenacious clay of the Glacial drift, usually known as Boulder-clay; and although much of this has been removed by subsequent denudation, the "wreck" of it is largely represented by the pebbles, boulders, and sub-angular fragments of various rocks—mostly foreign to this district—left on the surface of the land. In some localities to the north of Bedford this Boulder-clay has a mean depth of 50 feet and upwards, thickly interspersed with boulders scored and striated, showing evidence of their transportation by ice; whilst in other parts only a thin layer remains; and in some places, by cultivation, it has become incorporated with the subjacent Oxford clay, and its existence is known only by the presence of scattered boulders. It was across this boulder-clay region that the chief drainage of the district, at an early


Sketch Map
of the Surface Geology of
BEDFORDSHIRE.
By James Wyatt. F. G. S
NORTHAMPTONSHIRE
HUNTINGDONSHIRE
CAMBRIDGESHIRE
BUCKINGHAMSHIRE
HERTFORDSHIRE
KIMBOLTON
Tilbrook
Shelton
Swineshead
Pertenhall
Farndish
Risely
Keysoe
Little Staughton
ST NEOTS
Eaton
HARROLD
Bolnhurst
Colmworth
Thurleigh
Carlton
Ravensden
Roxton
Oakley
OLNEY
Bromham
Goldington
Barford
Biddenham
Blunham
Stagsden
BEDFORD
Sandy
POTTON
Kempston
Elstow
Wootton
Northill
Wrestlingworth
NEWPORT PAGNELL
Sutton
Willshamstead
BIGGLESWADE
Cranfield
Edworth
Lidlington
Brogborough
Clophill
Shefford
Astwick
Crawley
Ampthill
Maulden
Campton
FENNY STRATFORD
WOBURN
Pulloxhill
Stondon
Westoning
BALDOCK
Fingrith
Battlesden
Harlington
HITCHIN
LEIGHTON BUZZARD
STEVENAGE
DUNSTABLE
LUTON
Caddington
Valley Gravels
High level Gravels
Boulder Clay
Chalk
Chalk Marl
Gault
Lowr. Greensand
Oxford Clay
Great Oolite
Post Tertiary
Cretaceous
Jurassic
Competing Farms +
F. Dangerfield, lith: London.

period, found its course and is still continued in that direction—from west to east—the river having cut its way through the boulder-clay and the under-lying Oxford clay to the Cornbrash and Middle Oolite limestones. The large valley of the Ouse thus formed displays a great but variable breadth of gravel and alluvium; the former being composed of a remarkable variety of sub-angular rock fragments and pebbles, derived chiefly from the Boulder-clay in question. This gravel covers up the fossil bones of the Mammoth and other extinct mammalia, thus indicating the period when certain of these physical changes took place, and the gravel itself is covered by an alluvium, in some parts of considerable thickness and great fertility.

The river Ouse received, in post-glacial times, large, although probably intermittent, supplies from its extensive watershed; and the formation of the valley, which was thus gradual, may be traced by the remnants of *débris* in terraces still left at the higher levels—the gravel being, like that at the lower levels, composed of fragments of igneous and metamorphic rocks, as well as fossils and rock-specimens from the coal-measures, triassic, jurassic, and cretaceous beds elsewhere.

If the several strata had preserved their original condition the boundary lines might have been comparatively easy for the observer to detect; but the subsequent phenomena of the glacial and post-glacial epochs have produced more complicated conditions; and in some parts it is with difficulty that the actual boundary lines can be defined, by reason of the superficial deposits. Nevertheless the changes in the appearance and composition of the soils in a very short distance from north to south—from Boulder-clay to the Alluvium-covered gravels;—from the Oxford clay to the Lower Greensand;—and again to the Gault and heavy Chalk-marl, are very striking and remarkable.

The farm of Mr. Checkley, at Brogborough, is situated at the southern extremity of the band of Oxford clay, and possesses the usual characteristics of that formation, but the more elevated parts are capped with Boulder-clay, thin in most places, but more pronounced on the mount on which the homestead stands. Many boulders are turned up on the farm, and some of them bear the deep striations which are regarded as the graven proofs of their glacial transport.

The adjacent farm of Mr. T. Crouch, at Lidlington, is situated on the boundary line of the Oxford clay and Lower Greensand, the soils of both being blended somewhat at the junction, so as to make it difficult to discover the boundary; and the Oxford clay portion has been at an earlier period overlaid by Boulder-clay. The latter has, however, been so much denuded as to be now not distinctly observable, and only to be traced by means of the occasional boulders in the soil. The portion beyond the Oxford clay limit, and within that called the Lower *Green* sand has a light, loose, and very porous sand, containing many pieces of thin ironstone, which gives the ochreous colour to the soil. The chief portion of the parish of Lidlington is on an outlier of this yellow sand.

The farms of Mr. Charles Howard, at Biddenham, Bromham, and Bedford, are chiefly on the valley gravel (Post-pliocene) above described. In some parts the Oxford clay, as well as the Boulder-clay, has been completely eroded by the ancient river, and the deposited gravel lies on the Cornbrash rock, being itself covered with Alluvium of variable depth and richness.

Report on the Farm Prize Competition.

The prize which we were asked to award has been generally given by resident landowners and the Royal Agricultural Society for the best managed farm in a considerable area of the district in which the show has been held. This year the competition was confined to the county of Bedford alone, such having been the wish of Lord Charles Russell, who liberally offered the First Prize.

The conditions under which the farms were entered were, that the competition be limited to tenant-farmers paying *bonâ fide* rent for not less than three-fourths of the land in their occupation, the whole of which must be entered on the certificate.

The Judges were especially instructed to consider—

1st. General management with a view to profit.

2nd. Goodness and suitability of live stock, especially for breeding purposes.

3rd. Productiveness of crops.

4th. Management of grass land.

5th. State of gates, fences, roads, &c.; general neatness.

6th. Book-keeping.

Subject to these conditions, the twelve farms tabulated on p. 568 were entered for competition.

The farms may be divided into two districts,—the Bedford and the Woburn; 7 being within a 10-mile radius of Bedford, and 5 within a 6-mile radius of Woburn. Considering the size of the county and knowing it to contain so many good farmers, we were very much surprised at the small number of entries, for although the area we passed through was not a large one, we did not, with one or two exceptions, see any that we could call bad farming, and the greater part was above the average.

We commenced our first inspection on Tuesday, February 10th, which I think was the coldest week of last winter; but although the air was piercing, the weather was fine, and we were enabled to see everything to the best advantage. We were of opinion that if it were possible to get the preliminaries arranged, it would be much better to have the first inspection earlier, so that the farms might be seen before all the winter ploughing was finished, and also to give the Judges an opportunity of seeing the stall-fed beasts, the greater part of which were sold at the time of our visit. Our second inspection was begun on May 12th, and our last on Wednesday, July 8th, which was confined to seven selected farms.

Although all the farms were good, and our omission to inspect the whole of them on our last visit was no doubt a disappointment to some of the exhibitors, we did not think it necessary to visit a third time those who had no chance of a prize.

Our awards were as follow:—

First Prize.—Given by Lord Charles J. F. Russell—a Silver Cup, value 50*l.*, with a purse of 50*l.*, to Richard Checkley, Brogboro', Woburn.

Second Prize of 50*l.*, given by the Society, to Thomas Crouch, Boughton End, Lidlington, Ampthill.

Specially Commended.—Charles Howard, Biddenham, Bedford, to whom we suggested that the Council should award an extra Prize of a Gold Medal.

Highly Commended.—George Street, Moulden, Ampthill; John Lilley, Knotting Green, Bedford; Ulysses Paine, Goldington, Bedford; Zakariah Phillips, Birchmore, Woburn.

Commended.—James Lester, Kempston, Bedford; James Henman, Stagsden, Bedford; William Leaberry, Stagsden, Bedford.

First Prize Farm,

occupied by Mr. Richard Checkley as yearly tenant, is composed of 336 acres of arable and 292 acres of grass land, and is situated 3 miles north of Woburn and 12 from Bedford. The London and North-Western branch line from Bletchley to Cambridge runs through the centre of the farm, and Ridgmount Station is close to one end and within a mile of the house. The farm has been in the occupation of Mr. Checkley and his family for a hundred years. The soil, a strong clay with a substratum of Oxford clay, is not naturally either fertile or easy to work, but many years of patient, good management (for this land requires plenty of patience and energy as well) have made it capable of producing crops which equal, if they do not exceed, any that we have seen this year.

Forty years ago the farm was nearly all rough grass covered with ant-hills, which have been gradually levelled and a great part broken up. Mr. Checkley has also at different times drained the whole of the farm, on an average of 3 feet deep and

Name of Tenant.	Address.	Number of Acres.	Nature of Soil.	Proprietors.
Richard Checkley	Brogboro', Woburn	597	Heavy	The Duke of Bedford.
Thomas Crouch	Boughton End, Ampthill	456	Light and heavy	The Duke of Bedford.
Frederick Freeman	Speedwell, Woburn	323	Light and heavy	The Duke of Bedford.
James Henman	Stagsden, Bedford	286	Heavy	The Hon. Miss Rice Trevor.
Robert Howell	Oakley, Bedford	500	Light	The Duke of Bedford.
Charles Howard	Biddenham, Bedford	834	Light and heavy	E. R. Wingfield, Esq. The Hon. Miss Rice Trevor. Rev. W. T. Beckett.
William Leaberry	Stagsden, Bedford	245	Light and heavy	The Hon. Miss Rice Trevor.
James Lester	In Kempston, Bedford In Broughton, Bucks	110 400	Heavy	The Trustees of Mrs. Talbot Barnard. The Trustees of R. G. Tyeingham, Esq.
John Lilley	Knotting Green, Bedford	395	Heavy	The Duke of Bedford.
Ulysses Paine	Goldington, Bedford	322	Heavy	Sir Richard Power, Bart.
Zackariah Phillips	Brickmore, Woburn	440	Chiefly light and a little clay	The Duke of Bedford.
George Street	Moulden, Ampthill	487	Light and black moor	The Duke of Bedford.

7 yards apart, at his own expense; and in one year he dug and levelled with the spade 65 acres of old grass, and did 33 miles of draining. I think it was the year following that he was awarded a silver cup, offered by Lord Charles Russell, for "The Tenant-Farmer who should have done the most draining at his own expense."

Fifteen years ago, the farm, which then belonged to Delmé Radcliffe, Esq., of Hitchin, was bought by the Duke of Bedford, and since then great improvements have been made, for the late and also the present Duke seem to have been always ready to help those who have tried to help themselves; and it is no doubt owing to this that there are so many first-class tenants on his Grace's estates. The accompanying plans (pp. 570, 571) of the farm as it was, and now is, will show the alterations that have been made by removing old fences (of which 10 miles have been stubbed up by Mr. Checkley at a cost of 1*s.* per pole), and the site of the new buildings erected by the Duke two years ago. The farm is now laid out in fields of from 20 to 40 acres each.

The new quicks, except a few previously planted by Mr. Checkley, have been planted by the Duke, who has, until two years ago, when they were thrown to the tenant, cleaned and kept them in repair entirely at his own expense.

The four-course system of cropping is adopted entirely, viz.:

1. Fallow, all roots if possible.
2. Barley or oats.
3. Half beans and half clover.
4. Wheat.

Fallow.—As soon as the wheat stubbles are cleared after harvest, and the land forked, it is broken up with a steam cultivator twice over, which is hired for the purpose, from 9 to 10 inches deep, at a cost, including coal and labour, of 30*s.* per acre. Horses were used until two years ago, when Mr. Checkley was persuaded to use steam power, and of this change on his strong land he has already found the benefit. Farmyard dung to the amount of from 25 to 27 loads per acre is put on if possible in the autumn or winter, with 5 or 6 cwt. of salt sown broadcast over it, and then nothing further is done until about the first week in April, when the land is ridged up and 2 cwt. of superphosphate or mangold manure is sown between the ridges, which are then split and drilled with mangold (orange globe being nearly always grown), about 4 lbs. of seed per acre, and 28 inches between the rows. After being horse-hoed several times, and when the plants are sufficiently strong, they are set out 24 inches apart at a cost of 3*s.* 6*d.* per acre, Mr. Checkley finding boys to do the singling, which costs 9*d.* per acre more;

they are then flat-hoed at 4*s*. per acre, and afterwards horse-hoed as many times as required, one man and two horses doing 9 acres per day.

From 12 to 20 acres are usually grown, and from 40 to 50 tons per acre is an average crop.

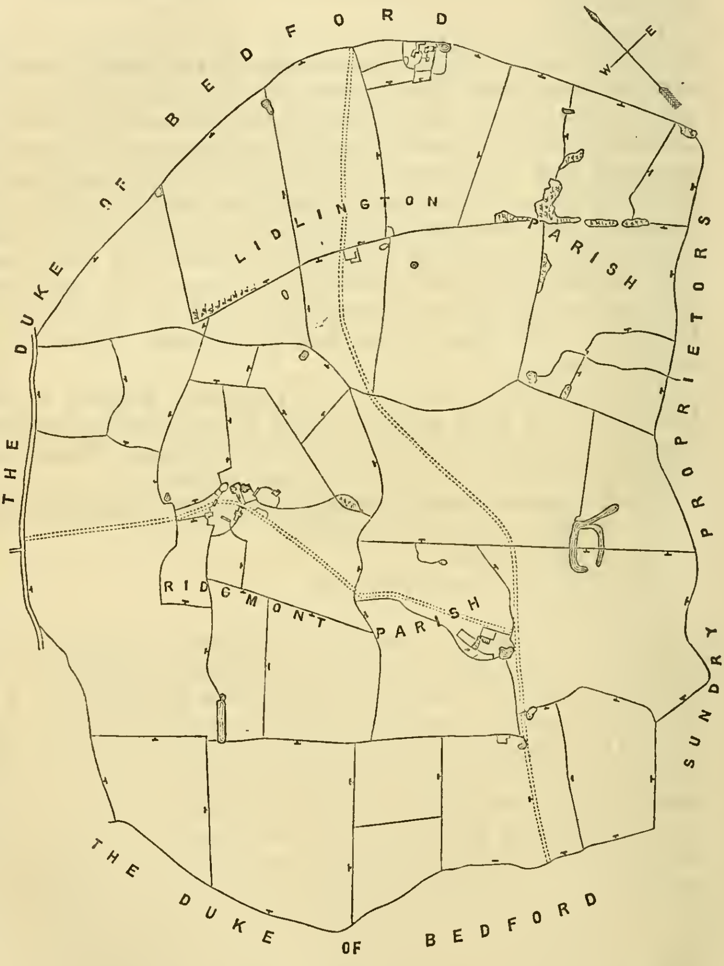


Fig. 1.—*Original Plan of Brogboro' Park Farm, in the occupation of Mr. Richard Checkley.*

The mangolds are drawn about the first week in November, and the whole carted off; the work is let to the men to get up, fill, and pit, at 11*s*. per acre; the pits are first covered with straw about 8 inches thick, which is done at 1*s*. 6*d*. per chain, taking both sides, and afterwards with 5 inches of soil at a cost of 3*s*. 4*d*. per chain. Taking the season into consideration, there is a very good piece of mangold growing this year.

From 10 to 12 acres of Kohl Rabi are sown about the second week in April, or as soon as possible after the mangolds, the land undergoing the same preparation: 2 lbs. of seed are drilled per

Fig. 2.—*Plan of Brogboro' Park Farm as at present laid out.*

acre, and sometimes, if the manure has been got on in the autumn, they are put in on the flat. The whole are got up and pitted after the rough leaves have been cut off, the ewes being afterwards run over the ground to clean them up. A portion are led off and stored on the grass land, where they are eaten by the sheep, the quantity depending on the following crop; if intended for wheat, the land is required earlier and more are taken off; if for barley, less.

About 8 acres of cabbages are sown the same time as the Rabi, and when the manure has been got on in the autumn 2 lbs. of seed drilled per acre on the flat, 24 inches between the drills; they are set out 18 inches, the gaps being filled up by transplanting. The kinds usually sown are the Early York, Enfield Market or Battersea, and Drumheads. This year, owing to the dry weather and also from being attacked by the fly, part of the Rabi and all the cabbage have missed; and at our last inspection the land was just being ploughed over again and drilled with common turnips.

About 20 acres of Swedes are sown about the middle of May. These have also missed this year, with the exception of about 5 acres, which are a fair plant. The cultivation is similar to that for mangold. Skirvings are principally grown; the whole of the crop is led off and stored on the grass.

Usually from 10 to 12 acres of common turnips are drilled about the first week in June, or as soon after as possible. The Grey Stone, Norfolk Reds, and Yellow Aberdeen, are the kinds grown, and this year the ground previously sown with Rabi and Swedes has been re-sown with the latter variety.

Rape is sown occasionally in June, from 4 to 5 lbs. of seed per acre being drilled, 8 inches between the rows. There are this year about 6 acres on a piece of new land, formerly a spinney, which has just been grubbed up.

Barley and Oats.—70 acres are usually grown, about equal quantities of each. The land is ploughed 5 inches deep, and the seeding commences the latter end of February or beginning of March. The small seeds are drilled 8 inches apart when the barley is coming up. Spring corn not sown with seeds is hand-hoed at a cost of 3*s.* 6*d.* per acre. The Alexandra barley is grown, and Canadian oats; 2 bushels of the former and from 2 to 3 of the latter are drilled per acre. The average yield of barley for the last three years is 6 quarters, and of oats 7 quarters.

Clovers.—The usual quantity grown is 35 acres, sown amongst the barley, 18 lbs. being drilled to the acre, two-thirds broad clover and one-third trefoil; occasionally one peck of rye-grass is added, but not as a rule. Last year Mr. Checkley grew considerably more, and less beans; and this year the whole shift has been sown entirely with clover, as he thinks it will be the most paying crop. About 23 acres are mown for hay and the rest grazed by sheep; the clovers grown at Brogboro' this year were considerably the best we saw during our inspection.

Beans.—The land having been ploughed in the winter, is set out with a drill, in rows 2 feet apart, in February, and $2\frac{1}{2}$ bushels of seed dibbled to the acre at a cost of 3*s.* 9*d.* per acre; they are horse-hoed three or four times and hand-hoed once at 3*s.* 6*d.* per acre.

Wheat, after Clover.—The land is ploughed about the beginning of November 3 inches deep, and is, if possible, drilled directly afterwards down the seams, with $5\frac{1}{2}$ pecks of seed to the acre. The bean stubbles, after such couch as there may be has been forked out, are then ploughed and drilled with 4 pecks of seed per acre.

Wheat, after fallow, is drilled about Christmas, with $4\frac{1}{2}$ pecks of seed per acre. Kinds usually grown are the Essex White and Browick. Average yield for the last three years 5 quarters per acre.

Cattle.—On the farm in July were:

44 milch cows.
13 in-calf heifers.
19 yearling do.
26 cow calves.
3 bull ditto.
2 bulls.

The cows, which are a very good lot of unpedigreed shorthorns, are kept entirely for dairy purposes, 150 lbs. of butter being made on an average weekly, and sent to the London market; and wonderfully good it is, unless our palates deceived us. On our first inspection the cows were just dropping their calves, and looked then really a grand lot; but many of them being first-rate milkers and the pastures bad, they were not quite so full of flesh when last we saw them. Mr. Checkley keeps all the cow calves, which are reared on skimmed milk: the bull calves are sold as they drop, to one man, at three guineas each.

The cows are kept during the winter on hay and straw chaff, with one quartern of boiled beans and a little cake and bran. In summer they do not usually have any artificial food, but latterly, owing to the scarcity of grass, they have had a little chaff mixed with the bean and maize meal. The two-year-olds and yearlings have in the winter hay and straw chaff, with a little bran, and looked extremely well.

Mr. Checkley has always kept a good bull. The one used for the last two years, bred by Thomas Garne & Son, Broadmore, Gloucester—sire, Royal Benedict—is a dark roan, with plenty of substance and quality; the calves and yearlings by him are certainly what any breeder may be proud of.

A white yearling bull, bred by Colonel Loyd Lindsay, and commended at the last Birmingham Show, where he was bought, seems likely to prove a good purchase. The whole of the beasts, without being extravagantly fat, are in beautiful growing condition; and we did not see an unhealthy animal about the place, which is a sufficient proof of their careful and judicious management. The barren and oldest cows are drafted and sold fat; eight were sold last year at an average of 30 guineas.

Sheep.—Originally Leicesters, which have been crossed with Lincoln and Cotswold rams—the former from the flock of Mr. Casswell, and the latter from the flocks of Messrs. Lane and Cother. Two hundred and fifty ewes were last year put to the ram, and have produced a crop of 310 lambs. The ewes are of great size, with a good deal of character and plenty of wool. The lambs, which are very good, are weaned about the middle of June, and are then run thinly over the grass and clover eddish, having half-a-pint of beans and maize, with a little cake and pea-chaff daily. The he tegs are put on cabbages the first or second week in August, the ewe tegs being put on turnips at the same time. The he tegs next consume the Rabi and Swedes that have been pitted on the land, and are then folded in breaks on the grass, where roots have been stored for their use; they are then clipped, and last year were sold at an average of 3*l.* per head. The ewe tegs on our first inspection were folded in the stack-yard; and, receiving roots and chaff, we did not think them quite up to the mark, but when last we saw them, without their wool, they were very much improved, and seemed a nice, level lot. The whole, numbering a hundred, are kept for the flock. During the winter the ewes, up to lambing, have clover, chaff, and a little bran; afterwards half-a-pint of beans per day, with a few roots. The lambs have cake and corn while with the ewes, and as soon as they will eat it, in troughs, to which they only have access.

Pigs are the only animals that are not bred on the farm, but a great many are bought and fattened during the year on the milk not required for the calves, with a little flour. Last year 147 were fed in this way, and realised 924*l.* 16*s.* 10*d.*

Horses.—Seventeen good working horses are kept, all of which have been bred on the farm. Four or five mares are put to the horse every year, the produce coming into the team at three years old, the aged horses being sold to make room for them.

Mr. Checkley has been fortunate in raising three capital foals this year. In the summer the horses are fed on vetches or clover, in the yards, until June, when they are turned out to grass, and have an allowance of 7 lbs. of corn per day, consisting of equal proportions of beans, maize, and oats, all being ground.

Artificial Manures.—The quantity used always depends on the supply of farmyard manure, but is never large.

	£	s.	d.
In 1871, 4 tons	26	0	0
„ 1872, $7\frac{1}{2}$ tons	22	10	0
„ 1873, none used	0	0	0
„ 1874, 17 tons.	98	17	0
Total in four years	147	7	0

Corn and Cake.—A large quantity of the former is used, the whole of the bean crop, a great portion of the barley and oats consumed, and a great deal of maize also purchased. A detailed account of the last three years' consumption will, I think, be interesting:—

1871.

	£	s.	d.
Cake, 21 tons 13 cwts.	240	6	6
Palm-nut meal	12	10	0
Maize, 141 quarters	248	4	0
Bran	189	18	4
Barley, 62 quarters	104	7	0
Oats, 17 quarters	19	16	6
Beans, 31 quarters	72	4	6
Pea-husks, 50 quarters	27	10	0
Also the produce of 55 acres of beans (say)	453	0	0
	£1367	16	10

1872.

	£	s.	d.
Value of corn, &c., consumed	1196	17	9

1873.

Value of corn, &c., consumed	1433	14	0

Labour.—There was a great deal of agitation among the labourers in the Woburn district during the spring, and at our inspection the farmers were every week expecting a strike, which took place soon after we were there, but only on the farms of Mr. Checkley and Mr. Crouch (the winner of the second prize). The wages for ordinary labourers were then 13*s.* per week, and the demand was for an increase of 2*s.*, which the farmers declined to give, their proposal being to raise the wages 1*s.* per week, but only on condition that the men left the union, which nearly all had joined. After being out about ten weeks, during which time Mr. Checkley had only a few men on the farm, nearly the whole returned on his terms, and now appear to have settled quietly to their work. Owing to the extra work involved in so large a dairy, Mr. Checkley's labour is heavy, amounting to a little over 2*l.* per acre. There are employed the whole of the year:—

13 ordinary labourers,	at	14*s.*	per week.
5 cowmen . . .	at	17*s.*	,,
3 horse-keepers .	at	17*s.*	,,
1 shepherd .	at	17*s.*	,,
1 boy	at	12*s.*	,,
3 ditto	at	10*s.*	,,
1 ditto	at	7*s.*	,,
15 ditto at from 3*s.* 6*d.*	to	6*s.*	,,

The shepherd receives 1*s.* per head for every lamb reared above the number of ewes put to the ram—half-a-ton of coals and two pints of beer per day being allowed him in lambing time. In hay harvest the men receive 1*s.* per week extra and 2½ pints of beer per day, which is increased to five or six pints when carting. The boys have 6*d.* per week extra and one pint of ale per day. The whole of the grass is mown with the machine.

In harvest, the shepherd and cowmen, who cannot be spared for any piece work, have 5*l.* 10*s.* for the month, with beer, the same as in hay harvest, and 6*s.* for the four Sundays.

There are only two cottages on the farm, the rest of the labourers coming from the adjoining villages.

The following extras are paid:—For ridging, 1*d.* per acre; horse-hoeing, the same; drilling, 1½*d.* per acre; washing sheep, 3*d.* per score; sowing artificial manure, ½*d.* per cwt.; laying down dung, 1*d.* per acre; shearing sheep, 3*s.* per score, with five or six pints of ale, a man being found to wind the wool and bring out the sheep.

Mr. Checkley does all his own threshing, having two six-horse portable engines, with a fixed threshing-machine, at the home farm; and a portable engine, with patent straw elevator, at the other farm. The corn is all cut with the reaper.

The gates and fences, as I have before mentioned, have only been in Mr. Checkley's hands for the last two years, but the latter are now all nicely trimmed and very clean. Only a small proportion of the boundary fences, which are anything but good, belong to the farm, so that he is not in any way responsible for them.

The roads on the farm have all been made by the tenant, but owing to the great distance from any good material, they have been repaired up to now with a kind of sand, and are consequently not quite so good as we should have liked to see them, but Mr. Stephenson, the Duke's agent, told me that they were intending very soon to have them improved.

The buildings at the home farm have been principally erected by the tenant, and are for the most part of wood, and although capable of housing a great number of stock, are not very convenient, which consequently entails more labour. They, together with the house, which, although old-fashioned, is very comfortable, were last year put into thorough repair by the Duke.

The new buildings lately erected are very complete, comprising two exceedingly good cottages, two capital yards, and the best feeding-shed we have ever seen. It is 33 feet wide, with a passage down the centre, and capable of holding 32 head of cattle.

Owing to the strike, Mr. Checkley has laboured this year under considerable disadvantage, but although there had not been a hoe in any of the corn, there was not a weed to be seen, and had we not known to the contrary, we should have thought everything had gone on in its usual routine. The amount of corn and cake consumed is very large, and the labour account is also very heavy, yet the results have undoubtedly justified the expenditure; for although everything is well done, there is no extravagant outlay, and it was owing to the thorough good management of the farm in all its details, and the uniform character and goodness of the live stock, that we unanimously awarded Mr. Checkley the First Prize.

Second Prize Farm,

occupied by Mr. Thomas Crouch, and held by him under the Duke of Bedford on a sixteen years' lease, which expires at Michaelmas, 1875.

The road from Woburn to Ampthill runs on the side of the farm, which is three miles from each of those places; the opposite side joins the First Prize Farm. It contains 262 a. 0 r. 16 p. of arable, and 195 a. 1 r. 26 p. of grass land. Half the farm, Mr. Wyatt informs me, lies on the Oxford clay, and the other half on the Lower Greensand, the soil being part light and part heavy. The farm, which was formerly in three occupations, is now very compact, the Duke of Bedford having spent a very considerable sum during the last fifteen years in draining and other improvements. Some of the draining done by the Duke across the lands, Mr. Crouch says, has not in some places answered very well, and he has at his own expense put in a few drains down the furrows and intersecting the old ones. The accompanying plan shows the position of the house and buildings, arable, and grass land, roads, &c. The fences, which on one part of the farm are entirely new quicks, were planted by the Duke, and, as in Mr. Checkley's case, have only been thrown to the tenant two years ago. They are very clean, but have not yet been topped, as in one or two cases Mr. Crouch tells us where they were done too young they afterwards died away. This, from our experience, we could not quite understand.

The four-course system is also adopted on this farm:—1st, Fallow; 2nd, Barley; 3rd, Seeds; 4th, Wheat.

Fallow.—About 60 acres yearly. The wheat stubbles, directly

Fig. 3.—*Plan of Boughton End Farm, in the occupation of Mr. Thomas Crouch.*

after harvest, are Bentalled if necessary, and then deeply ploughed, the couch being forked out afterwards as it shows itself.

The land is ridged, and the manure, which has been carted out of the yards into large draw heaps in the previous autumn, is put on in the spring at the rate of 14 large loads per acre; no artificial manure is used. We may here remark that in our experience, in order to obtain a good crop of mangolds or rabi, the land should be prepared and manured in the autumn, which always ensures the germination of the seed.

Mangolds and rabi are sown the first week in April, 6 lbs. of the former and 4 lbs. of the latter being drilled per acre, 27 inches between the ridges. They are both set out 24 inches in the rows, and the work is usually done by the day. The mangolds are all carted off, and the rabi eaten where grown, without being pitted. From 20 to 30 acres of swedes are sown about the first week in June, with 2 lbs. of seed per acre; but few are fed off. The cost of getting up, cleaning, and heaping is 5*s.* 10*d.* per acre; the covering is done by the day. A few winter tares are sown, and eaten on the ground by sheep in the spring. The land is afterwards ploughed and drilled on the flat with rape and common turnips. A few cabbages are grown occasionally, but not as a rule, as Mr. Crouch does not think the land good enough.

This year, owing to the strike, Mr. Crouch being almost without men for ten weeks, the manure was not spread until some time after it was carted on the land, and the roots were in consequence very late in being put in. The mangolds and rabi this year are patchy, and the swedes (with the exception of one piece in the same field with the mangold, which was a fair plant, but wanting rain) had not yet made their appearance.

Barley is grown after roots. The land being ploughed as early as possible, three to four inches deep, the seed is then drilled at the rate of 2½ bushels per acre. Seeding is commenced in the middle of March. The kind of barley called in the locality "Brewers' Delight," has been sown for the last twenty years. The barley is never hoed, but weeded when necessary.

Seeds.—About 14 lbs. of small seeds are used per acre, two-thirds being red clover and one-third trefoil. Of this mixture, 9 lbs. are first drilled with the large drill when the barley is coming up, and 5 lbs. afterwards sown broadcast with the barrow drill. About 15 acres, as a rule, are mown, and the remainder grazed. The seeds were all very good, the land showing no symptoms of clover sickness, which might be expected from red clover being sown every four years.

Wheat.—About 60 acres after clover. When the land has been ploughed about 4½ inches deep, with an 8-inch furrow, the seed is drilled down the seams at the rate of 2½ bushels per acre. Seeding generally begins in October. The kinds usually grown are the Bristol red, golden drop, and Grace's white. The wheat, which is this year a very good crop, had not been hoed, but was nevertheless very clean indeed.

Cattle.—A splendid herd of unpedigreed shorthorns, with plenty of size and substance, is kept for dairy purposes. When we saw them there were 14 cows in milk and 6 in calf. The calves are kept in the winter on hay chaff, with 10 lbs. of boiled corn per day, 13 three-year-old heifers having straw and hay chaff with a little boiled corn, 11 two-year-old heifers, and 22 yearlings fed in the same way, and 14 rearing calves having skimmed milk and hay chaff. The cows in the summer run on the grass land, which adjoins the house, and is of very fair quality, and have an allowance of corn (boiled) daily; but this year, on the strike breaking out, as there were not men sufficient to look after the stock and do the other necessary work on the farm, the calves, which had been previously weaned, were again put to the cows and turned out with them, while the cows, having more milk than the calves could take, were milked once a day, and the allowance of corn was discontinued; in fact the whole of the stock were obliged to get their own living. The steers, which were a first-rate lot, are grazed out annually at from two to three years old.

A very good, pure-bred, shorthorn bull is always kept. The two now on the farm were bred by Mr. Crouch, and others from the herds of Lord Penrhyn and Mr. Majoribanks have been used previously.

We cannot speak too highly of the character and quality of the whole of this herd, and too much praise cannot be given to Mr. Crouch for the great judgment displayed in bringing them to this state of perfection.

Sheep.—These, like Mr. Checkley's, are improved Leicesters. The flock contains:

236 ewes put to the ram,
110 he tegs,
108 she tegs,
14 rams.

The ewes have roots on the grass a few weeks before lambing, and afterwards a little corn and cake. After weaning, the lambs are run thinly over the grass and clover eddishes, and have a little corn until September, when they are put on to rape or common turnips—the he tegs having then 1 lb. of corn, with clover chaff, and the ewe tegs ½ lb. (with clover chaff) per day, which is continued throughout the winter. The he tegs are clipped and sold in the spring. The barren and culled ewes are sold fat.

Pigs.—None are bred, but a few are regularly bought, and those not required for home consumption are sold fat.

Horses.—Twelve very useful working horses are kept; in the winter they have 10 lbs. of corn per day, consisting of beans and maize, with clover chaff; in the spring they have tares and clover; and in the summer they are turned out, the same quantity of corn being given. A certain number of mares are put to the horse every year, and we saw half-a-dozen very good colts and fillies, their produce, from two to three years old.

Labour.—Mr. Crouch's men, as I have mentioned before, struck for an advance of wages at the same time as Mr. Checkley's, and returned to him on the same conditions. His staff of men consists of:

10 ordinary labourers, at 14*s.* per week.
3 cowmen, at 17*s.* per week.
1 shepherd, at 16*s.* 6*d.* per week.
2 horse-keepers, at 17*s.* per week.
5 boys, at from 3*s.* to 8*s.* per week.

The cowmen come at a quarter to five in the morning and leave at six at night, the ordinary hours of labour being from six to six.

The horse-keepers, during the time that the horses are turned out in the summer, have 1*s.* 6*d.* per week deducted from their wages, their attendance not being required on the Sunday. In hay harvest the whole of the men receive 2*s.* per week extra, with 2½ pints of beer daily, and when carting 4 pints, and remain until seven o'clock, and nine if required.

The boys have 9*d.* per week extra, with 1½ pint of beer daily.

Mr. Crouch pays 4*s.* per acre for his mowing, which is all done by hand. The whole of his hay and corn harvest is gathered without any additional help; and, with the exception of the grass-mowing, everything is done by the day. By this system Mr. Crouch thinks, and it is no doubt the case, that the work is better done, but it can only be carried out by constant supervision.

In harvest the ordinary labourers receive 5*l.* 10*s.* for one month, the cowmen, horse-keepers, and shepherds 5*l.* 16*s.*; and if the harvest is not finished in that time they are paid 2*s.* 6*d.* per day, but this is rarely the case.

The total amount of wages paid during the harvest month last year was 111*l.* 4*s.*, the harvest being finished and the stacks thatched in that time.

This gives an average of 16*s.* per acre, which, it should be remembered, covers not only the special harvest work, but the ordinary work of the farm as well.

The average amount paid for labour during the last three years is 676*l.* 11*s.* 7*d.*, or an average per acre of 1*l.* 9*s.* 8d.

Cake and corn consumed from October 1st, 1872, to September 30th, 1873, 560*l.* 17*s.* 6*d.*

Artificial manures for same time, 14*l.* 17*s.*

Amount of stock bought, 35*l.* 7*s.*

The present house and the buildings adjoining were erected by the Duke of Bedford, about fourteen years ago at considerable cost, and are replete with every comfort and convenience. As regards the plan and construction, they are most excellent, but the cost of such buildings would unfortunately place them beyond the means of smaller proprietors.

In addition to the above there is accommodation for several head of cattle, at some premises constructed principally of wood on another part of the farm.

There are several good cottages on this farm, but they are not under the control of the tenant.

To sum up, we may describe the system pursued in the management of the arable land, as the ordinary four-course system, well carried out. We are, however, inclined to think that it is a mistake not to put on the manure in the autumn on the strong land where roots are grown.

It will be observed that a very small quantity of artificial manure is used, but from the amount of corn and cake consumed and the abundance of straw, the farmyard manure is both plentiful and of good quality; and from the crops we saw growing any further outlay would seem unnecessary.

The root crops this year are certainly not up to the mark, but we had to make great allowance for the unfavourable season and the unfortunate strike which happened at the most critical time.

The whole of the stock is uniformly good, especially the cattle, and, with the exception of a few pigs, all bred on the farm; and great praise is due to Mr. Crouch for the excellent manner in which they are managed.

The peculiarity of Mr. Crouch's system of having nearly all the work done by the day would, under ordinary circumstances, seem to be a mistake; but, from his unremitting attention to business, the work is no doubt better done, and at probably a cheaper rate than if done by the piece.

Specially Commended Farm.

Mr. Charles Howard has three farms in his occupation. The smallest of the three, called the Priory, consists of 85 acres of arable land, and is the property of the Rev. W. T. Beckett, Ingoldesthorpe Rectory. It lies so near the town of Bedford, that the buildings, comprising a large old-fashioned barn and two cattle-yards, are almost in the town itself.

The Biddenham farm, two miles from Bedford, where Mr. Howard resides, is the property of T. R. Wingfield, Esq., Barrington Park, Oxon, and consists of 229 acres of arable and 80 of grass land; the Bromham farm, the property of Miss Rice Trevor, is situated about two miles from the latter and four from Bedford, and contains 220 acres of arable and 220 acres of grass land. The Priory and Biddenham farms are worked together, all the horses employed being kept at the latter place. Biddenham and Bromham are two most picturesque villages still retaining the old village greens, on which happy groups of children were congregated and playing as we passed. Many of the cottages are old-fashioned, but all are in good repair, and, with their well-kept gardens, gave a general aspect of comfort and happiness to the whole village.

Mr. Howard's farm-buildings at Biddenham, which were formerly built of wood, were burnt down about three years ago, and have since been rebuilt in a very substantial and complete manner: they are furnished with every convenience for threshing, grinding, &c. A portable engine and threshing-machine are used, but are so arranged that the threshing can be carried on under cover. The house is now being repaired and enlarged, Mr. Howard at present residing in Bedford.

The soil at Biddenham is light loam, on a gravelly subsoil, and consequently easily affected by dry weather; this year, owing to the long drought, the crops have suffered considerably. When first we saw them they promised well, and their altered appearance on our last inspection could not be attributed to mismanagement.

The soil on the Priory farm is of a mixed character, part being light, and a portion comparatively strong clay. One field, which is this year fallow and sown with turnips and rabi, has been twice drained by Mr. Howard, the landlord finding tiles.

The four-course system is adopted on the Biddenham and Bromham farms; but as the cropping is rather different on the latter farm, it will perhaps be better to give it a separate description. On the Priory farm the rotation is as follows:—Fallow (all sown with a green crop); Wheat; Barley; Seeds; Wheat.

Fallow.—On the stronger portion of the farm the land is forked, ploughed, or steam cultivated in the autumn, in preparation for roots; in the spring, the scuffler is run through once or twice to start the annuals, prior to sowing the seed, which is drilled with artificial manure alone. On the light land it is ploughed in the autumn and allowed to remain in the furrow until the time for sowing the roots in the spring, when the furrow is turned back and afterwards scuffled; farmyard manure, at the rate of 16 loads per acre, with an occasional dressing of salt, is spread and ploughed in, and the seed drilled as soon afterwards as possible.

Mr. Howard pays considerable attention to his green crops, a succession of them being absolutely necessary to a ram-breeder. Cabbages for early eating are sown in August and planted out in November, and again early in the spring. Mangolds are drilled about April 10th, and a few swedes and common turnips shortly afterwards, the lambs being put on the latter in August. The rest of the swedes are sown the latter end of May or beginning of June.

None of Mr. Howard's roots had missed this year, and the whole were exceedingly well put in and looked very promising when last we saw them, nothing but rain being wanted to insure a good crop.

Barley is grown after roots, except on the Priory farm, where it is sown after wheat, and farmyard manure applied to this, instead of the root-crop. Hallett's is the only kind used: five pecks are sown per acre, and when the barley is well up it is horsehoed with the steerage-hoe; the small seeds are afterwards sown broadcast and harrowed in across the drills: 14 lbs. of white and 18 lbs. of red are respectively sown. The seeds at Biddenham are not very good this year, which Mr. Howard attributes to the cold nights in May and June, and the extreme drought subsequently.

Wheat is sown after seeds, Browick being used entirely: it is drilled eight inches apart, and, like the barley, is horsehoed and harrowed in the spring.

The average yield of wheat and barley for the last four years on the Priory and Biddenham farms is as follows:—

Priory.	Qrs.	*Biddenham.*	Qrs.
Wheat	$5\frac{3}{8}$	Wheat	$4\frac{4}{8}$
Barley	$6\frac{4}{8}$	Barley	$5\frac{7}{8}$

Mr. Howard has only occupied the Bromham farm four years, and in that time has made great alterations and improvements. The greater part of the arable land is now thrown into one large field, $3\frac{1}{4}$ miles of fences having been taken up, and the whole drained at his own expense, the landlord finding the tiles. A road has been made through the centre of this land and is met by another running at right angles to it, so that the whole can be worked by a "roundabout cultivator," and nothing can be more complete than the arrangements which have been made. One other improvement, however, we might suggest, viz., the removal of a small spinney which runs awkwardly into the arable field, and not only looks bad but must also be a great inconvenience to the tenant in steam-cultivation. This, however, is a question for the landlord's consideration.

The fences on the grass land are very bad. Mr. Howard has, at considerable expense, remedied this evil by putting up oak posts, with iron rope, round most of the grazing fields. The farm formerly suffered from an inadequate supply of water: to obviate this a large reservoir has been made, which, notwithstanding the drought, has been filled from the new drains.

The grass land is good, and (with the assistance of a little oilcake) is capable of feeding some good steers. One piece of land has been much improved by the application of soil and farmyard manure.

The system of cropping, as I mentioned before, is the four-course, viz :—Fallow ; Barley ; half Seeds, half Beans ; Wheat.

On the light-land portion of the farm one-fourth is sown with roots, as in the ordinary four-course shift; on the heavy land, one-fourth of the fallow is sown with roots and three-fourths with rye-grass, trefoil, and tares. The rye-grass and trefoil, which are sown in the wheat in the previous spring, and the tares in the autumn, after the land has been manured and ploughed, are eaten off in the spring and summer by sheep, and when finished the land is broken up by the steam-cultivator and allowed to remain in the rough state until the following spring, when it is sown with barley. This system seemed to answer very well.

After barley, half the shift is sown down with clover and half with beans, farmyard manure being applied for the latter crop.

The average yield of corn on this farm for the last four years is $4\frac{1}{2}$ quarters of wheat and 6 quarters of barley.

Stock.—Mr. Howard has for several years been well known as a successful breeder of Shorthorns and Oxford Down sheep, the former of which were sold off three years ago. He is now forming another herd, but has at present only a small number. Since the sale a few calves have been reared, nine milch cows only being kept. There is a large amount of good grazing land on the Bromham farm, and a considerable number of steers are bought every autumn for wintering and grazing the following year. In February the stock consisted of 120 head, viz. :—

48 three-year-old shorthorn steers.
5 fat ditto.
20 Welsh runts.
9 fat ditto.
16 shorthorn steers, two years old and under.
9 cows.
12 calves.
1 bull, of the Fawsley tribe.

The whole of the store steers were having an allowance daily of chopped straw, mangolds, and bran, with 4 lbs. of cake. The three-year-olds were bought in November, at an average of about 19*l.* each, and were a very useful lot: they were grazed this summer on the best of the Bromham land, an allowance of cake being continued, and, at our last inspection, had made very satisfactory progress, being then worth nearly 30*l.* each.

The nine Welsh runts, which were in the stalls, Mr. Howard had not found a very profitable investment, as they were evidently very slow feeders; they were having an allowance of 8 lbs. of cake, and half peck of meal, with hay and chaff. The remainder of the Welsh runts and shorthorn steers were grazed in Bromham Park and had done well, especially the former, which were for the most part fat.

Mr. Howard has, for many years, been a most successful breeder of Oxford Down sheep, and has realised very high prices for rams at his annual sales. With his European reputation, the flock needs but an endorsement of its excellence from us. The lambs were scarcely in their usual form this year, which is doubtless due to the long drought. We thought the rams an extremely good lot.

Of the 386 ewes, 216 only are reserved for ram breeding, and are kept principally at Biddenham; the remaining 170 compose the Bromham flock, and do not call for particular notice, except that they are useful farmer's sheep. The whole flock consisted, in February, of

77	Ram tegs.
13	Show ditto.
12	Old rams.
100	Biddenham ewe tegs.
233	Feeding tegs.
102	Shearlings.
78	Ewe tegs for flock.
19	Ditto for exhibition.
216	Biddenham ewes.
171	Bromham ditto.

In the winter, the ewes are penned on the roots in the daytime, and turned on the grass at night; for a short time before and after lambing they have an allowance of cut clover and malt-dust. The lambs are weaned about the latter end of June, and are then run upon the eddishes. The feeding-sheep on roots have a mixture of split beans, peas, locust beans, and cake, daily. Mr. Howard has this year used the Marseilles cake, which costs 11*l.* 15*s.* per ton, and also a large quantity of Matthews' corn cake, which he finds very beneficial, especially for lambs.

We saw a very good and simple shade for the field rams in use at Biddenham, consisting of a skeleton frame, covered with old superphosphate bags sewn together, each frame being about 10 feet long. These shades can easily be moved by a man and boy, and, by using them, the evil resulting from the sheep lying too long in one place is avoided.

Horses.—Mr. Howard works, in all, 20 horses,—10 Suffolks at Biddenham, and 10 of a heavier class at Bromham; both classes being well adapted to the respective farms. We thought them as a whole extremely good, and were glad to hear that he was successful with a pair of them at the late Bedford show.

Pigs.—Mr. Howard keeps a stock of Berkshire sows, which he crosses with boars of the middle breed, belonging to his brothers, the Messrs. J. & F. Howard, which we thought a good lot.

Labour.—Considering the great neatness and cleanliness of Mr. Howard's farm, together with the well-kept roads, his yearly labour account is not large, the average amount paid for the last four years being 1273*l.* 16*s.* 6*d.*

The cake and corn account on this farm is of course a serious item, in consequence of the number of rams kept; and, in giving the average of the last four years, it must be borne in mind that the year in which Mr. Howard sold off his shorthorns is included.

The average value of cake and corn consumed for the last four years is 1720*l.* 18*s.*

The amount of artificial manure used is not large, the average for four years being 81*l.* 17*s.*

In conclusion, we cannot speak too highly of Mr. Howard's system of book-keeping, which is at once elaborate and simple. From the time he began the business, every transaction, however small, has been carefully noted down: we were thus enabled to obtain much useful and interesting information with the greatest possible facility, and were pleased we were enabled to award Mr. Howard the Society's Gold Medal.

Highly Commended Farms.

Mr. Lilley's Farm (Knotting Green) is situated nine miles from Bedford, and about two miles from Sharnbrook Station on the Midland main line, and is the property of the Duke of Bedford. The house and home buildings have been recently erected, and are very substantial and good; in addition to the latter, at a distant part of the farm, there are two yards for the accommodation of cattle, with stackyard adjoining.

The farm contains 238 acres of arable and 197 acres of grass land; the soil is for the most part a strong clay, some portions having been woodland, and reclaimed some eight or ten years ago. The farm is well laid out in fields of from 15 to 30 acres, the quicks over nearly the whole of it being newly planted. It is held on a yearly tenancy, five per cent being paid for all the draining done by the landlord subsequent to the taking of the farm.

Mr. Lilley adopts the four-course system, viz.:—Roots; Seeds, or Beans and Peas; Barley; Wheat.

The management for root crops is very liberal; immediately after harvest, from 12 to 14 good cartloads of farmyard manure are spread upon the stubbles; the land is then worked twice with the steam cultivator and left in the rough state all winter. In the spring, as soon as the land will work, $3\frac{1}{2}$ cwt. of salt per acre is sown broadcast and scuffled in, and before the mangolds or turnips are drilled, 3 cwt. per acre of Lawes' turnip or mangold manure is sown, and the land again scuffled; in addition to this, 3 cwt. of the manure for mangolds and $3\frac{1}{2}$ cwt. for turnips is mixed with dry mould and drilled with the seed. There was a good plant this year of mangold and turnips, which since the late genial rains have gone on well.

Mr. Lilley has occasionally sown rabi, but does not like it; he thinks that it draws the land too much, and is therefore detrimental to the following crop.

When we last visited the farm there was a good horse-hoe at work in the turnips, of Mr. Lilley's own invention, and made by the smith on the farm. It has been found so effective that similar hoes are now manufactured by Messrs. Howard, of Bedford.

About 8 pecks per acre of barley and from 6 to 7 pecks of wheat is the quantity usually sown. The crops this year are very good, and the yield of other years must also have been excellent; the average of the last three being for wheat 4 quarters, barley 6 quarters, oats 7 quarters, and beans $4\frac{1}{2}$ quarters. Part of the beans are winter and part spring sown.

The following mixture of small seeds is used, viz., 12 lbs. red clover, 2 lbs. white clover, 2 lbs. trefoil, and $1\frac{1}{2}$ gallon of Pacey rye-grass.

Mr. Lilley's farm is not naturally well adapted for breeding purposes, the grass land being of poor quality; but he has a very good flock of Grey Cotswolds: 144 ewes were put to the ram last year, and about 60 rams are sold annually at Bedford, at from 8 or 10 guineas each. They are very useful, and being kept in a natural state, pay well at this price. The remainder of the tegs, with the exception of the ewes reserved for breeding, are sold to the butcher.

The cattle have all been bred on the farm, and consisted in

February of 11 milch cows, 7 heifers, near calving, 6 fat steers, 12 two-year-olds, 6 yearlings, 8 calves, and 1 bull.

The average amount of cake bought during the last three years is 181*l.* 14*s.* 8*d.* In addition to the purchased feeding-stuffs, corn to the value of 500*l.* is annually consumed by the stock on the farm.

The labour-account, considering the proportion of arable land, is small, being only 30*s.* per acre.

Mr. Lilley's farming is of a very high class, the hedges being neatly kept, the land remarkably clean, the crops uniformly good, and the stock decidedly above an average; and although we were unable to award him a prize, he was fully entitled to a high commendation.

Mr. Phillip's Farm is situated one mile from Woburn, and is held under the Duke of Bedford on a yearly tenancy. It contains 220 acres of arable and 220 acres of grass land. The house is beautifully situated almost in the centre of the farm, with a capital set of buildings adjoining.

Mr. Phillips has only been on the farm six years, and has, we hear, much improved its condition in that time. It is now very clean and in excellent order; but this year, owing to the nature of the soil (part of which is a light sand and part a sand loam, with a little clay), the crops are rather light, except those on the clay, which are very good.

A considerable portion of the pasture land is of good quality. The flat meadows, which were originally irrigated, are peaty and boggy, but they grow a deal of rough grass and are a very useful run for young stock, as in the driest seasons they have a plentiful supply of water, which cannot be too highly estimated in a season like the present.

The four-course system of cropping is adhered to on this farm also, beans, as well as clover, being taken on the stronger land as the third course.

As a preparation for the root-crop the land is ploughed in the autumn: after being carefully forked over, 16 loads of good farmyard manure are spread and ploughed in as soon as possible. Early in the spring, before the seed is sown, an additional dressing of 4 cwt. of dissolved bones is applied, mixed with ashes, on which liquid manure has been pumped during the winter.

Mr. Phillips grows carrots on the light-sand land, in preference to either mangold, swedes, or rabi, and for this crop he does not use any manure, the clover-leys being manured for wheat. The carrots are hoed and set out at a cost of 1*l.* per acre. In a letter to me, dated August 17th, Mr. Phillips says, "My carrots will beat any other roots this season."

Potter or Chevalier barley is usually sown at the rate of 2 bushels per acre, and a change of seed is obtained from the chalk or clay districts every season.

The same system is also adopted with regard to the seed wheat, 7 pecks of Browick being drilled per acre.

The average yield of corn for the last four years is as follows:—

	Qrs.	Bush.
Wheat	4	1½
Barley	5	½
Peas	5	2 nearly.
Beans, two years	5	2½
Oats, only last year	6	

Red and white clover are sown alternately every four years on the light land, and on the strong land every eight years, beans and peas being substituted; 12 lbs. of clover and 4 lbs. of trefoil per acre are used.

Mr. Phillips has a herd of twenty-one well-bred shorthorn cows, the calves from which are all reared, the best of the heifers being retained for stock, and the remainder fed off. A considerable number of cattle are also purchased annually for grazing, and those not sold during the summer are stall-fed, having 8 lbs. of cake, 1 bushel of roots, with hay, straw, and chaff daily.

180 very good Oxford Down ewes are kept, and the average fall is rather more than a lamb and a-half to a ewe. No expense has been spared in procuring the best rams, which have been purchased from the flocks of Messrs. C. Howard and Treadwell. After lambing, the ewes have about 1½ lb. of oats with chaff per day, and upon this allowance they appeared in good condition. The ewe tegs are kept during the winter in good store condition on roots and clover chaff, and the feeding-tegs, of which a number are purchased in addition to those bred on the farm, have a little cake, and are clipped and sold fat. The produce of seven breeding sows are annually fattened, a portion of which are sold.

Seven working horses are used on the farm.

Average quantity of cake and corn consumed during the last four years	£670
Artificial manures	113
Average labour account for last four years.. ..	553

The harvest this year was let to twelve men to cut, cart, and stack, at 13*s.* per acre, giving use of machine with boys to drive the carts.

Each man receives 1*l.* per month in lieu of beer, and the boys are paid in the same proportion.

We were of opinion that the management of this farm was very creditable to Mr. Phillips, and worthy of a high commendation. From the accounts shown to us, its productiveness seems to have increased greatly during the short time it has been in his occupation.

Mr. Street's Farm is also the property of the Duke of Bedford, and is held on lease. It is situated two miles east of the small town of Ampthill and ten from Bedford, and consists of about 120 acres of grass and 360 acres of arable land.

The house and buildings are conveniently situated, commodious, and exceedingly well arranged in every respect. The fields are for the most part large. The whole of the farm is very well watered, having on opposite sides two running streams, which never fail. A water-wheel of 5-horse power is driven by one of these, and with this Mr. Street is enabled to do all his threshing, grinding, pulping, &c: the whole of the machinery was erected at his own expense. The same stream is utilized in irrigating a large meadow at one extremity of the farm. For some years this had been discontinued, and Mr. Street has, at much trouble and expense, renewed the sluices and water-carriers, relaid the beds, and made the irrigation complete.

The farm consists entirely of light land, a portion being a blowing sand and a considerable area a light loam on gravelly subsoil, and the rest is peat.

The system of cropping adopted is similar to that on the preceding farm, as also the mode of cultivation, except that a large quantity of kohl rabi is grown, Mr. Street being of opinion that, with proper management, a good crop may be grown any year, and he prefers it to swedes. About 15 or 16 loads of good farmyard dung, or 6 cwt. of artificial manure (Procter and Ryland's being preferred) are used for all the root-crops: occasionally 2 cwt. of artificial and 10 loads of farmyard manure are substituted for the above. Salt and lime are also applied when required. At our last inspection most of the roots, and especially the rabi, were a good plant, but very much in want of rain; since the recent showers, however, Mr. Street informs me that the whole of the crop is much improved and promises well.

Browick wheat is the only kind grown, 7 pecks per acre being drilled, and nearly the whole produce sold for seed. This year all the moor or peaty land under cultivation was sown with corn and permanent grass seeds, as Mr. Street thought that in consequence of the agitation amongst the labourers he would be better prepared to encounter any contingency that might hereafter arise. Unfortunately, owing to the dry weather, the seeds are a failure.

The quantity of barley usually sown per acre has been $2\frac{1}{2}$ bushels, but this year 2 bushels of Hallett's have been tried with very satisfactory results.

The grass land on this farm is of inferior quality, and as a rule but very few cattle are kept during the summer. When we first saw them there were a few nice in-calf heifers and some good three-year-old steers, but the remainder were inferior, and, from the appearance of the young stock generally, we were of opinion that they might have been more judiciously managed.

Mr. Street's great speciality is his management of a splendid flock of Oxford Downs, which was decidedly more uniform than any we saw elsewhere, and calls for a somewhat detailed description.

On our first visit the flock consisted of—

244 breeding ewes,
212 feeding tegs.
30 he tegs, selected for showing.
19 she tegs, ditto.
90 ewe tegs, for the flock.
6 rams.

The ewes have access to roots during the winter, and after lambing are folded upon them, having a small quantity of linseed-cake, locust-meal, and clover-chaff. When the roots are finished the ewes and couples are folded on the young clovers, and the latter are allowed a break in advance, hurdles being used for the purpose, through which the ewes cannot pass.

The feeding tegs have on the roots from $1\frac{1}{2}$ to 2 bushels of cake and locust meal, with clover chaff, and are clipped and sold out fat in the spring, the greater part of them being sent to the London market. The average price realized this year would be over 3*l.* per head.

The show tegs are of course fed as well as possible, a change of diet being given as often as seems necessary. We were glad to learn that Mr. Street had been successful at the Royal Agricultural Society's show at Bedford, as well as at local shows.

The store tegs have three pecks of meal, with roots *ad lib.* At our last inspection we thought them a very superior lot, and were much struck by their unformity of character. In fact, this is one of the most noticeable features in the whole flock. Rams from the flocks of Mr. C. Howard and Mr. Treadwell are used.

The team consists of twelve very good working horses, with five colts and fillies. In these also Mr. Street takes a great pride, and he has been very successful with them at the Royal and other shows.

The ordinary wages on this farm are the same as on the preceding ones; but it may be interesting to know that the average price paid for cutting, carting, and thatching during the last nine years amounted to 10*s.* 2*d.* per acre, and since the reaper has been used 2*s.* 6*d.* per acre has been deducted from that price for the use of the machine. This seemed to us an extremely low price.

The average amount paid for labour for the last three years is 832*l.* The cake and corn purchased last year amounted to 745*l.* 12*s.*, and besides this, all beans, peas, and tail-corn grown on the farm were consumed. Average amount of artificial manures used for the last four years, 36*l.*

Although in a few instances the farm was not quite so clean as we might have wished, and a little fault might be found with the selection and management of some of the young stock, yet, taking into consideration the goodness of the crops and the excellence and management of a large flock of sheep, with a good lot of horses, we thought Mr. Street fully deserving a high commendation.

Mr. Paine's Farm is situated in the pretty village of Goldington, two miles from Bedford, and is held on a seven years' lease: it is conveniently situated in every way, each field opening on to a good road, and all lying near the house. It contains 293 acres of arable and 29 acres of grass land. Mr. Paine's great perseverance and attention to everything likely to be profitable make the farm answer, although the rent is very high and the soil a strong clay, requiring very judicious and careful management.

The rotation of cropping is the six-course system, viz.:—Roots; Wheat; Barley; Beans; Seeds; Wheat.

The land intended for mangold is manured in the autumn, or directly after harvest, with 20 cartloads of farmyard manure, and ploughed immediately. For rabi and turnips the land receives 14 loads of manure and an addition of 2 cwt. of guano before sowing.

Part of the fallows are sown with tares and eaten off with sheep in the spring, and are afterwards drilled with common turnips.

About 50 acres of barley are grown annually, and 10 pecks per acre is the quantity drilled. The average yield last year was $5\frac{1}{2}$ qrs. Seeds are sown in the barley, and the following quantities are used in alternate years, viz., 12 lbs. of white clover and 14 lbs. of red, with 4 lbs. of trefoil per acre. About 100 acres of wheat are usually grown after clover and beans, and this year the crops are very promising. The yield last year was 38¾ bushels; from 6 to 7 pecks of seed per acre is drilled, the Golden Drop and Langham being the kinds usually preferred.

With the very small quantity of grass land in his occupation, Mr. Paine is not able to keep any number of cattle during the summer, his stock at that period generally consisting of 3 milch cows, and from 8 to 10 yearlings and calves. To enable him to convert his straw into manure, a number of beasts are purchased in the autumn and resold in the spring; 25 two-year-olds were bought last year at 14*l.* 5*s.* each, which, after being kept during the winter on straw and chaff, with 4 lbs. of cake and a quart of meal per day, realised this spring 19*l.* 5*s.* each. Besides these, 18 older beasts were purchased, and sold fat; they had during the winter an allowance daily of 7 lbs. of cake, 1 peck of bean, wheat, and barley flour, with chopped straw and pulped mangold. With this liberal allowance they paid well, and made a quantity of good manure.

Mr. Paine has a good flock of long-woolled sheep, on which he bestows much attention; 136 ewes were last year put to the ram, and produced a good lot of lambs, which were very promising.

There was an excellent lot of feeding and she-tegs on the roots at our first inspection, the former having 4 pecks of beans and 4 pecks of cake daily; they were clipped and sold early, others being afterwards bought and folded in breaks on the tares; these were sold, leaving the value of their wool as profit.

Four breeding sows are kept, and the produce sold fat; also 11 useful working horses.

	£	*s.*	*d.*
Average amount of labour yearly	577	0	0
,, Cake and corn consumed, besides 48 acres grown on the farm	434	0	0
Artificial manure	36	10	0

Mr. Paine's farm is in every way worthy of a high commendation for its evident fertility, brought about by much energy and perseverance, and also for its general cleanliness and neatness. It is within easy access of Bedford; and to intending visitors we confidently recommend it for inspection, being assured that they will receive a hearty welcome from its kind and hospitable occupier.

Commended Farms.

Mr. Henman's Farm of West End, Stagsden, is worthy of commendation for its great cleanliness, the neatness of the fences and the general good management of the arable land.

It consists now of 178 acres of arable and 108 acres of grass land; and 35 years ago, when Mr. Henman took the farm at a rent of 15*s.* per acre, it was nearly all in rough grass, which he has gradually broken up. Three miles of old fences have been grubbed up, two miles of new quicks planted, and the whole of the arable land drained at his own expense.

The land is a very strong clay, and considering that Mr. Henman entered the farm with a very small capital, and, besides the improvements that he has made, has brought up a large family of thirteen children, great credit is due to him for his industry and perseverance.

The grass land is very poor, and, with the exception of a very useful flock of a hundred half-bred ewes, the stock does not call for further remark.

A seven-course system of cropping is adopted, which seems to answer well. The rotation is as follows:—Fallow, generally sown with Rabi; Barley; Seeds; Tares, eaten off with sheep; Wheat; Beans; Wheat.

Mr. Leaberry's Farm adjoins the farm last described, and is in the same parish; the soil is naturally very similar, as is also the management. It contains 200 acres of arable and 45 acres of grass land; the latter of very bad quality. Mr. Leaberry is, consequently, not able to keep much stock, and we thought him worthy of commendation more especially for the management of his arable land, the goodness of his crops, and the efficient way in which he had drained his land.

Mr. Lester's Farms come more under the head of market-gardening, especially the one at Kempston, which from good management and a plentiful supply of manure (soot being used to a large extent) is made very productive; onions and turnip-seed are, as a rule, the most paying crops.

Owing to the short time the Broughton Farm has been in his occupation, Mr. Lester has not yet been able to get it into that state of cultivation which we have no doubt he will, if he is spared a few years longer, for it is evident that everything he undertakes he does well. In Mr. Lester we have an instance of what may be done by steady industry and perseverance, as he began life as a labouring boy at 3*d.* per day, and has worked himself up to his present position.

In concluding our Report we cannot help complimenting the district which we visited, with a very few exceptions, on its good and conveniently-arranged homesteads; as well as on the comfortable cottages with their well-kept gardens and allotments, indicating that the agricultural labourer was well cared for by the landowners as well as by his employer. The cottage rents, including gardens, vary from 1*s.* to 1*s.* 6*d.* per week, and of the allotments from 2*d.* to 2½*d.* per perch, free of taxes. Taking these things into consideration, we thought the men fairly paid.

Our best thanks are due to all the competitors for the kindness and hospitality shown to us during our inspection, and with very pleasant recollections we shall look back to our visit to Bedfordshire in 1874.

XXVI.—*Report on the Live Stock exhibited at Bedford.* By Robert Leeds, of Castleacre, Norfolk (Senior Steward.)

The Thirty-sixth Meeting of the Society, held at Bedford, was in every respect a satisfactory exhibition of the various departments of English agriculture.

In the town of Bedford, famous for its nobly-endowed schools, is one of the greatest manufactories of agricultural implements in the world,—historically speaking, of recent creation; for it has attained importance within the last quarter of a century, by supplying the demand which it has been the great work of the Royal Agricultural Society of England to foster.

The county was happily chosen, for Bedfordshire, almost entirely devoted to rural industry, presents a fair specimen of the progress of modern agriculture. The farms are of fair size; the tenants are men of capital and intelligence; the live stock is of a superior description; the markets of the metropolis are within reach both for sale and purchase; and conveyance to any part of the kingdom is rendered easy by two important railways—the London and North-Western and the Midland.

Mr. Charles Howard, of Biddenham, has given me the following interesting note on the agricultural position of the county:

"The county of Bedford claims the honour of being the birthplace of the Agricultural Societies which encourage the exhibition of live stock.

"During the latter part of the last and the beginning of the present century, two ancestors of the noble family standing at the head of the county, Francis and John, Dukes of Bedford, made great exertions in the cause of agriculture. Their example had a very beneficial influence upon the farming of Great Britain. At the Woburn sheep-shearings, royal princes, noblemen, and others, met and discussed with farmers the best modes of rearing and feeding stock, as well as other agricultural topics.

"Francis, Duke of Bedford, with some few others, established the Smithfield Club in 1798, and was its President until his death in 1802. He was succeeded in the office of President by his brother, John, Duke of Bedford, the grandfather of the present Duke, who held the office until 1821. In these praiseworthy efforts in behalf of agriculture, the Dukes of Bedford were closely associated with Mr. Coke, of Holkham, afterwards Earl of Leicester.

"The Woburn and Holkham sheep-shearings will, for generations yet to come, be discussed with the liveliest interest, as they were the means of bringing into existence large numbers of county Agricultural Societies. Bedfordshire, one of the oldest, was established in 1801. From these small beginnings we owe our own Royal Agricultural Society. With these historical facts before them, it is not surprising that our Bedfordshire friends considered it would be a fitting compliment for the Society to hold its show at their county town, on the occasion of its visit to the district of which Bedfordshire formed a part."

In the glut of labour that prevailed in 1810, a year of Woburn sheep-shearing, at which Arthur Young was present (commemorated by an elaborate engraving), there was little encouragement for the ingenuity of an implement maker. It has, however, been distinctly ascertained that the germ of many implements now in common use was to be found in the workshops of Woburn Abbey from the designs of the ingenious Mr. Salmon.

The site of the showyard, 55 acres of grass-land admirably suited for the purpose, two miles from Bedford, was rendered easily accessible from that town, from London and from the manufacturing centres of the north, by two temporary stations connecting the yard with the Midland and North-Western lines; thus reducing to a minimum the difficulties of transporting implements and live stock as well as passengers.

The arrangements of the Society's showyards in a uniform series of sheds, are now so familiar that it is not worth while to dwell upon them. It is a question whether the extreme limits of space have not been reached, and whether future plans should not be rather in the direction of concentration. When the show is pitched near a dense population like that of Leeds and Manchester, the avenues are perhaps neither too wide nor too long, but on a hot July day to traverse five miles of live stock and implement streets is beyond the powers and enthusiasm of ordinary visitors. The recent alteration under which all the prize implements were brought together, arranged in two special sheds in the centre of the implement yard, gave satisfaction to the public and to the prize-winners.

Divine service was performed on the Sunday preceding the show in the Members' large tent in the showyard. In the morning, the Ven. Archdeacon Emery, B.D. officiated, and in the afternoon the Rev. Cyril R. Greaves, B.C.L.; both services were, as usual, numerously attended by the grooms, herdsmen, and shepherds in charge of the stock on the ground.

With respect to the details of each department of the show, the Stewards and Judges have sent in reports, which are given verbatim.

When the Society began its labours, the cost of conveyance presented almost insuperable difficulties to comparison and competition between the different breeds of meat-producing animals, under different circumstances of soil and climate. At present the spread of information and the facilities of communication place the breeders of every district nearly on a level. The respective merits of all the breeds of cattle and sheep are no longer a matter of theory: each county has discovered what best suits its own class of pastures and cultivation. The pure-bred male animals required are supplied by what may be called professional breeders, who exhibit and compete at nearly all the Societies' shows, and thus keep up the quality of the cross breeds which (especially in sheep) tenant farmers find most profitable.

Under these influences inferior local breeds have almost disappeared. Some, like the Norfolk polled and the Sussex (those large editions of the Devon), have been much improved, while the recent attention of enthusiastic dairymen has brought into notice the merits of carefully bred Jerseys and Guernseys.

Since the institution of the shows of the Society, the Herefords and Devons have maintained their place, improved their points as meat-makers in their own districts, and have had their respective merits acknowledged in the United States and the colonies of Australia; while the Shorthorn, which in the early days of the Royal Agricultural Society's Shows was considered a strange interloping beast from the North, has conquered all prejudices and established its value from East to West and from North to South, either as a pure breed or a cross.*

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* The following extract, from a report in 'The Times' on an Agricultural Show in New South Wales, illustrates this point:—"Herds are springing up everywhere along the lines of railway, and a vigorous competition is going on. Breeding is a profitable trade, when men like Mr. Jenkins can average 225*l.* apiece for 25 calves sold last year. Men think nothing of giving or refusing 1500*l.* for a pair of horns. The competitive entries number 250, the non-competitive 120. Of the former, 25 are Devons, 40 Herefords, and the rest Durhams. The Durhams are as yet first in popular favour, although the Herefords have a great number of adherents, and the Devons are rising in estimation. Quite a sensation was produced this year by the selection of a Hereford as the best male animal in the yard. The first prize in the aged bull class was given to Mr. E. K. Cox's 'Earl Fitzwindsor,' a pure-bred animal from Mr. Carr's herd, of Stockhouse. Mr. Jenkins, as usual, was a large prize-taker in the Shorthorns, Mr. Reynolds in Herefords and Devons, and Mr. Walter Lamb in all three."

Commercial and fiscal changes have made the meat of sheep more important than its wool. The attempts to acclimatise the merino, and to put a merino fleece on a South Down carcase, which occupied the attention of the exhibitors at the Holkham and Woburn sheep-shearings, as well as of Lord Western, one of the early promoters of this Society, have been abandoned.

The Society has been successful in calling the attention of farmers to the value as mutton-producers, not only of the descendants of Bakewell's Leicesters, and the triumphs of Jonas Webb's Southdowns, but of those excellent mutton-making animals, the Oxford Down, the Shropshire Down, and their crosses, which first made their mark at the Royal Shows.

In numbers and in quality, the pure breeds of the farm stock of England were well represented.

Class.	HORSES.	No. of Entries.
	STALLIONS.	
1	Agricultural Stallion, foaled in the year 1872	15
2	Agricultural Stallion, foaled before 1st of January, 1872 ..	26
3	Clydesdale Stallion, foaled in the year 1872	6
4	Clydesdale Stallion, foaled before the 1st of January, 1872	7
5	Suffolk Stallion, foaled in the year 1872	12
6	Suffolk Stallion, foaled before the 1st of January, 1872 ..	10
7	Stallion, suitable for getting Hackneys	16
8	Thorough-bred Stallion, suitable for getting Hunters	9
	BROOD MARES.	
9	Agricultural Mare, in foal, or with foal at foot	20
10	Clydesdale Mare, in foal, or with foal at foot	7
11	Suffolk Mare, in foal, or with foal at foot	8
12	Mare and foal, of any breed, for Agricultural purposes ..	8
13	Mare, in foal, or with foal at foot, suitable for breeding Coach Horses	5
14	Mare, in foal, or with foal at foot, suitable for breeding Hackneys	10
15	Mare, in foal, or with foal at foot, suitable for breeding Hunters	14
	DRAUGHT GELDINGS AND FILLIES.	
16	Yearling Gelding, of any breed, for Agricultural purposes ..	1
17	Yearling Cart Filly, of any breed, for Agricultural purposes	5
18	Agricultural Gelding, two years old	6
19	Agricultural Filly, two years old	19
20	Suffolk Filly, two years old (*County of Suffolk Prize, offered by Breeders of Suffolk Horses*)	6
21	Agricultural Gelding, three years old	6
22	Agricultural Filly, three years old	10
23	Pair of Agricultural Horses (Mares or Geldings), not under four years old, used solely for Agricultural purposes ..	8

HORSES—*continued.*

Hunters.

Class.		No. of Entries.
24	Hunter Filly, two years old	5
25	Hunter Gelding, two years old	9
26	Hunter Mare, three years old	7
27	Hunter Gelding, three years old	15
28	Hunter Mare, four years old	6
29	Hunter Gelding, four years old	25
30	Hunter Mare or Gelding, five years old and upwards, up to not less than 12 stone	19
31	Hunter Mare or Gelding, five years old and upwards, up to not less than 14 stone	20

Hackneys.

32	Hackney Mare or Gelding, up to not less than 12 stone ..	21
33	Hackney Mare or Gelding, up to not less than 14 stone ..	14

Ponies.

34	Pony Mare or Gelding, above 13 hands 2 inches, and not exceeding 14 hands 2 inches	15
35	Pony Mare or Gelding, not exceeding 13 hands 2 inches ..	10

36	Jackass, not under 13 hands, for getting Mules for Agricultural purposes	3
37	Mule, not under 15 hands, for Agricultural purposes	5

CATTLE.

Shorthorn.

38	Bull, above three years old	17
39	Bull, above two and not exceeding three years old	14
40	Yearling Bull, above one and not exceeding two years old ..	28
41	Bull-Calf, above six and not exceeding twelve months old ..	26
42	Cow, above three years old	20
43	Heifer, in-milk or in-calf, not exceeding three years old ..	15
44	Yearling Heifer, above one and not exceeding two years old	22
45	Heifer-Calf, above six and under twelve months old	17

Hereford.

46	Bull, above three years old	4
47	Bull, above two and not exceeding three years old	7
48	Yearling Bull, above one and not exceeding two years old ..	7
49	Bull-Calf, above six and not exceeding twelve months old ..	9
50	Cow, above three years old	9
51	Heifer, in-milk or in-calf, not exceeding three years old ..	3
52	Yearling Heifer, above one and not exceeding two years old	6
53	Heifer-Calf, above six and under twelve months old	10

Class.	CATTLE—*continued.*	No. of Entries.
	DEVON.	
54	Bull, above three years old	3
55	Bull, above two and not exceeding three years old	1
56	Yearling Bull, above one and not exceeding two years old ..	6
57	Bull-Calf, above six and not exceeding twelve months old ..	7
58	Cow, above three years old	4
59	Heifer, in-milk or in-calf, not exceeding three years old ..	3
60	Yearling Heifer, above one and not exceeding two years old	6
61	Heifer-Calf, above six and under twelve months old	8
	JERSEY.	
62	Bull, above one year old	18
63	Cow, above three years old	25
64	Heifer, in-milk or in-calf, not exceeding three years old ..	16
	GUERNSEY.	
65	Bull, above one year old	4
66	Cow, above three years old	1
67	Heifer, in-milk or in-calf, not exceeding three years old ..	1
	SUSSEX.	
68	Bull, above two years old	7
69	Bull, above one year old	4
70	Cow, above three years old	10
71	Heifer, in-milk or in-calf, above two years old	5
	NORFOLK AND SUFFOLK.	
72	Bull, above two years old	9
73	Bull, above one year old	5
74	Cow, above three years old	4
75	Heifer, in-milk or in-calf, above two years old	5
	ANY BREED.	
76	Cow of any breed, in-milk or in-calf, not eligible for entry in any herd-book	19
77	Heifer, of any breed, in-milk or in-calf, not exceeding three years old, not eligible for entry in any herd-book	9
	SHEEP.	
	LEICESTER.	
78	Shearling Ram	31
79	Ram of any other age	26
80	Pen of Five Shearling Ewes, of the same flock	8
	COTSWOLD.	
81	Shearling Ram	24
82	Ram of any other age	14
83	Pen of Five Shearling Ewes, of the same flock	5

Class.	SHEEP—*continued.*	No. of Entries.
	LINCOLNS.	
84	Shearling Ram	41
85	Ram of any other age	9
86	Pen of Five Shearling Ewes, of the same flock	10
	BORDER LEICESTER.	
87	Shearling Ram	18
88	Ram of any other age	1
89	Pen of Five Shearling Ewes, of the same flock	5
	OXFORDSHIRE DOWN.	
90	Shearling Ram	42
91	Ram of any other age	11
92	Pen of Five Shearling Ewes, of the same flock	11
	SOUTHDOWN.	
93	Shearling Ram	35
94	Ram of any other age	11
95	Pen of Five Shearling Ewes, of the same flock	7
	SHROPSHIRE.	
96	Shearling Ram	60
97	Ram of any other age	20
98	Pen of Five Shearling Ewes, of the same flock	18
	HAMPSHIRE AND OTHER SHORT-WOOLLED BREEDS. *Not qualified to compete as Southdown or Shropshire.*	
99	Shearling Ram	14
100	Ram of any other age	3
101	Pen of Five Shearling Ewes, of the same flock	4
	LONG-WOOLLED.	
102	Pen of Ten Breeding Ewes, of any age, which shall have suckled lambs up to June 1st, 1874	6
103	Pen of Ten Ewe Lambs	4
104	Pen of Ten Wether Lambs	3
105	Pen of Five Shearling Wethers	3
	SHORT-WOOLLED. *Including Oxfordshire and Shropshire.*	
106	Pen of Ten Breeding Ewes, of any age, which shall have suckled lambs up to June 1st, 1874	3
107	Pen of Ten Ewe Lambs	8
108	Pen of Ten Wether Lambs	4
109	Pen of Five Shearling Wethers	8

PIGS.

Class.	Large White Breed.	No. of Entries.
110	Boar, above six months and not exceeding twelve months old	9
111	Boar, above twelve months old	11
112	Pen of Three Breeding Sow Pigs of the same litter, above four and under eight months old	11
113	Breeding Sow	17
	Small White Breed.	
114	Boar, above six months and not exceeding twelve months old	11
115	Boar, above twelve months old	10
116	Pen of Three Breeding Sow Pigs of the same litter, above four and under eight months old	7
117	Breeding Sow	18
	Small Black Breed.	
118	Boar, above six months and not exceeding twelve months old	7
119	Boar, above twelve months old	6
120	Pen of Three Breeding Sow Pigs of the same litter, above four and under eight months old	3
121	Breeding Sow	9
	Berkshire Breed.	
122	Boar, above six months and not exceeding twelve months old	18
123	Boar, above twelve months old	19
124	Pen of Three Breeding Sow Pigs of the same litter, above four and under eight months old	9
125	Breeding Sow	24
	Other Breeds. *Not eligible to compete in any of the preceding classes.*	
126	Boar, above six months and not exceeding twelve months old	9
127	Boar, above twelve months old	3
128	Pen of Three Breeding Sow Pigs of the same litter, above four and under eight months old	7
129	Breeding Sow	16

With respect to the arrangements for exhibiting Horses, an opinion was very generally expressed that the ring was too small for a racecourse, and too large for a showyard. The stand was inconveniently placed, and, consequently, never full. Probably it would be an improvement if it were brought as close as possible to the entrance, so that ladies, always much interested in the Horse-classes, might be spared a long walk.

The Society, with its liberal prizes and heavy expenses, cannot altogether neglect attractions for that shilling multitude which is not very much in earnest about agricultural progress. Otherwise the utility of prizes for hunters over five years old might be doubted, especially as these prizes generally fall to aged hunter-geldings that have established their reputation in the field and under the auctioneer's hammer. Prizes to hunter-mares have a more solid foundation.

The prizes for thoroughbred stallions become of doubtful advantage when the winners are itinerant prize winners, covering at fees far beyond the pocket of an average tenant-farmer.

The number of horses was considerably in excess of those exhibited at many former meetings, the entries being 407 as against 314 at Cardiff and 281 at Hull; and although, as might be expected, there were many not likely to catch the judge's eye, the show must be pronounced a very good one.

Class 1 contained several useful colts, but none but the winner of the first prize called forth any particular notice.

Class 2 was a grand class. The winner, No. 19, is a first-rate 3-year-old. "Young Champion," No. 39, a horse of great power and wonderful activity, who was third to "Le Bon" at Cardiff, and second to him at Hull, now wins the second prize, and "Le Bon" is not placed. No. 38, another 3-year-old, runs well up to his stable companion. No. 39 was second in the young class at Hull, and is now third; and Nos. 30 and 37, especially the latter, are very useful horses. It should be observed that the winners of the first and third prizes, and the reserved number, are all by the great prize-taker "Honest Tom," and that the winner of the second prize was beaten by his own brother at Alexandra Park, which shows how desirable it is to use a good sire.

Class 3 produced only two competitors.

Class 4.—The older Clydesdales were good. "Young Lofty" (now 13 years old!) is always worth looking at, and Nos. 48, 53, and 54 were good specimens of this active useful breed, and No. 49 is a promising young one.

Classes 5 and 6.—The Suffolks were well represented, considering they were rather out of their favourite district; and it certainly appears that more attention is being paid to their hocks and bone below the knee than has been hitherto done. "Heir Apparent," a very good horse, with strong loins and good legs and feet, who was first in his class at Wolverhampton and Hull, is second here.

Class 7.—This class, as usual, contained rather a motley lot. "Sir George," the winner at Hull and at many other places, *as a pony*, is a great beauty, but hardly in his class as a hackney. "Rapid Roan" is a grand goer, but rather short in the rib. No. 86 is a gentlemanlike chestnut, likely to get riding-horses. The "Great Gun," No. 88, is a fine goer, and equal to more weight than anything in the class. The two roans, Nos. 79 and 81, are neat and good trotters, and so are Nos. 90 and 92.

Class 8 must have been about up to the average, as old "Laughing-Stock"—who may be looked upon as a sort of dynamometer, having been first at Newcastle in 1864, third at Manchester in 1869, second at Oxford in 1870, first at Cardiff in 1872—is now placed second to "Citadel," also a well-known prize-taker. "King John," a great favourite of the late Mr. Blenkiron's, is a horse of great power, with wonderful bone; and "Massanissa" is long and low, very hardy-looking, and likely to get hunters. But there was nothing like "Dalesman," who won last year at Hull, and who, be it remembered, is chiefly employed in covering half-bred mares, for hunters.

Class 9.—There were several fine powerful horses in this class. "Royal Duchess," placed first here and third at Hull, is a great good mare, but rather lacks quality; and "Beauty," who was placed before her at Hull, is now second. No. 103 is a fine-topped mare, but light of bone; and Nos. 110–114 and 119 are all good. It is hardly fair either to exhibitors or judges that mares suckling foals should have to compete with those without, and this is exemplified by the fact that neither of the prize mares had a foal at foot.

Class 10.—This was not so good a class as was shown at Hull. No. 128, "Mrs. Muir," the first here, was only third there; but it is only fair to say she was first at Cardiff.

Class 11.—A small but good class. The winner was shown by Mr. H. Wolton, who was first at Hull with another mare, also bred by Mr. S. Wolton.

Class 12.—The winner, No. 139, is a useful mare, and won in a young class at Cardiff. The Marquess of Bristol's two mares looked as if they should have been in the Suffolk class.

Class 13 contained nothing like breeding a coach-horse.

Class 14.—There was nothing in this class which requires particular mention except No. 154; the real stamp of hackney is getting very scarce.

Class 15.—"Lady Derwent," as she has done many times before, placed herself first. Those placed by the Judges second and third were good, well-bred mares, and the class, as a whole, was up to the average.

Class 16 produced only one entry.

Class 17 had only five entries, of which Nos. 177 and 179 were decidedly the best.

Class 18.—This was not a good class.

Class 19 was better filled, and contained several very promising fillies.

Class 20.—Not numerous, but good.

Class 21.—The same observation applies here, but No. 214, Mr. Plowright's grey colt, is worthy of special notice.

Class 22 contained several good fillies, Nos. 228 and 229 approaching very near the winners.

Class 23.—This class contained several magnificent pairs. The three pairs sent by Mr. Brierley, including the well-known and matchless "Sensation" and "Tommy Dodd," with the winners, were worthy of the admiration they elicited.

Class 24 contained only a moderate lot.

Class 25.—The winner of the first prize in this class by "Dalesman" shows blood and moves fairly. He is rather leggy, but, if he thickens, will be a showy horse. The second-prize colt is small and plain, but No. 245, another "Dalesman," is, perhaps, the largest thoroughbred 2-year-old that was ever seen; his future is, of course, a complete speculation.

Class 26 was not well filled. The winner, No. 254, was a fine big mare, but did not show the breeding of No. 252, who took the second prize, and was a nice long, low filly.

Class 27.—This was a good class. The winner of the first prize was a fine showy trotter, and a good-topped colt; but he turned his toes out, and looked to have weak pasterns. Lord Spencer's "Dalesman" colt looked like making a Leicestershire hunter, with power and size enough to carry his Lordship with the Pitchley. Mr. J. B. Booth's "Berwick" will make a weight-carrying hunter, and the same gentleman's "Baldersby" is very neat, and went as well as anything in the class, and his manners were perfect.

Class 28.—With the exception of the first and second prize-winners this was a poor class. No. 274 was a powerful mare; she galloped well, but was not a good walker. No. 276 ("Rosebud") showed more blood, and looked like going fast.

Class 29.—This was a good class of 4-year-olds. The winners of the first and second prizes were powerful animals, and moved well; but "Cornishman," although the best-looking of the lot, does not use his shoulders as he ought, and did not appear to relish the hard ground. "Reindeer," No. 283, is a slashing goer, perhaps the finest galloper in the yard. He is high on the leg, and has a slight enlargement on one hock, which might have deprived him of a place. No. 292 brought no discredit to his sire, "Dalesman;" and No. 298 looked like making a hunter.

Class 30.—In this class the "Jester" was first, as he was at Alexandra Park, where he beat "Joe Bennet." He is by "Laughing-Stock," and, like his sire, all over a gentleman. No. 310 is a weight-carrier, but does not show the same quality, and appears rather too wide before to ride quite pleasantly.

Nos. 305 and 313 were fine gallopers, and 314 and 316, belonging to Mr. Westley Richards, looked like going across any country.

Class 31.—This was a great class. The first and third prizes were awarded to Mr. Whitehead, who had five horses in the class, all looking like hunters. No. 326, which takes the first prize, is a level-made horse of good substance, capital legs and feet, and gallops strong and well. The third-prize horse is very active, and a rare mover, and looks better bred than No. 343, the Irish horse, "Mullingar," which divides Mr. Whitehead's two. Nos. 325 and 334 were well worthy of notice. "Chief Constable" must have stood high in this class, as he is a fine specimen of the weight-carrying hunter; but it was stated that he made a slight noise—it might only be the effect of an incipient cough.

Class 32 contained several valuable hacks with showy action, of which Major Quentin's "Sparkling Moselle" was placed first. She is good-looking, and a nice level goer. Then comes No. 362, "Princess," second, and Mr. Gilbey's "Maud" third. One of the best goers in this class was Mr. Parsons' 3-year-old "Polly;" and "Ozone," "Ladylike," and "Ballet Girl," were hacks that any light man might covet.

Class 33.—In this class was one of the most gentlemanlike weight-carrying hacks in the country, Mr. Harvey Bayly's "Enterprise," also winner of the first prize for hunters not exceeding 15 hands 2 inches, at the Islington Show. The second to him was Mr. Frisby's well-known "Filbert." "Black Friar" and "Kitty" looked and went well.

Classes 34 and 35 contained some valuable ponies, amongst which "Princess Louise," a grand goer; "Princess Polo," winner in both saddle and harness at the Agricultural Hall; "Kingfisher," a very powerful pony; and "Kitty," a white-faced chestnut, were conspicuous in Class 34; and "Whimsical," a real beauty, "The Shah," "Pride of the Vale," and "Jesse," were the pick of the smaller class.

The following are the Reports of the Judges:

Report of the Judges on Agricultural Horses.

In submitting the following report on the exhibition of agricultural horses at the Bedford meeting, we may congratulate the Society on the classes being numerically well filled, whilst there is a marked improvement in the quality and soundness of the animals entered for competition as compared with former years, although there were one or two cases in which decidedly the best animals in their respective classes were prevented taking the prize by the fiat of the veterinary inspector.

There were fifteen entries in Class 1—*Agricultural Stallions, Two Years old.* Mr. G. E. Daintree takes the prize with "Grand Prince," who deserves his name, being a remarkably fine, handsome colt, with a capital back, and good legs and feet. Mr. Golden has the second prize for "Champion," a heavy colt, with rather a low back—the third prize going to Mr. Russell's good-looking bay. Mr. Hipwell gets the Reserve Number and Highly Commended for a useful roan colt, but who is rather deficient in the brisket. The Rev. J. Micklethwaite shows a very smart and improving colt called "Taverham Hero."

Class 2—*Agricultural Stallions foaled before* 1st *of January*, 1872—comprised 25 entries, many of them being much more calculated for dray purposes than for agricultural work. Our old friend "Honest Tom" is well represented in this class, the first and third prize-takers being by him, as well as the Reserve Number. Mr. Briggs takes first prize for a very clever 3-year-old, with a rare top, body, and legs. Mr. Statter's "Young Champion," well known in the prize-ring, being second, and his "Young Honest Tom," a very smart horse, with rather a light middle, being third; whilst Mr. Brookes' "Honest Tom Second" is Highly Commended and Reserve Number; he is a heavy horse, with plainish rump. The good-looking "Le Bon" was passed over, his feet being sadly out of order, and his ankles being too much worn for a 6-year-old horse. Mr. Stokes' "Young Champion," an own brother to the second-prize horse of the same name (what a pity it is that breeders do not let us have a few fresh names, instead of naming their horses after their sires for generations), is very active; but we thought him too rough and heavy for purely agricultural purposes. There was a remarkably good grey horse in this class who at once was put down for the first prize, but which a too prevalent infirmity prevented his receiving. There were several more useful horses, and a few very bad ones, that it would, perhaps, be invidious to call special attention to.

Only two 2-year-old Clydesdale stallions were present to compete for the three prizes offered. The first prize was awarded to a clever colt named "Tam O'Shanter," belonging to Mr. Tweedie; but we were obliged to withhold the second and third prizes for want of merit in the other competitor.

Class 4—*Clydesdale Stallions*—had seven entries; and "Young Lofty," looking very fresh and well, at once caught our eye for the first prize; it is seldom so good a one is to be found. The second prize, Mr. Stanford's "The Duke," is a worthy representative of his famous sire, "Sir Walter Scott," being active and very compact. Mr. Pease gets third prize for "Emperor," a good, heavy, lengthy, 4-year-old, without much fashion about him.

Class 5—*Suffolk Stallions, Two Years old*—was a good one, the first prize going to Mr. M. Biddell's "The Templar," a colt of full size, good quality, and one that, if he goes on well, must, in spite of being a trifle low in the back, grow into a very fine and valuable horse. Mr. Garrett's second-prize colt, by "Cupbearer," is too dark in colour, but has many points of resemblance to his sire, and has the same remarkable action. He is rather light below the knee, but shows rare constitution, and his commended colt, No. 59, is a very true-made one, but rather small. Mr. James Toller's third-prize colt, by a son of "Harwich Emperor," is a very smart one, with good action. Mr. Byford is Highly Commended for a son of his "Volunteer," a very useful colt, with good back, but rather drooping hind-quarters. He gets the Reserve Number. Mr. William Toller is Highly Commended for his colt by "Ploughboy," a very useful colt, but without much style about him. There was one colt shown in this class, and about as bad a one as one could well find; it was not, however, sent from Suffolk.

Class 6. *Suffolk Stallions foaled before* 1st *of January*, 1872.—Seven out of the nine entered came forward for our inspection, and a very good lot they were, Mr. C. Frost taking the first prize for his 4-year-old "Cupbearer Second," a horse of great power and substance, a little deficient in quality perhaps, but who, if he goes on well, must grow into a very superior animal. Colonel Wilson is second with "Heir-Apparent," a very true-made one, full of quality, and a capital back and loin. Mr. Garrett's "The Claimant" is a hardy-looking son of "Cupbearer," but whose legs look scarcely equal to the task of supporting his bulky carcase. Mr. Byford gets Highly Commended and Reserve Number for "The Statesman," a horse of great size and power, and who will, in all probability, some day turn the tables on one or more of his conquerors of to-day. Mr. Wolton's "Royal Duke Second" is a very well-made, compact horse, but there is not quite enough of him. The class of agricultural mares neither Clydesdale nor Suffolk had 19 entries. The first-prize mare, "Royal Duchess," is a great prize-taker, and a first-class specimen of the heavy draught horse; the second prize goes to Mr. Street's roan, "Beauty," a clever, short-legged, wide mare, with capital action; Mr. Tomlinson's grey being third—a nice, fresh, well-proportioned mare; Mr. Purser's well-known "Honest Lass" only getting the Reserve Number and Highly Commended, her weak pasterns and light fore-legs being out of proportion to her top. There were several useful animals in this class, but nothing demanding special notice. Mr. Statter takes the first prize with the good-looking "Mrs. Muir" in the Clydesdale mare class. Lieutenant-Colonel Lindsay is second with the short-legged, good-bodied "Darling," whilst his "Isabella" is third. This class is not so good as we have seen them.

Class 11 has an entry of 5 Suffolk mares. Mr. Horace Wolton takes the prize for his "Pride," a beautifully-topped mare, but with rather too much daylight under her. Sir William Throckmorton is second with his good-looking "Jolley," a mare with a good forehand and back, but rather light above her hocks. Mr. Coulson gets third prize for a heavy mare from Essex, that looks like a good, hardy, brood mare. Colonel Wilson's "Violet" is the Reserve Number and Highly Commended, and is a mare of full size, but with a slack loin.

Class 12. *Mare and Foal of any Breed for Agricultural Purposes.*—Mr. George Street takes the first prize for a clever roan 4-year-old mare called "Cardiff Lass," rather light in her waist, but having a capital foal; the Marquis of Bristol is second, with a very short-legged, good stamp of Suffolk mare, as well as taking the Reserve Number and Highly Commended for his 16-year-old "Diamond.' In Class 16 but one yearling gelding was shown, a smartish one too. The yearling fillies had nothing particular calling for observation about them.

Class 18—*Agricultural Geldings, Two Years old*—were a good lot, with the exception of a leggy grey, whose owner could not have been proud of him in the ring. The first prize, belonging to Mr. Henman, is a very clever one; Mr. Allwood's second-prize one has a plainish head, and Mr. Arch takes the third prize.

Class 19—*Agricultural Fillies, Two Years old*—was well filled, there being nineteen shown, and mostly very creditable animals. There was not much to choose between Mr. Vergette's "Violet," the first prize, and Mr. Nix's second-prize bay, both being good, wide mares; Mr. Morton gets the third prize for a daughter of "Honest Tom;" and Mr. F. Street the Reserve Number and Highly Commended for his "Smart," a nice, compact filly. Mr. Morton is Highly Commended for another "Smart," and Messrs. Stanford get a Commendation for a good, brown daughter of the second-prize Clydesdale stallion. Mr. M. Biddell gets the first prize offered by Suffolk breeders for 2-year-old Suffolk fillies, with a very smart descendant of "Cupbearer:" she is of the favourite colour, a red chesnut, a capital back, but she might have a trifle more bone. Mr. Wilson's filly is of full size, with not so much quality, and rather split up behind; she will, however, grow into a fine mare some day. Mr. Lofft gets the Reserve Number for a useful filly named "Blossom."

Class 21—*Agricultural Geldings, Three Years old*—had 6 entries, the first prize going to Mr. Plowright's very clever grey, "Dragon;" Mr. Cartwright has the second prize for his very big and appropriately named "Drayman;" for he is certainly more calculated for dray-work than agricultural purposes. Messrs. J. and F. Howard take the third prize with a nice, short-legged horse.

The 3-year-old agricultural fillies were of any breed, the first prize going to Mr. Vergette's "Gipsy," a good, wide, black mare; Mr. Lester's very big "Blossom" gets the second prize, Mr. Middleton is third with "Flower Girl," Messrs. Howard get the Reserve Number and Highly Commended for "Jess," and Mr. James Toller's Suffolk filly is Highly Commended.

Class 23—*Agricultural Pairs*—were a very mixed lot, and an unsatisfactory class to judge, being so very different in character, there being those wonderful animals of Mr. Brierley's—"Warwick" and "Tommy Dodd" (the latter, however, went lame, and so was out of it), "Sensation," and "Honesty," which got the Reserve Number and Highly Commended; whilst Messrs. J. and F. Howard took the first prize with a pair of fine bay geldings; Mr. Charles Howard took second prize for a pair of very useful ones, and Mr. Brierley gets the third prize for a pair of active chesnuts. The owners of the other two pairs of geldings cannot have had much experience in the Show-yard, or they would not have sent their animals.

Report of the Judges of Thoroughbred Horses and Hunters.

We commenced our duties with Class 8.—*Thoroughbred Stallions for getting Hunters.*—This was a small class considering the amount of money given. There were three nice horses. We awarded the first prize to No. 99, "Citadel," a horse of great power and substance, and goes moderately well; his shoulders and back are not so good as they might be. No. 96, "Laughing-Stock," took second honours. The old horse looks remarkably well, and is well known to all frequenters of Show-rings. He is very gay, and of nice quality, but short of substance, and stands high on the leg. The third prize, No. 100, "King John," is a strong, useful, level-made horse, good colour, and goes fairly, and looks like a very valuable country stallion. No. 98, "Massanissa," was the Reserve Number. He is a short-legged horse, but his fore-legs are not right, and he goes very badly. The rest of this class call for no remarks.

Class 15. *Hunting Brood Mares.*—Some very good animals in this class. We selected three without much trouble, but it was with great difficulty that we decided upon their respective positions. We had, however, the consolation that, however we might place them, we could not get far wrong, as it seldom falls to the lot of Judges to have three such mares together; and it is quite probable that as often as they meet the awards will differ. In the end we decided to put No. 164, "Lady Derwent," first—a beautiful, level mare, with a good foal by "Cathedral;" No. 171, "Lady Lina," second—a very handsome, game-looking, mare, fine mover, but not quite so good a back as she might have been; No. 168, "The Wren," third prize—a sweet, hunting-like mare—but her shoulders are, perhaps, a little upright. No. 162, the Reserve Number—a fine mare without a foal.

Class 24. *Hunting Fillies, Two Years old.*—This was the worst class we had. The first prize, No. 238, has good legs, but short of size; the second prize, No. 239, is pretty, but very light.

Class 25. *Hunting Colts, Two Years old.*—Not very good. No. 246, first prize, is a fine colt, but a little long in the leg; No. 249, second prize, has rather a pony-look about his head and neck, but he is bound to go well over a country some day.

Class 26. *Hunting Fillies, Three Years old.*—A short entry here; but No. 254, first prize, and No. 252, second prize, are two nice young mares.

Class 27—*Hunting Geldings, Three Years old*—came out stronger. We awarded the first prize to No. 262, a very nice-stepping horse; but if he had a little more length he would, perhaps, be more likely to retain his position another year. No. 261, the second prize, is a great, big, fine colt, though his limbs are not so large as they look; still, if he grows the right way, he must make a valuable horse. The third prize, No. 267, is a great, powerful colt, and looks like a weight-carrier, but he made a very bad show. The Reserve Number, No. 268, is a good mover, but, perhaps, more like a riding-horse than a hunter.

Class 28. *Hunting Mares, Four Years old.*—A very bad entry, and moderate what there were.

Class 29. *Hunting Geldings Four Years old.*—A much better entry, and better altogether. We awarded the first prize to No. 288, a very useful, good-looking horse, with rather a large head, and not very fast in his paces. The second prize, No. 301, is a good colt, with very big legs; gallops well, but wants time to furnish. If he goes on well he will reverse positions next year. The third prize, No. 294, is a nice, wiry-looking horse, but he does not move so well as he ought to do from his appearance. No. 298, the Reserve Number, is the best-looking horse in the class, but, upon inspection, his fore-legs are very weak.

Class 30. *Hunting Gelding or Mare up to* 12 *stone.*—This looked at first sight a good class, but there were many that would not bear examination. We had no difficulty in awarding the first prize to No. 320, a very good-looking, brown horse, and a beautiful mover; the second prize to No. 310, also a good horse, but rather deficient about his shoulders; the third prize, No. 316, is very light, but gallops like a race-horse. The Reserve Number, 315, is a useful horse, but we thought almost ought to have been in the heavy-weight class.

Class 31. *Heavy-weight Hunters.*—A very useful lot. No 326, the first prize, is a nice, long, low horse, with good, strong legs, and gallops well and fast. The second prize, No. 343, is a fine, good-looking horse, but does not gallop so well as the first prize. No. 328, third prize, is also a good-looking horse. We were sorry that in this class we had to call in the veterinary, who disqualified one that would have taken a prominent position.

Report of the Judges of Hackneys, Coach Horses, Ponies, &c.

In compliance with the request of the Council, the Judges beg to submit the following remarks on the animals exhibited for their inspection at the Show of the Royal Agricultural Society of England, held at Bedford. And, generally, they wish to state, that although some of the classes were fairly represented, yet, in their opinion, no great merit, except in the prize horses, was apparent in the animals below them. This remark, however, does not apply to Classes 32 and 34.

In Class 7—*Stallion for getting Hackneys*—"Sir George," No. 89, won very easily. He is a magnificent mover, a perfect horse in miniature, but his shoulders might be improved as a hackney stallion. Indeed, many of the stallions now-a-days exhibited as hackney stallions have harness shoulders, and consequently action too high and too round.

In Class 13 only two animals were exhibited, and the Judges were of opinion that No. 149 did not deserve more than a third prize.

Class 14. *Mare for breeding Hackneys.*—This was not at all numerously represented; and although the prize animals were very creditable specimens of their class, they were wanting in substance.

Class 32. *Hackney Mare or Gelding, to carry not less than* 12 *stones.*—This was a very meritorious class, although rather of a mixed character.

Nineteen were exhibited, two entries being absent. Among this number the thorough-bred hack and the under-bred cob stood side by side.

CLASS 33. *Hackney Mare or Gelding, to carry not less than* 14 *stones.*—In this class, No. 372, "Enterprise," was a very easy winner, although there were several good ones in the class.

CLASS 34. *Pony Mare or Gelding, above* 13 *hands* 2 *inches, and not exceeding* 14 *hands* 2 *inches.*—This class was a good one, and the Judges had some difficulty in placing the three prize ponies.

CLASS 35. *Pony Mare or Gelding, not exceeding* 13 *hands* 2 *inches.*—This class does not call for any special remark.

CLASSES 36 and 37.—The Judges have but to remark that there appears to be a prejudice against the breeding of jackasses and mules in this country, which will probably take some time to overcome.

JACKASSES AND MULES.

The number of entries in these two classes, the prizes for which were liberally offered by Mr. Edward Pease, of Darlington, was rather limited, although the quality of the few animals exhibited was decidedly superior. Taking the jackasses first, three only presented themselves; amongst them a massive Poitou ass of 14 hands, the best of the three, so far as getting mules for agricultural purposes is concerned. This animal belonged to Mr. Pease, and was entered "not for competition." Of the other two, one was a smart, 14-hand Spanish, exhibited by Mr. C. L. Sutherland, of Coombe, Croydon, to which the first prize was awarded, and the other a young, undeveloped Poitou, sent by Mr. Samuel Lang, of Bristol, which took the second prize.

Five Poitou mules, all regularly used by their owners for agricultural purposes, were exhibited, varying in height from 15·2 to 16 hands. These mules are bred from French cart-mares by Poitou asses, and their appearance certainly favoured the idea that they are capable of doing any amount of work. The casual observer could not fail to be struck with their round barrels, short legs, bone below the knee, and good, open feet; all of which are points peculiarly characteristic of the Poitou, as distinguished from the Spanish, mule. It appears that Poitou mules are in great request in almost every part of the world except England, where, from their scarcity, their value is little known, and, consequently, not appreciated. The great strength of the mule in proportion to his weight, his capability of enduring fatigue, his freedom from disease, his longevity, his capability of thriving on the coarsest food, and his docility, where his nature is properly understood, are points worthy the attention of agriculturists and others who require heavy-draught animals at once efficient and economical. In the United States mules are very extensively used in agriculture, as well as for draught-purposes in towns.

Messrs. Pease, Lang, and Sutherland, were the only exhibitors in this class—Mr. Pease showing a heavy, short-legged, mare mule of immense power, "not for competition;" Mr. Sutherland taking the first and third prizes, and also the reserve number; and Mr. Lang being awarded second honours.

Cattle.

For the following Report I am indebted to my colleague, Mr. M. W. Ridley, M.P.

In point of numbers as well as of quality, the show of cattle at Bedford will compare favourably with its predecessors. The entries reached the large total of 410, but of these there were 69 not present—a fact which is to some extent attributable to the appearance of the foot-and-mouth disease in the neighbourhood, or in the herds of intending exhibitors. In point of quality the show was, speaking generally, decidedly up to the average, while, as regards the Shorthorns, it probably was about the best ever exhibited by the Royal. Class 43 (that for Heifers in-milk or in-calf, not exceeding three years old) was the best class of any sort upon the ground, and was so good, that if the four prize winners and the reserve number had all been absent, the remaining six animals shown would have been themselves a most excellent competition.

The Judges, who were Mr. Hugh Aylmer, of West Dereham Abbey, Stoke Ferry, Mr. E. Bowly, of Siddington House, Cirencester, and Mr. Henry Smith, of Eske Hall, Durham, report as follows:—

Shorthorns.

The *Bulls above Three Years old* are a good class. Besides the four prizes, the Judges highly commend No. 420, the reserve number, as well as No. 416, and commend the whole class.

Class 39. *Above Two and not exceeding Three Years old.*—Except the prize animals and those commended, this class contained nothing very striking.

Class 40. *Yearling Bulls.*—This is a large class and contains many superior animals. The first prize, No. 451, is very straight and level on his top, but wants depth in his middle.

Class 41. *Bull Calves.*—A large and promising class.

Class 42. *Cows above Three Years old.*—A very fine class. In addition to the three prize animals, the Judges highly commend No. 520, the reserved number, and No. 503, and commend Nos. 493 and 501.

Class 43. *Heifers in-calf or in-milk.*—This was the best class shown, and the Judges highly commend all.

Class 44. *Yearling Heifers.*—The first prize in this class is very superior to any other in the yard. The Judges consider her the best animal they have seen at the Royal Show for some years. It is a large class, and several are highly commended.

Class 45. *Heifer Calves.*—This is also a good class, and contains many promising specimens for future shows.

The Judges consider the show of Shorthorns very good, and above an average.

The Herefords were, as was naturally to be expected, rather more numerous than at Hull, there being 49 animals on the show-ground. The Devons were fewer in number (37), but, as the short general report annexed will show, pleased the Judges rather more than the Herefords.

Mr. F. Evans, of Bredwardine, Hereford, Mr. S. P. Newbury, of 4, Boringdon Villas, Plympton St. Mary, and Mr. T. Pope, of Horningsham, Warminster, have sent in the following report:—

Herefords and Devons.

Since being requested to make a report on the merits of the breeds of animals brought before our notice, we would wish to briefly state that the Herefords generally scarcely maintained the position they usually have held, though, of course, there were many very deserving specimens. The Devons, though comparatively few in number, well maintained their reputation, and the different classes had specimens which their respective owners may regard with great favour.

The Jerseys were very well represented, but the Guernseys were short in number.

The Judges, Mr. J. Dumbrell, of Ditchling, Hurstpierpoint, and Mr. C. P. Le Cornu, of La Hague Manor, Jersey, send a carefully-drawn statement of their opinion, which is as follows:—

Jersey and Guernsey.

Class 62. *Bulls of all Ages.*—In this there were eighteen animals entered for competition, some of which were undoubtedly good, though none particularly striking as infinitely superior to the rest. The first prize was taken by No. 682, with good head and horns, general neatness, and combination of power. No. 676, a younger animal than the latter, came in for second place. There is no doubt that this animal has much in its favour; for instance, the rich yellow colour of its horns, always denoting excellence, a well-formed head and good lines, though, on the other hand, he shows some flatness and certain wants about the rump, which age may to some extent remedy. The reserve number was given to No. 69, a large and powerful animal.

The Judges would observe that in this class the bull No. 684 should not have been entered, but should have been shown in Class 65, where he might certainly have competed with some advantage.

Class 63. *Cows.*—This was by far the largest and most interesting of the classes submitted to us. The entries numbered 24, comprising some very creditable animals, and, as a class, on the whole of fair average. There could be no hesitation in awarding the first prize to No. 715, but not so with the second; here the competition was as closely run together as it is possible to be. The two animals competing, differing in many respects, combined individual merits of first-class order, and it was only after much consideration that this prize was given to No. 713, a grand and rich milker, and the reserve number to 706, heavy in calf, whose condition to some extent assisted her appearance, but withal is a splendid animal. Amongst the rest, nothing approached the three mentioned, though others in the class could well bear inspection.

Class 64. *Heifers.*—In this class sixteen were entered. The first prize fell to No. 722, a heifer of great promise, which later (judging from her present forms) ought to hold a distinguished position in the Cow classes. For the second prize No. 731 had it all her own way; there was nothing left that could approach her: a fine fore-hand, a capital udder, and general development were here easily noticeable. The reserve number went to 720, as the best of the remainder; but the difference in her favour was not great, owing to some coarseness about her head and neck.

Guernsey Cattle.

The difficulty of judging these classes was reduced, in consequence of the paucity of numbers, to a mere allotment of the prizes.

In Class 65, *Bulls*, there were three entries only, one of which was at once disqualified, as not of the Guernsey breed. Had No. 735 been entered with the Jerseys in Class 62, his chances might have been better; he would, at least, have been amongst his own sort. Though the numbers in this class (65) were few, the bull No. 736, to which the first prize was awarded, is an animal of superior merit; his neatness of horns and general appearance are indisputable.

Class 66.—One cow only was exhibited, to which the first prize was awarded. This animal showed an excellent dairy type, and well deserved the award.

Class 67.—As in the last class, the prize-taker had it all her own way, she being the only animal exhibited. No. 740 is a large heifer of good dairy promise.

Mr. Dumbrell further urges the desirability of the Society expressing its strong disapproval of the absurd practice of "stocking up" cows' udders. "Many," he says, "in fact most, of the cows shown to us had not been milked since the previous afternoon, and several of them were quite unable to retain their milk." And he further suggests that the Society might with advantage divide the Jersey Bull Class into two, one for over and one for under three years old.

The remaining classes were the Sussex Cattle, the cows and heifers of any breed, and the Norfolk and Suffolk Polls. These last constituted a class of their own, as was suggested by the Judges at Hull, and in quality, at all events, justified the action of the Society. The number of exhibitors was not large, and Mr. Colman took three first prizes; one first and two seconds falling to Lord Sondes. The Judges were Mr. H. Overman, of Weasenham, Brandon, and Mr. Josiah Pitcher, of Hailsham, Sussex, and they reported:—

Sussex, Norfolk, and Suffolk.

The Judges beg to report as follows on the classes of Sussex cattle:—

Class 68. *Bulls above Two Years.*—A very good class of animals.
Class 69. *Bulls above One Year.*—Not well represented.
Class 70. *Cows above Three Years old.*—A good class.

Class 71. *Heifers in-calf or in-milk.*—Not superior.
Class 72.—Well represented, and in it several superior animals.
Class 73.—Excepting the first-prize animal, the remainder are inferior.
Class 74. *Cows.*—Not a superior lot.
Class 75. *Heifers.*—Excepting the prize animals, the class was not superior.
Class 76. *Cows of any Breed.*—A large and good class.
Class 77.—The prize animals good.

The cattle were paraded every day after Monday, and, speaking generally, with a regularity which leaves the Steward little to complain of. The great difficulty consists in securing the attendance of exhibitors' servants to lead out their cattle, and much work, which ought to be done by them, has to be done by the Society's men. As there is, no doubt, some risk in valuable animals being led out by men not accustomed to them, and this risk may fall upon the Society, the Steward of Cattle at Bedford ventures to suggest to those who will follow him in his office, that the rules of the Society affecting this point be more strictly enforced than they have been. He would also add that the parade of cattle might well be discontinued on the last day of the show.

Sheep.

Mr. Wakefield has been so good as to furnish the following report on his department.

The number of entries at this year's show amounted to 479.

The Inspectors of Shearing examined the whole of the sheep on the Saturday previous to the Show, and disqualified a certain number on the ground of their not being fairly shorn, in accordance with the rule laid down by the Society. They also stated that there were several other cases with which they might have dealt in a similar manner, but they picked out the more flagrant, in the hope that they might suffice as a deterrent for the future; but they added, that should they have to act again for the Society as Judges of shearing, they should be disposed to be much more stringent in insisting on a more rigid carrying out of the rule. The attention of exhibitors intending to compete next year is specially drawn to this, in order that they may more carefully look after the shearing, and not leave the matter altogether in the hands of servants over anxious for the honour of their employers.

The Inspectors also drew special attention to the great desirability of passing a rule that no application of any kind to the wool of sheep be allowed. It serves no good or useful purpose; it makes the duties of judging very unpleasant in the handling, both to themselves and to the Judges who come after them, and is, in fact, a practice by all means to be discouraged. It seems to be a custom in fashion only amongst certain kinds of sheep, and it is hoped that we have seen the last of it at Bedford.

It will therefore be the duty of the Council to take this subject into their consideration before issuing the Regulations for next year's Show.

LEICESTERS.—CLASS 78. *Shearling Rams.*—There were 31 entries, 2 being absent. The First, Second, and Third Prizes were all awarded to Mr. George Turner, jun. The Reserve Number, the property of Mr. J. Borton, was highly commended.

CLASS 79. *For Aged Rams.*—Had 26 entries, 2 being absent. Mr. George Turner, jun., again took First honours, and his father, Mr. Turner, of Bramford Speke, took the Second Prize; Mr. John Borton taking Third, and the Reserve Number, which was highly commended.

CLASS 80. *For Pen of* 5 *Shearling Ewes of same Flock.*—Had 8 entries. Mr. Turner, jun., took First and Third Prizes; Mr. Borton, Second. The Reserve Number, the property of Mr. T. H. Hutchinson, was highly commended.

Subjoined is the Judges' Report of the above Classes :—

The Judges of Leicesters beg to Report Class 78—*Shearling Rams*—as being in their opinion equal to what have been exhibited for several years past. There are some very good well-formed animals—a true type of the Leicester breed.

In CLASS 79—*Rams of any other age*—we find the two shears possessing the greatest merit, being well-formed, indicating more flesh than the older sheep, although there are some very good specimens among the older ones.

In CLASS 80—*Shearling Ewes*—we find a very fair class, possessing size with good coats.

The competition in the above classes we consider good.

COTSWOLDS, LINCOLNS, AND LONG WOOLS—CLASS 81. *Cotswolds Shearling Rams.*—24 entries, 1 absent. Mr. Thomas Brown carried off all the Prizes in this class, but from the report of the Judges there does not appear to be any improvement over the sheep shown in this class in former years.

CLASS 82. *Cotswold Aged Rams.*—14 entries, 1 absent. Mr. Brown took First and Third Prizes, and Mr. Swanwick, Second.

CLASS 83. *Pen of* 5 *Shearling Ewes of same Flock.*—5 entries. Mr. Swanwick took the First Prize, and Mr. Gillet, Second and Third.

CLASS 84. *Lincoln Shearling Rams.*—41 entries, 5 absent. Mr. E. J. Howard took First Prize; Mr. John Pears, Second; Mr. Robert Knight, Third. The Reserve Number, belonging to Mr. T. Cartwright, highly commended.

CLASS 85. *Lincoln Aged Rams.*—9 entries. First Prize awarded to Mr. John Pears; Second and Third to Mr. R. Wright. The Reserve Number, belonging to Messrs. W. and H. Dudding, highly commended.

CLASS 86. *Pen of* 5 *Lincoln Shearling Ewes.*—10 entries, 2 absent. First Prize awarded to Mr. T. Gunnell; Second to Mr. J. Byron; Third to Mr. John Pears. The Reserve Number, belonging to Mr. C. Clarke, highly commended.

Subjoined is the Report of the Judges of Cotswolds and Lincolns, and of the Long Wool Classes, 102, 103, 104, 105.

CLASS 81. The entries more numerous in this class than at late Shows of the Royal Agricultural Society. There are several very useful sheep in the class, fairly representing the character of the Cotswold sheep; but we do not consider the first-prize sheep as being quite up to the standard of excellence of some former years.

CLASS 82 was also fairly represented as to number, and also contained some useful animals; the first-prize sheep being of good stamp and character.

CLASS 83 had but 5 entries. The first-prize pen were fair representatives of the Cotswold breed.

CLASS 84 was largely represented as to number, having 41 entries, and occupied the Judges a considerable time in arriving at a decision. Eventually No. 952 was awarded first honours, being a sheep of nice character, good quality of wool and mutton, with good carriage, but rather deficient in his leg of mutton. The Second Prize was awarded to a sheep very full of firm flesh, but somewhat deficient in character. The number of commendations show that the Judges considered there were many useful sheep in the class.

CLASS 85. Though not so numerous, this was a very fine class, the First, Second, and Third Prize sheep being of great merit, and well representing Lincoln sheep.

CLASS 86. Nothing in this class to call for particular remark.

CLASSES 102 to 105, inclusive, did not contain any sheep of special merit, with the exception of the First Prize Shearling Wethers, which were of very high class.

BORDER LEICESTERS.—CLASS 87. *Shearling Rams.*—18 entries. First and Second Prizes awarded to Mr. T. Forster, jun.; Third to Mr. W. Purves.

CLASS 88. *Aged Rams.*—There was only 1 entry in this class, by Mr. T. Forster, jun., to whom the First Prize was awarded.

CLASS 89. *Pen of* 5 *Shearling Ewes of same Flock.*—5 entries, 1 absent. First Prize awarded to Mr. W. Purves; Second to Mr. H. Newby Fraser; Third to Mr. R. Tweedie.

Subjoined is the Report of the Judges of the above:—

It is much to be regretted that, owing probably to the distance at which the Show was held from the districts in which this most valuable breed prevails, Border Leicesters were poorly represented in point of numbers.

The First Prize Shearling—Mr. Forster's—was good, with the exception of his wool, which, instead of being of a fine, long, curly texture, was somewhat hairy and coarse; he had the style, the white head, and all the liveliness for which the breed is remarkable. The Second Prize, belonging to the same owner, was fairly good, while the Third—Mr. Purves's—was moderate, with nice wool. Only one sheep—also belonging to Mr. Forster—came forward in the Aged Class, but seldom or never has a better specimen of the breed been seen, though he is perhaps a little deficient in neck. The females were a poor show, and, with the exception of Mr. Purves's good and nice-woolled prize pen, call for little notice. The Third Prize would have occupied a better position, had they not been seriously faulty in one of the chief characteristics of the breed—their heads, which were bare, and the skin quite pink, almost red.

We would strongly recommend that bare and pink heads, which in our opinion indicate delicacy, should be avoided, and that sheep with lively, somewhat bold, "cleanly" cut white heads, and with the skin about the noses and eyes, be adhered to as much as possible.

OXFORDSHIRE DOWNS, SOUTH DOWNS, HAMPSHIRES, AND SHORT WOOLS.—CLASS 90. *Oxford Down: Shearling Rams.*—41 entries. The First and Third Prizes awarded to the Duke of Marlborough; the Second to Mr. A. F. M. Druce. The Reserve Number, belonging to Mr. G. Wallis, was highly commended.

CLASS 91. *Aged Rams.*—11 entries. The First and Second Prizes were awarded to Mr. G. Treadwell; the Third to Mr. A. F. M. Druce. The Reserve Number, belonging to Mr. C. Howard, was highly commended.

CLASS 92. *Pen of* 5 *Shearling Ewes of same Flock.*—11 entries, 1 absent. The First Prize was awarded to Mr. A. F. M. Druce; the Second to the Duke of Marlborough; the Third to Mr. G. Wallis. The Reserve Number, belonging to Mr. C. Howard, was highly commended.

CLASS 93. *South Down Shearling Rams.*—35 entries, 11 absent. The First Prize was awarded to Mr. William Rigden; the Second and Third to Lord Walsingham. The Reserve Number, belonging to Messrs. J. & A. Heasman, was highly commended.

CLASS 94. *Aged Rams.*—11 entries, 2 absent. First Prize awarded to Lord Walsingham; Second to Mr. William Rigden; Third to Sir W. Throckmorton. The Reserve Number, belonging to H.R.H. the Prince of Wales, was highly commended.

CLASS 95. *Pen of* 5 *Shearling Ewes of same Flock.*—7 entries, 1 absent. The First Prize was awarded to Lord Walsingham; the Second to Sir William Throckmorton; the Third to Mr. J. J. Colman. The Reserve Number, belonging to Lord Walsingham, was highly commended.

Subjoined is the Report of the Judges of the above Classes, also of the Short Wool Classes, Nos. 99, 100, 101, 106, 107, 108, 109.

The show of Oxford Downs were, as regards numbers and quality, of very superior character. In the Shearling Class, the prize animals were well supported by many others. The old class constituted a very fine lot of sheep. The first and second prizes were of immense size, but may be considered to be too fat for service. The third prize was a nice, firm-fleshed, good animal;

and we considered the whole class well worthy of being highly commended. In the class of Shearling Ewes, we consider them over an average of former years, and likely to produce some prize-takers in future years.

The South Down classes were well represented; and in the Shearling class some good animals were exhibited. The first prize, although rather under size, was a perfect specimen of a South Down, both as regards character and quality. The second and third prizes were fair specimens of the breed; and many others in this class were remarkable for their quality. In the older class the prize animals were very similar as regards size, character, and quality, all being excellent specimens of the breed. The Shearling Ewes was a very good class, although few in number; the whole class being commended. And we can make the same remark as on the Oxfords. The Hampshire Downs, in Class 99, were a mixed lot. The first prize was a good useful sheep of the breed. The old Sheep and Shearling Ewes, although small in numbers, were fairly represented as regards size and quality. In the Ewe Class, 106, being a mixed class, the first prize, Oxford Downs, were well worthy of notice. The Lamb Classes, 107 and 108, were also of a mixed character; and some useful pens were exhibited. Class 109 was remarkably well filled, and some very good pens shown, the first prize being of unusual excellence.

SHROPSHIRES.—CLASS 96. *Shearling Rams.*—This was the most numerous of all the Sheep Classes, having 61 entries, with 10 absent. The First Prize was awarded to Lord Walsingham; the Second to Messrs. Mansell; Third to Mr. Crane. The Reserve Number, belonging to Mr. Beach, was highly commended.

CLASS 97. *Aged Rams.*—20 entries. The First Prize was awarded to Messrs. Mansell; the Second to Mr. Crane; the Third to Lord Chesham. The Reserve Number, belonging to Mr. W. German, was highly commended.

CLASS 98. *Pen of* 5 *Shearling Ewes of same Flock.*—21 entries, 1 absent. First Prize awarded to Lord Chesham; the Second to Mrs. Beach; Third to Mr. J. Pulley. The Reserve Number, belonging to Mr. W. O. Foster, was highly commended.

The Judges of Shropshire Sheep report as follows:—

We beg to present our Report in these classes, and have great pleasure in congratulating the Society on the extent of the classes, and the exhibitors on the merits of the animals exhibited. As compared with previous exhibitions, which we have observed for about fifteen years, we consider the classes contrast favourably, especially taking into consideration the number of the general entries. As a whole, we find the sheep possess more uniformity of character, have not diminished in size, and still maintain the muscular proportions and consumable material which are themselves the natural properties of the Shropshire; though we wish to remark that there were specimens exhibited to whose character we take exception, and whose breeders we advise to exercise a strict attention to type and colour. Class 96 consists of 61 entries, and contains animals well calculated to perpetuate the prestige of the Shropshire. But care must be taken to avoid selecting for sires the weaker types, and most undefined specimens exhibited. Class 97. The sheep are, as a lot, variable in type, size, and quality; and our selections were confined to the animals we considered most likely to reproduce true specimens of the breed, and therefore of the greatest service to the breeder of animals intended for future exhibition, and most attractive to practical judges. Class 98 was represented by the large number of 20 entries, containing several lots of excellent type and good size. We do not consider that the entries in this class call for any particular commendation from the Judges, although no exception generally can be taken to the class, which we consider a most important one, as it is in our opinion quite impossible to breed good rams unless great attention is given to the female portion of the flock; and we were much pleased at seeing 100 animals exhibited in this class, nearly all of which are highly creditable to the breeders. We observe, in conclusion, that our selections in all instances were made with the view to mark what we consider to be the truest type and most desirable class of the Shropshire.

Hampshire and other Short Wools, not qualified to compete as South Down or Shropshire.—Class 99. *Shearling Ram.*—14 entries, 2 absent. First and Second Prizes awarded to Mr. A. Morrison; Third to Messrs. Russell. The Reserve Number, belonging to Mr. C. Coles, highly commended.

Class 100. *Aged Rams.*—3 entries, 1 absent. First and Second Prizes awarded to Mr. T. C. Saunders.

Class 101. *Pen of* 5 *Shearling Ewes of same Flock.*—4 entries. First Prize awarded to Mr. T. C. Saunders; Second to Mr. William Parsons; Third to Mr. Walter, M.P.

Long Woolled.—Class 102. *Pen of* 10 *Breeding Ewes that have suckled Lambs up to June* 1*st*, 1874.—6 entries. First Prize awarded to Messrs. Gillett; Second to Mr. T. Gunnell.

Class 103. *Pen of* 10 *Ewe Lambs.*—4 entries, 2 absent. First Prize awarded to Mr. F. Allwood; Second to Mr. F. Ellis.

Class 104. *Pen of* 10 *Wether Lambs.*—3 entries, 2 absent. No award made, for want of merit.

Class 105. *Pen of* 5 *Shearling Wethers.*—3 entries. First Prize awarded to Mr. C. Crawshay; Second to Mr. J. Newman.

Short Wools, including Oxfordshire and Shropshire.—Class 106. *Pen of* 10 *Breeding Ewes of any Age which shall have suckled Lambs up to June* 1*st*, 1874.—First Prize awarded to the Duke of Marlborough; Second to Mr. Bowen Jones.

Class 107. *Pen of* 10 *Ewe Lambs.*—8 entries, 1 absent. First Prize awarded to Mr. T. Nock; Second to Mr. F. Street. Reserve Number, belonging to Messrs. Mansell, highly commended.

Class 108. *Pen of* 10 *Wether Lambs.*—4 entries. First Prize awarded to Messrs. Howard; Second to Mr. G. Street. Reserve Number, belonging to Lord Sondes, highly commended.

Class 109. *Pen of* 5 *Shearling Wethers.*—8 entries. First Prize awarded to the Executors of the late S. Druce; Second to Duke of Marlborough. The Reserve Number, belonging to Mr. G. Cooke, highly commended.

It will be noticed that the number of entries in certain classes is very small. In point of fact, there were 7 classes with only 24 entries in all, and in these classes prizes to the amount of 163*l.* were offered. It may fairly be questioned whether, where the competition is so small, it is desirable to allot so much prize money. On some of the classes, doubtless, the locality where the Show is held might have an effect, favourable or otherwise; but should it be found, on an average of years, that the competition falls below a certain amount, it may fairly be supposed that the liberal offer of prizes fails to produce the desired result in the encouragement thus given to breeding sheep of particular species.

Report of the Inspectors of Shearing.

We, the undersigned, Inspectors of Sheap-shearing, have to report that the shearings of sheep shown at Bedford Show, and examined by us, were not so satisfactory as at the Hull meeting in 1873. We found several sheep in the yard with which we were not satisfied, and were compelled to recommend some of them to be disqualified from showing for prizes—which was acted on by the Stewards.

We strongly recommend that the Council of the Royal Agricultural Society press on exhibitors the necessity of honest and fair shearing of their sheep. We particularly desire to draw the attention of exhibitors to the abuse of colouring oil, or other filthy covering, put on their sheep, which make them unfit to enter a show-yard. We marked out the *two worst pens* in the yard to be disqualified, and many others had a narrow escape. At no showyard have we seen such an extravagant use of oil and other greasy substances as at Bedford. We wish to call the serious attention of the Council of the Royal Agricultural Society to this stupid practice. The sheep are not fit to touch, and, in our opinion, are not in any way improved by such applications.

William Jobson,
Henry Bone,
J. B. Workman,
} Inspectors of Sheep-shearing.

27th July, 1874.

Pigs.

The Hon. W. Egerton, M.P., has kindly reported as follows on the exhibition of pigs.

The number of entries this year shows an increase of 223 against 191 in 1873, which would have been still more marked but for the number of absentees, which amounted to 39 against 10 in 1873. Three of the animals died on arrival, and at least 3 on the road, while many others were probably deterred from coming by the great heat.

It is worthy of remark that a hot sun, acting on animals whose vital organs were debilitated by an excess of fat, produced the same effects as a thick fog on many of the animals shown in a similar condition at the Smithfield Show in December 1873.

It is to be hoped that this experience will not be lost on exhibitors, and will tend to produce a less morbid condition of obesity in the animals exhibited in these shows.

The increased number of disqualifications has resulted from the careful examination into the state of the dentition, which enabled the veterinary inspector to assert with certainty that animals were of a different age from that described in their entry. I trust that for the future greater caution will be exercised in their description, which will prevent good animals from being excluded from competition.

In the large white breeds the prize winners are the Earl of Ellesmere, Mr. Richard Elmhirst Duckering, Mr. Clement R. N. Beswicke-Royds, Mr. Matthew Walker, and Messrs. James and Frederick Howard.

In the small white breeds the prize winners are Mr. Jacob Dove, the Earl of Ellesmere, Mr. George Mumford Sexton, Mr. C. R. N. Beswicke-Royds, and Mr. R. E. Duckering.

Among these the most perfect were Lord Ellesmere's large-breed boar, bred by Mr. Henry Nield, and the small-breed boar of Mr. Beswicke-Royds.

The small black breeds were badly represented; the breeding-sow of Mr. John Wheeler being alone a superior animal.

The Berkshire boars were inferior to those in previous years.

There was a good competition among the sows, and Mr. Russell Swanwick, Mr. Matthew Walker, Mr. John Looker, and Mr. Arthur Stewart are prize-takers.

The finest pig in the yard was of the middle breed "improved Lincolnshire," belonging to Mr. R. E. Duckering.

The remaining prizes were taken by the Lancashire pigs of Lord Ellesmere and Mr. Eden, a breed which combines size with the short snout of the smaller breed; it is also characterised by its long wavy hair, which is asserted by those who favour it, to be the mark of a hardy constitution. I am informed that this peculiarity was observable formerly in the pigs of the Earl of Radnor's strain.

I beg to add the Judges' Report, which is as follows:—

Class 110. With the exception of the first prize, a moderate class.

Class 111. This was not an average class.

Class 112. Very moderate.

Class 113. This was a good class of 17 entries, in which we found a close competition.

Class 114. This was a moderate class: small competition.

Class 115. In this class we found a small competition of superior animals, especially No. 1364.

Class 116. Small entry, but good.

Class 117. In this class we had an entry of 18, being a great improvement on many of the former classes, the competition being very close between the first and second prizes and reserve number.

Class 118.
Class 119. Very little competition in any of these classes, the first prize
Class 120. in the last class being a superior animal.
Class 121.

Class 122. Very moderate; inferior to previous years.

Class 123. This class was represented by a large number of inferior animals.

Class 124. This being a good class, well represented.

Class 125. This we also found a much larger class, and better representatives of their breed than any of the previous class, and had much pleasure in giving a general commendation.

Class 126. The first prize an exceedingly good pig.

Class 127. Small competition; first and second prizes excellent in hair and flesh.

Class 128. The whole class we found deserving a commendation.

Class 129. This we considered the best class that came under our inspection, and the first-prize animal well deserving the honours awarded to her.

We generally report on the show of pigs, and regret to find so many disqualifications by the veterinary inspector, and absentees caused by the excessive heat during their transit to the show, causing in many of the classes a want of competition. However, it was most gratifying that some of the classes were so good as to cause us to give a general commendation; and we here wish to especially remark as to the excellent qualities of Nos. 1364 and 1520.

The show was well attended by the landed gentry of the district, as shown by the receipts on the half-crown days. As a matter of course there was not the shilling attendance which occurs when the meeting is held in a district of highly-paid workmen.

On Monday the show was honoured by a visit from their Royal Highnesses the Prince and Princess Imperial of Germany. The Prince, who took a deep interest in the Implement department, repeatedly expressed his astonishment at the magnitude of the show, and his regret that he was not able to devote at least one day to its examination.

Amongst other features of the Bedford Show not to be passed over, was a capital exhibition, near the Show-yard, of steam cultivation by Messrs. John Fowler and Co., Messrs. Howard, and Mr. Barford, and of reaping-machines by Messrs. Howard; while on the Clapham Park estate, the residence of Mr. James Howard, magnificent crops, in spite of the long drought, attested the value of deep steam cultivation on a congenial soil.

An energetic hard-working local committee gave the Council and Stewards every possible assistance, while the Mayor and other residents exercised the most liberal hospitality.

The Senior Steward has specially to acknowledge the admirable arrangements made by Mr. C. Stephenson for the supply of fodder under the difficulties of a most trying season.

Agricultural visitors from a distance were much struck by the capital farming displayed in the neighbourhood.

In conclusion, I have to warmly acknowledge the assistance I have received from my fellow Stewards; and also from Mr. Milward, who was good enough to give me the benefit of his four years' experience in the same department. There cannot be a question that the office of Steward affords a valuable opportunity of making the personal acquaintance of leading men engaged in every branch of agriculture, and of thus gaining valuable information, especially on the subject of the legitimate differences of opinion that must always prevail in a pursuit such as agriculture, carried on under very different conditions of soil, climate, and markets.

XXVII.—*Report on the Exhibition of Implements at Bedford.* By T. C. Booth, of Warlaby, Northallerton (Senior Steward).

The implements for trial in 1874 comprised drills for various kinds of seed—horse-hoes and grubbers, carts and waggons, with the addition of a new section for shepherds' huts, and vans for the accommodation of men engaged in steam cultivation.

The great number of entries in these sections shows that competitive trials are still esteemed of importance by the great body of exhibitors; and whilst what are known as some of the "large firms" did not enter for competition, it is satisfactory to find that after going through a more severe trial than at any previous exhibition of the Society, the Judges were enabled to make their awards without requesting the Stewards to act on Clause 24 of the general regulations.

Acting on a suggestion made at the general meeting of members in December last, and also with the knowledge that legislation was proposed to remedy the supposed danger to people working on threshing-machines, the Council determined to offer the Society's Gold Medal for the best guard or appliance to the drum of a threshing-machine for preventing accidents to the people employed. In the list of competitors who had taxed their ingenuity to further the endeavours of the Council appear the names of the most eminent makers of these machines—one section had acted on the principle of combining a self-feeder with safety, the other had simply devised a guard in various forms.

After carefully examining the different appliances, and consulting with the Stewards as to carrying out the wishes of the Council, the Judges, not satisfied that any of them could be considered of sufficient advantage to justify them in awarding the prize, determined to withhold it, with a recommendation that it should be repeated another year, making two classes—one for a self-feeder and guard combined, the other for a fixed guard. Exhibitors will thus have more time to work out various schemes for carrying out this object; but considering the immense importance of steam threshing machinery to the agricultural interest, and the very small proportion of accidents that take place in working it, as compared with other kinds of machinery worked by steam power, it is very doubtful whether any good will result from these endeavours, which will tend to increase the cost of the machine and diminish the amount of work to be done.

The dynamometer for testing the traction of carts and waggons was quite a new feature in the trials, and will prove of great use in future competitions.

The trials are fully described by Mr. Smith in the following Report.

XXVIII.—*Report on the Trials of Implements at Bedford.* By G. Purves Smith, of Preston Dunse, Berwick, N.B.

The Bedford Implement trials took place in proximity to the racecourse, about two miles from the town, and between the Midland and the London and North-Western railways. They commenced on July the 6th, and extended over the entire week until Saturday, July 11th; all the awards, excepting that for the horse-hoes for thinning turnips, having been placed in the hands of the Secretary before the evening of that day.

The drill-classes were tried on two fields specially prepared, while the trials of the horse-hoes were conducted on two which had oats growing in them, much overgrown, as well as upon another which had been ridged up, and prepared for the different classes of horse-hoes and grubbers, and in a turnip-field on the farm of Mr. Prolle, of Elstowe. Unfortunately, owing to the continued dry weather, the turnips which had been sown on part of the field which had been ridged up did not come to anything. This necessitated the trials of turnip-thinners and general-purpose horse-hoes being conducted in Mr. Prolle's turnip-field. These turnips were sown on the flat, and, as some of the turnip-thinners were specially adapted for thinning turnips on the ridge only, it was deemed necessary to hold a second trial of these implements in a field of turnips on the ridge on the farm of Mr. Horrel, near Oakley, about eight miles from the Show-yard.

The trial-course for the carts and waggons was partly along the turnpike-road, and partly along the oat-field. Owing to the long-continued drought, the fields and road were very dry, while the oppressive heat during the trial-week rendered the task of the Judges somewhat fatiguing. Probably no previous trials by this Society have presented more points of interest, or are calculated to prove more useful and instructive both to exhibitors and to the agricultural public, than the present. This year, for the first time, was the new mode of judging by stated numbers of points fully employed throughout the trial. A list of these points having been placed in the hands of every exhibitor previous to the trials, he could at once see to what features in the implements the greatest importance would be attached. The system also rendered the work of the Judges easier and more satisfactory.

The respective points of merit awarded for perfection in the various qualifications will be found recorded in the Table appended to each class.

The special features of these trials were in Classes 1, 2, 3, and 4 (corn-drills), as well as in the cart and waggon classes. The former classes were specially tested as to their regularity of seed-delivery; and their trial was very protracted and exhaustive. The trials of the carts and waggons were also very complete, having been specially so rendered by the use of Messrs. Easton and Anderson's new horse dynamometer. The classes for turnip-thinners and potato-drills were also very interesting.

The Society offered their gold medal for the best guard or appliance to the drum of a threshing-machine for preventing accidents to the people employed, and there were a number of entries; but the Judges did not see fit to award the prize, for reasons which will be found stated in the Report on that class.

The following is a list of the prizes offered, together with the names of the Judges for the different classes:—

Prizes.

Section I.—*Drills.*

Class 1.—General Purpose Drills	£10— 5
Class 2.—Corn-drills	15—10
Class 3.—For the best adaptation to a Corn-drill for hill-side delivery	10
Class 4.—Corn-drills for small occupations	10— 5
Class 5.—Drills for Turnips and other roots on the flat	10— 5
Class 6.—Drills for Turnips and other roots on the ridge	10— 5
Class 7.—Drills for Turnips and other roots on the ridge, without manure-box	10— 5
Class 8.—Water-drills	10— 5
Class 9.—Drills for small seeds	10— 5
Class 10.—Barrows for sowing small seeds	5
Class 11.—Drill-pressers	5
Class 12.—Potato-drills	15—10

SECTION II.—*Horse-Hoes.*

CLASS 13.—Horse-hoes for general purposes	£10— 5
CLASS 14.—Horse-hoes combined with drill for small seeds ..	5
CLASS 15.—Single-row horse-hoes for ridge and flat	10— 5
CLASS 16.—Single-row grubbers	5
CLASS 17.—Horse-hoes for thinning turnips	15—10

SECTION III.—*Manure Distributors.*

CLASS 18.—Distributors for liquid manure	£10
CLASS 19.—Distributors for dry manure	5

SECTION IV.—*Waggons.*

CLASS 20.—Pair-horse Waggons	£15—10
CLASS 21.—Light Waggons on springs	10— 5
CLASS 22.—Other Waggons	10

SECTION V.—*Carts.*

CLASS 23.—Single-horse Carts for general agricultural purposes ..	£10— 5
CLASS 24.—Harvest-carts	10
CLASS 25.—Market-carts on springs	10
CLASS 26.—Carts for the conveyance of water, with pump attached	10— 5
CLASS 27.—Other Carts	10

SECTION VI.—*Stock and Implement Carts.*

CLASS 28.—Low-bodied Carts, on springs, for conveyance of stock	£10
CLASS 29.—Lorries, or other vehicles, for the conveyance of implements	10
CLASS 30.—Carts with crank-axle and low body	10

SECTION VII.—*Moveable Huts.*

CLASS 31.—Shepherds' Huts on wheels	£10— 5
CLASS 32.—Vans for men engaged in steam-cultivation, with fittings	15—10

SPECIAL PRIZE. CLASS 33.—For the best guard or appliance to the Drum of a Threshing-machine for preventing accidents to the people employed .. .. Society's Gold Medal.

MISCELLANEOUS AWARDS to Agricultural Articles not included in the ordinary rotation .. .. Ten Silver Medals.

JUDGES.

Classes 1, 2, 3, 4, 8, and 9 :—

MAJOR GRANTHAM, West Keal Hall, Spilsby.
MATTHEW SAVIDGE, The Lodge Farm, Sarsden, Chipping Norton.
J. W. KIMBER, Fyfield Wick, Abingdon.

Classes 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 :—

JOHN HICKEN, Dunchurch, Rugby.
T. P. OUTHWAITE, Goldsboro' House, Knaresborough.
J. D. OGILVIE, Mardon, Cornhill, Northumberland.

Classes 20 to 32 :—

J. COLEMAN, Escrick Park, York.
G. TURNBULL, Tughall House, Chathill, Northumberland.
J. WHEATLEY, Neswick, Driffield.

Miscellaneous Articles and Special Prize for Guard to the Drum of a Threshing-machine:—

Henry Cantrell, Baylis Court, Slough.
J. Ford, Portland Lawn, Leamington.
John Hemsley, Shelton, Newark.

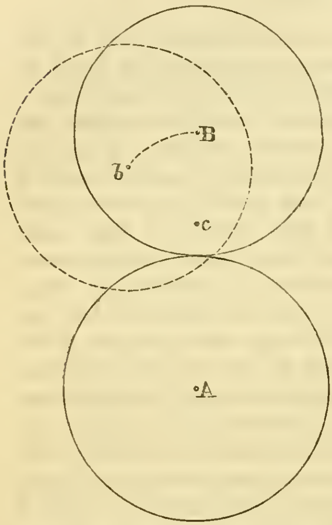
Section I.—Drills.

The trials of corn-drills must be looked upon as one of the main features of the Bedford implement trials, and it is to be hoped that the unsuccessful exhibitors will at the next trial of drills endeavour to turn out implements which will stand the test of equal delivery in every respective coulter. This was the point upon which the Judges principally insisted, and it made the task of singling out the best drills in classes with such numerous entries much easier than would at first sight appear. The only drills which could fairly stand this test were those in which the seed was raised from the seed-box by cups; even in some of these the delivery was so unequal that the difference between two coulters would have amounted to about 2½ pecks per acre. Regular delivery is one of the principal points in a drill, and too little attention seems to have been bestowed upon it by exhibitors, who seemed all to be taken by surprise when they saw the method adopted for testing this point. Small bags were hung on the upper seed-tin of each coulter, and after the run their contents were carefully weighed by the assistant-engineer. The inequality of delivery in some drills was surprising, the greatest difference between two coulters being in one case at the rate of 40 lbs., or about one bushel, of oats per acre.

The Judges were of unanimous opinion that, however well any drills might be constructed, they were useless, unless the coulters could penetrate the soil to a proper depth; in this respect none were so effective as the Woburn Drill, No. 5001, entered by William Coleman; a description of it will be found in Class 4. They also recommended that the coulters should be arranged on double stay-bars; and that the lid of every drill seed-box be so constructed as to keep out the wet. For hill-side delivery the seed-box should be partitioned, so as to prevent the flow of the seed to one end of the box or the other, while going along an incline.

In all the prize-drills, excepting Nos. 1587, 2849, and 3821, will be found a mechanical error, which will be best understood by referring to Fig. 1 (p. 630). The seed-box is hung on pivots at points indicated at *c*, below the centre of the seed-barrel spindle, B. Now, if in going up hill the box were turned on the pivot, *c*, the centre of the seed-barrel spindle, B, would move towards *b*, and then it is evident that the relative position of the seed-barrel cog to the driving-wheel cog, A, would be altered, and would cause slipping of cogs and breakages. If the seed-box rested on the ends of the seed-barrel spindle, it might be levelled in either direction without in the least degree altering the relative position of the two cog-wheels.

Fig. 1. — *Illustrating relative positions of Seed-box, Seed-barrel Spindle, and Driving-wheel in Drill.*



Mr. James Coultas, of Grantham, carried off the principal honours, including the first prize in Class 2, which was strongly contested. At the Plymouth trials he took a good place, obtaining the third prize in that class; but the competitors who excelled him there, did not enter any implements for the present trials.

Class I. General Purpose Drills. —These were heavy complicated machines; combining too many operations in one, each of which could be performed at little, if any, extra expense, by separate machines, and certainly more satisfactorily. The saving in prime cost of the separate machines is nothing, for they could be bought for the same amount as the general-purpose drill.

The various parts and cog-wheels requisite for the different changes are so numerous, that some of them might easily be lost if under the charge of an ordinary farm-labourer; and they would also quite confuse him. The draught of these machines is heavy. In the Report on the Plymouth trials a similar opinion was expressed by the Judges there, who at the same time recommended that this class should be abolished in future trials by this Society; and it was again the unanimous opinion of the Judges at the present trials.

The soil of the trial-field was an alluvial clay, which had become regularly baked by the long-continued dry weather. It therefore formed a pretty severe test for the drills, for in ordinary practice drills would not often be subjected to more severe shaking than was the case on these trial-fields. The soil was somewhat difficult to penetrate, and many of the drills, with full pressure on the coulter-levers, could not penetrate to a greater depth than two to three inches.

The distance of run was about 220 yards. Seven drills were entered, and six were presented for trial. First they were tried with one bushel of oats and three bushels damped manure, with the coulter-lever press-bar full on. The attendant was made to go on to the field with the coulters up, and at a signal given by the Judges to let them down, and put the pressure on to the levers, at the same time putting the seed and manure barrels into gear. In the middle of the field the attendant was obliged to take the coulters off the ground, carry them round while the drill was being turned, and again let them on to the ground. After this first run, two of the drills were allowed to be withdrawn, namely, Harrison's, No. 852, and Rainforth and Son's, No. 3358. In the second run one bushel of wheat was used instead of oats, and after this, three drills were selected for a third trial, namely, Thomas Harrison's, Nos. 851 and 852, and James Coultas's, No. 2790, which were now tried with dry superphosphate and coulters off the ground, in order to observe the regularity of manure deposit; at the close of this, James Coultas's, No. 2790, and T. Harrison's, No. 851, were selected for the awards. Each of these drills was now changed from corn-drills into turnip-drills; it being observed how many men were required for this operation, and in what time it could be done. In Coultas's drill three men did so in fifteen minutes, while in Harrison's two men were occupied for forty minutes.

The regularity of the seed-deposit from the respective coulters of these drills is given in the accompanying Table (p. 632), where in the first column we have the actual maximum, mean, and minimum delivery into the bags, which were weighed; these weights, together with their greatest differences, being recorded in ounces. In the second column these are calculated into the rate of lbs. per acre, while in the third column they have been respectively reduced to the rate of 120 lbs., or 3 bushels of oats, and 124 lbs., or 2 bushels of wheat. It will be seen that in the first run with oats the greatest difference per acre in Coultas's drill was 17·9 lbs., and in Harrison's 15·1 lbs.; while in the second run with wheat these differences were respectively 7·8 lbs. and 13·2 lbs.; so that, on an average, Coultas's had the most equal delivery.

The different modes of distributing the manure consisted in—

1. As in J. Coultas's drill by a Chambers's revolving notched cylinder, with inclined, laterally working stirrers; and independent steel-spring scrapers placed on the lower side of the

TABLE I.—SHOWING COMPARATIVE REGULARITY OF DELIVERY. (CLASSES I. and II.)

	Name.	Catalogue Number.	Number of Trial.	Grain used in Experiment.	Delivery per Coulter in a given Experiment in ozs.			Delivery of Oats reduced to a Mean of 3 bushels (120 lbs.) per Acre in lbs.				Delivery of Wheat reduced to a Mean of 2 Bushels (124 lbs.) per Acre in lbs.			
					Maximum.	Mean.	Minimum.	Maximum.	Mean.	Minimum.	Greatest Difference.	Maximum.	Mean.	Minimum.	Greatest Difference.
CLASS I.	James Coultas	2790	1st	Oats	9	8·35	7·75	129·7	120	111·3	17·9				
			2nd	Wheat	16½	16	15½	..	..	..	..	127·8	124	120·	7·8
	T. Harrison ..	851	1st	Oats	9	8·35	8	129·	120	113·8	15·1				
			2nd	Wheat	17½	16½	15¾	..	..	..	..	129·6	124	116·4	13·2
CLASS II.	James Coultas	2792	1st	Oats	18½	17·7	17·5	125·5	120	118·5	7·0				
			2nd	Wheat	19	18·5	18	..	..	..	..	127·3	124	120·6	6·7
			3rd	Do.	17	16·5	16	..	..	..	..	123·6	124	116·3	7·3
			4th	Do.	20¼	19·7	19¼	..	..	..	..	119·4	124	113·6	5·9
	Holmes & Son	3821	1st	Oats	11½	10·46	9½	132·2	120	109·2	11·5				
			2nd	Wheat	17·25	16·41	15·5	..	..	..	..	129·	124	116·2	7·5
			3rd	Do.	17·25	16·29	15·75	..	..	..	..	130·7	124	119·3	7·6
			4th	Do.	21	19·54	18·5	..	..	..	..	134·4	124	118·4	6·4
	Walker & Son	3411	1st	Oats	12	10·58	9¾	136·8	120	111·	11·4				
			2nd	Wheat	20	18·36	17	..	..	..	..	136·	124	115·6	6·8
			3rd	Do.	16	15·38	15	..	..	..	..	129·6	124	121·5	8·1
			4th	Do.	18¾	18	17	..	..	..	..	129·3	124	118·3	6·9
	Gower & Son ..	2847	1st	Oats	15½	14·5	13¾	128·6	120	114·1	8·3				
			2nd	Wheat	17½	16·8	16¼	..	..	..	..	129·5	124	102·2	7·4
			3rd	Do.	14¾	14·2	13¾	..	..	..	..	128·2	124	119·5	8·7
			4th	Do.	18½	18	17½	..	..	..	..	127·6	124	120·7	6·9
	Dening & Co...	1571	1st	Oats	17½	16·95	16	134·7	120	123·2	7·7				
			2nd	Wheat	16¾	16·15	15¾	..	..	..	..	128·9	124	121·2	7·7
	S. A. & H. Kell	3100	1st	Oats	10	9·08	8¼	143·	120	118·0	14·3				
			2nd	Wheat	8½	17·38	16¾	..	..	..	..	55·2	124	108·8	6·5
	T. Harrison ..	853	1st	Oats	15½	14·5	13¼	95·1	120	82·1	6·2				
			2nd	Wheat	20¾	20·	18¾	..	..	..	..	128·6	124	116·2	6·2

cylinder, one acting on each set of notches. This was the most effective one, especially as it could distribute small as well as very large quantities without in any way rubbing the manure. When superphosphate, however dry it may be, is rubbed, it at once becomes pasty; so that the less it is disturbed in this manner the better.

2. As in T. Harrison's, by a smooth roller, revolving at the bottom of the manure-box, with stirrers placed vertically over the top of the revolving cylinder working laterally. These stirrers were effective, and the revolving smooth cylinder delivered small quantities very well, but not such large quantities as the notched cylinder.

3. T. Harrison also exhibited a drill in which the stirrers were inclined and worked laterally, the manure being distributed by a smooth roller, similar to that in the mode last described. This also delivered small quantities well, but not large ones.

4. In W. Rainforth and Son's drill, No. 3356, the manure was distributed by a smooth roller, and the stirrers were placed vertically, having also a vertical motion. These stirrers were ineffective, sending out the manure unequally over the rollers.

No. 2790. *James Coultas, of Grantham.*—The manure-box contains 5 bushels. It has a door in front, which may be removed, when it is requisite, to clean out the box. In the box is placed an inclined stirrer, which consists of a longitudinal rod with a number of flat projecting teeth, and having a lateral motion.

A Chambers's manure-barrel is placed at the bottom of the manure-box, and is geared off both driving-wheels so as to equalise the draught. The cylindrical barrel has a number of small projections cast on it, each notch carrying its own quantity from the manure-box to the trough, where it is scraped off by steel scrapers, a number of which are placed side by side beneath the box, one against each set of projections. The pressure of these springs may be varied according to the adhesiveness of the manure. By a slide the quantity to be delivered may be regulated from a small dressing to a very large one. The manure is thrown into a hopper, and passes down through chain cups into the coulters, these being attached to weighted independent levers.

The capacity of the upper seed-box is $3\frac{1}{2}$ bushels, and it is provided with a waterproof lid, in order to prevent any rain from entering the seed-box. From this the seed passes into a lower seed-box, its flow being regulated by slides. The seed is delivered by means of cups, attached on the side to the circumference of the discs of a revolving barrel; thus raising it up and throwing it into hoppers. A bolster is placed between each of the discs, to prevent the seed flowing from end to end in going along hill-sides.

Each hopper has a cover which may be closed when required, so as to stop delivery into any one or other of the coulters. From the coulters the seed passes through two chain-cups into india-rubber seed-pipes; these being connected above to the lower chain-cups, and below to tin seed-pipes, which are in turn attached to the seed-coulters at their lower end. Each seed-coulter is attached to an independent lever. All the coulter-levers are arranged on two stay-bars; they are raised by means of a wooden roller and chains attached to it and to the ends of the levers, the roller being acted on by an improved crank-handle and bevel gearing. Pressure is put upon the coulter-levers by means of an improved presser-bar. The presser-bar has an improved top joint at its centre; being fitted with long side jaws, bored, with the rivets turned, to prevent the levers from swerving. The cap of the joint is made to clip the bar and fasten on to a hinge on the under-side of the joint, being secured on the top by a strong bolt. This is a good arrangement, as it keeps the pressure on the levers more equal. The presser-bar is bolted to a lever, which has its fulcrum on the stay-bar in front, and is attached to the vertical press-rod at its hind end, this latter being connected by a chain with the wooden roller; so that in continuing the motion of the roller which has let down the coulters, the chain is wound up, consequently throwing the weight of the drill upon the press-rods and presser-bar.

The seed and manure-barrels are thrown out of gear by a hand-lever at the side.

The boxes are mounted upon strong wrought-iron sliding side brackets, which, by means of a worm, are made to rise and fall to suit any size of cog-wheel. The whole rests on a strong wooden frame, and is supported on two travelling wheels of 4 ft. 9 in. diameter, with 2-in. × ½-in. tyre, which are fitted with turned case-hardened arms, running in the oil from recesses at the back and front. The machine is guided by a two-wheeled lever steerage in front. A board on the inside of the travelling wheels protects all the gearing from dust and mud. The manure apparatus may be taken off, and it then forms a light corn-drill. It required four horses to draw it.

This is a well-constructed drill, with good workmanship; its only fault being that it is too complicated and clumsy. Its price is very high, being 47*l.* 10*s.* As we have already seen, the delivery of seed was fairly regular.

No. 851. *Thomas Harrison, of Burton Road, Lincoln.*—The manure-box is small, capable of containing only 3½ bushels, and it is not provided with a lid. The stirrers in the manure-box are placed vertically over the barrel, and work laterally. A smooth metal cylindrical barrel, revolving at the bottom of the manure-box, carries the manure over into hoppers, being scraped off the barrel by a scraper which extends from one end of it to the other. The barrel is geared with the driving-wheel on one side only, which is a disadvantage, as it makes the draught unequal. From the hoppers the manure passes through chain-cups into the coulters.

The upper seed-box contains 3 bushels. Its lid is not watertight, which is a disadvantage. The seed is delivered by cups in the same manner as described in the last drill; but passes down into the same coulters with the manure, and is deposited with it: this is not a good arrangement, for the manure ought to be deposited at a greater depth than the seed. All the coulters are attached to one coulter stay-bar, so that the levers are not of equal length, and cannot be so equally adjusted. The coulters are raised, by means of chains attached to a cross-bar, and a hand-lever which folds back when not in use, while the press-bar is put on by the ordinary roller and hand-levers. A great pressure may be easily applied; for the roller is of iron, and of small diameter, thus giving a powerful leverage. The presser-bar is not jointed.

There is no fore-carriage steerage, the horse being attached to shafts; this is certainly the preferable arrangement.

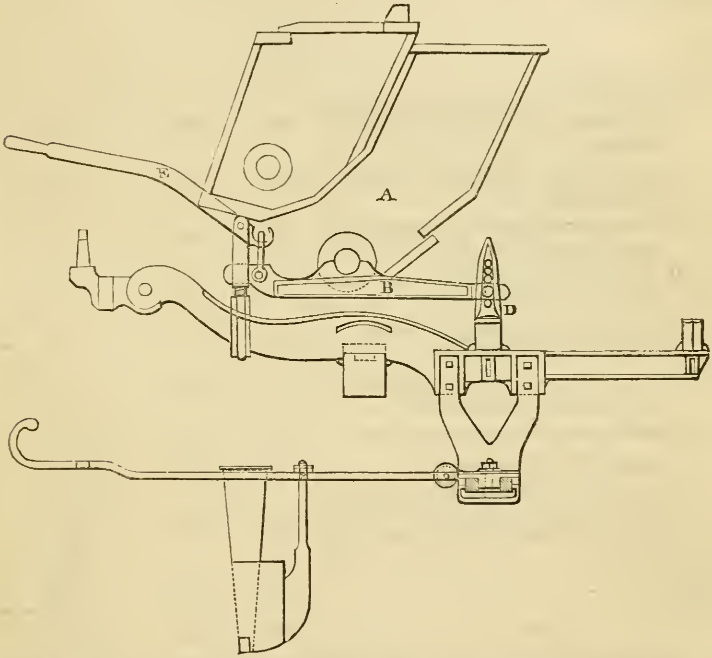
The framing is of wood, good and strong; and altogether this is a great deal lighter machine than the one last described, which may be gathered from the fact that it only required two horses to draw it, in place of four; but it cannot be taken to pieces and converted into a corn-drill. The wheel-axles have caps at their ends. The price of the drill is 40*l.*

The regularity of seed delivery was fair.

No. 2854. *A. Armitage, of Bury, Huntingdonshire.*—This drill is fitted with a good leverage for raising the end of the box in throwing the manure and seed-barrels out of gear.

The bearing on the end of the manure-box, A, rests upon a cast-iron support, B, which is fastened by a pin to a vertical support, D, this latter being perforated with a series of holes, into which the bar may be changed to suit different sizes of cog-wheels. The hind end of the lever is hooked to a simple and effective hand-lever, E. This leverage might be still more improved by constructing the bar, B, of wrought instead of cast iron.

Fig. 2.—*Mr. A. Armitage's Leverage for throwing the Cog-wheels out of gear, No.* 2854.



A. Manure-box. B. Cast-iron Support Bars. D. Vertical Support. E. Hand Lever.

First Prize of 10*l.* to J. Coultas (2790), of Grantham.
Second Prize of 5*l.* to T. Harrison (851), of Lincoln.

For TABLE II., GENERAL PURPOSE DRILLS, see p. 636.

Class II. Corn-Drills.—The trial of this class took place in a field, the soil of which was an alluvial clay, also very rough and dry. The length of run was 220 yards.

The number of entries was twenty-six; of these, nineteen were presented for trial.

In the first run one bushel of oats was served out to each drill, and after this, the following thirteen drills were selected for a second trial, in which one bushel of wheat was employed:—

TABLE II.—GENERAL PURPOSE DRILLS. (CLASS I.)

Name of Exhibitor		Coultas, J.	Harrison, T.
Catalogue number		2790	851
Order of trial		5	1
Price		47*l.* 10*s.*	40*l.*
Width between centres of wheels		6′·6″	7′·3″
Maximum width between end seed-distributors		5′·11″	6′·2″
Capacity of seed-box in bushels		3·5	3
Capacity of manure-box in bushels		5	3½
Number of horses		4	2
Number of rows		10	10
	Perfection being		
POINTS OF MERIT:—			
1. Mechanical construction, soundness, and quality of materials and workmanship	200	200	100
2. Simplicity and lightness, combined with strength	100	75	70
3. Size, form, and general arrangement of seed and manure-boxes	70	70	60
4. Construction and adaptation of seed and manure-distributors	50	50	40
5. Facilities for regulating quantities of seed and manure delivered	50	48	40
6. Form, materials, and arrangement of conducting tubes and coulters	70	60	57
7. Efficiency of steerage arrangements	50	50	30
8. Arrangement of press bar	20	17	18
9. Regularity of distribution of seed and manure, evenness of depth, draught, and general perfection of work done on trial	300	285	200
10. Price	90	85	70
Total	1000	940	685

Walker and Son, No. 3411; Dening and Co., No. 1571; S. A. and H. Kell, No. 3100; T. Harrison, No. 853; William Gilbert, No. 172; Holmes and Son, No. 3821; B. Reid and Co., No. 4412; Gower and Son, Market Drayton, No. 4968; W. Coleman, No. 5000; J. Coultas, No. 2792; Gower and Son, Winchfield, No. 2847; W. Rainforth and Son, No. 3357; Dening and Co., No. 1574; of these, four were selected for a third trial, again with wheat:—W. Walker and Sons, No. 3411; Holmes and Sons, No. 3821; James Coultas, No. 2792; Gower and Son, Winchfield, No. 2847. These latter underwent a fourth trial, again with one bushel of wheat, at the close of which they were placed in the following order:—1st, J.

Coultas; 2nd, Holmes and Son; 3rd, W. Walker and Son; and 4th, A. W. Gower and Son, of Winchfield.

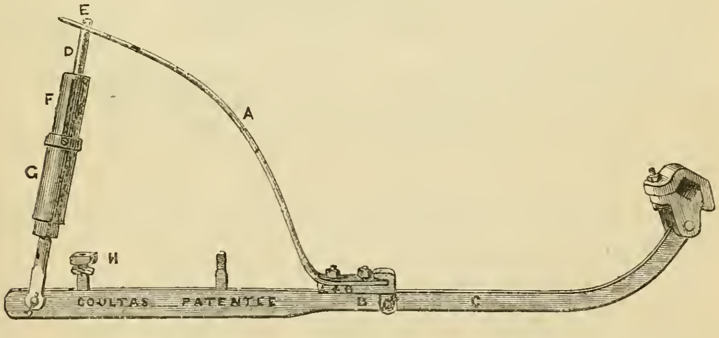
In the way of novelties may be mentioned Hollings Brothers' Canadian drill, in which the seed is delivered by falling upon the delivering-wheel through an opening in the top of the box in which the wheel is placed, being carried half round to an opening in the side of the box, from which it falls; but the regularity of its seed-deposit was not good. None of the modes of delivery, excepting that of the ordinary cup-arrangement, could deliver the seed in any way approaching to regularity.

No. 2792. *James Coultas, of Grantham.*—The seed is placed in an upper seed-box provided with a water-tight lid, and passes from it into a bolstered lower seed-box. The flow is regulated by slides acted on by a rack-and-pinion arrangement, and the seed is delivered by cups into hoppers, and through india-rubber seed-pipes to the coulters, as already described in No. 2970 in the previous class. The box is levelled on hill-sides by a crank-handle behind, which is connected with a rack and pinion before.

The coulter-levers are arranged on two stay-bars, thus giving equal leverage and plenty of room between the coulters. This is a good arrangement, as it not only gives greater strength, but also greater freedom of action.

The presser-bar has a lock-joint at its centre, as previously described, and is acted on by two flat spiral springs. These, as will be seen by the accompanying engraving, consist of a flat steel spring, A, which is bolted to the

Fig. 3.—*Coultas's Patent Flat and Spiral Spring Press-Bar, No.* 2792.



fastening, B; this latter being pivoted with a pin to the coulter-lever, C, at about its centre. The flat spring is fastened to a vertical rod, D, at E, this being connected with a spiral spring placed in a brass tube, F. This brass tube fits into a lower brass tube, G, which latter may be screwed up or down upon the former, to adjust the pressure, and is pivoted to the end of the lever with a pin. The press-bar is placed above the press-bar-lever, and is connected with it by a screw-bolt, H. The springs are pressed by means of a cross-bar, which is fastened to the ends of the one set of arms of a hand leverage, this being also employed for raising the coulters off the ground—the coulter-levers are attached by chains to this cross-bar. The seed-box is thrown out of gear on both sides by this same leverage, for its levers are also connected by chains to it, being fastened to small projecting arms on the ends of its spindle.

The seed-box is hung at its sides upon points below the centre of the seed-barrel spindle, which, as already explained, is not a very correct mechanical arrangement. It rests upon a wooden frame, supported by strong wheels, these having a wooden shield placed on their inner side, to protect the gearing from dust and mud. The ends of the axles are connected with brass oil-cups.

The two-wheeled fore-carriage steerage has a semicircular table fastened to it; this moves in a staple on the pole, and may there be fixed by a pin when the drill is going straightforward, so as to steady the steerage. This drill delivered the seed very well, but the spiral press-bar arrangement is quite inefficient when a good depth is required; although it may be very useful for drilling barley land, and will then no doubt make good work. The workmanship and finish of this drill are very good, and its price, 27*l.*, is moderate.

No. 3821. *Holmes and Son, of Norwich.*—The lid of the upper seed-box is not watertight, which is a disadvantage; but the box is divided in order to give greater strength. The lower seed-box is cushioned between the discs, and the seed is delivered from it by cups attached to the discs of a revolving seed-barrel; it is thrown into hoppers and passes down through tin conductors, which are so constructed that they are not affected by wind. The coulter-levers are arranged in front on two strong bars, formed of tubular wrought iron: this is a good arrangement. The coulters are made in two pieces, so that the wearing part may be replaced at a cost of 1*s.* 6*d.*

The seed-box rests upon the ends of the seed-barrel spindle. An iron plate, with a projecting box through which the seed-barrel spindle passes, is fastened to the seed-box, and is supported in an upright sliding iron fastened to the frame; thus it will be seen that in levelling the box in going up or down hill, the box is made to turn upon the centre of the spindle, which does not in the least change the relative positions of the two cog-wheels gearing with each other. The gearing is well shielded. This, as already explained (pp. 629 and 630), is a more correct mechanical arrangement than where the box is made to turn upon centres below those of the seed-barrel spindle. This drill made good work, but is in itself not nicely finished; its price, 29*l.* 10*s.*, is also somewhat high.

No. 3411. *W. Walker and Son, of Tithby, Bingham.*—The upper seed-box, capable of containing 4½ bushels, is provided with a watertight lid. The seed is delivered from the lower seed-box by cups attached to the discs of a seed-barrel, which may be reversed for sowing beans or peas; it is thrown into hoppers and passes through telescopic tin seed-pipes to the coulters.

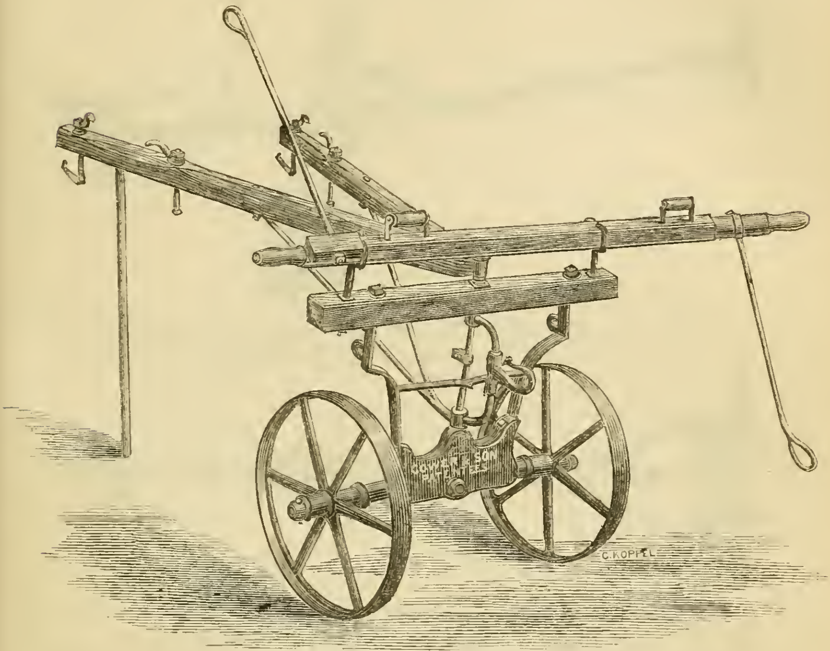
The coulter-levers are all arranged on one coulter stay-bar, so that they are not of equal length—a disadvantage—and are pressed by the ordinary roller and chain arrangement. The weights on the ends of the levers are not well fastened, for they can move too much backwards and forwards.

The box rests upon a frame, the sides of which are of wrought iron, bolted through the front and hind wooden cross-pieces; this might be greatly improved by turning the iron sides round the ends of the cross-pieces.

The construction of this drill combines lightness with strength, and might be even still further improved in this respect. Its price is 31*l.* 15*s.* 6*d.*; therefore somewhat high.

No. 2847. *A. W. Gower and Son, of Hook, Winchfield.*—This drill has its seed delivered by ordinary cups, as already described in the foregoing drills. The principal point worthy of notice in it is its fore-carriage steerage, which is a greatly improved one, and decidedly the best exhibited. As will be seen from the accompanying woodcut, the two wheels, instead of being placed at the extremities of the handles, so as to form a mark for guiding the drill, are placed close together; while the drill is guided in a straight line by keeping the sloping sight-rod in a line with the driving-wheel track. The axle of the steerage-wheels is connected to the vertical bracket by a pivot, so that in going over clods, the wheels can accommodate themselves to them, without transmitting the shock to the man who guides the drill. The price is 28*l.*

Fig. 4.—*Messrs. A. W. Gower and Son's Improved Fore-carriage Drill Steerage, No.* 2847.



4412. *B. Reid and Co., of Aberdeen.*—This was the disc delivery-drill, the principle of which will be found described in the report on the Cardiff Miscellaneous Class. The form and arrangement of the coulter-levers are specially worthy of notice. Fig. 5 (p. 640) is a side elevation, with cross section of the lever-stay bar, and Fig. 6 the plan. These modes of attachment not only give great strength, simplicity, and stiffness to lateral strain, but the pressure put on the coulters is easily varied by shifting the weights, F, on the lever, and fixing them in the desired position by the plate H, which is pivotted on the pin J. This device prevents the weights jumping when travelling over uneven ground, while all the advantages of the coulters rising and falling to suit unlevel land are fully maintained. It will also be seen by referring to the engraving, that upon a square wrought-iron bar, A, running the breadth of the machine, the levers, B, are attached by straps, C, and secured by cotters, D. In altering the distances between the coulters, all that is required is to ease the cotters, when the straps with the levers can be shifted on the bar A, and the distances between the rows accurately adjusted; the lever with its coulters being again secured in position by the aid of the straps and cotters. The lever will bear great lateral strain, being well stayed on the sides.

Fig. 5.—*Side Elevation of Coulter Lever and Coulters, and Cross Sections of Stay-bar, in Messrs. B. Reid and Co.'s Drill, No.* 4412.

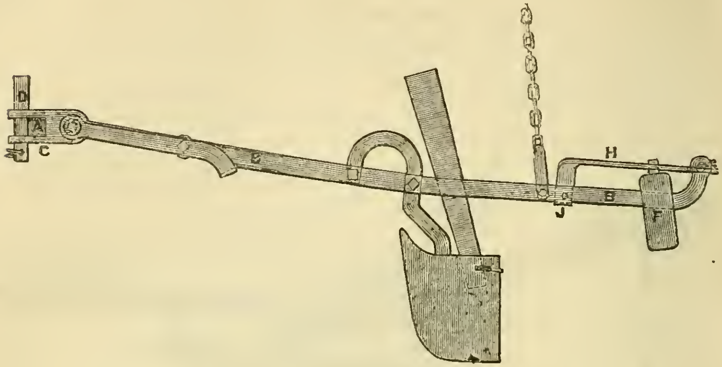
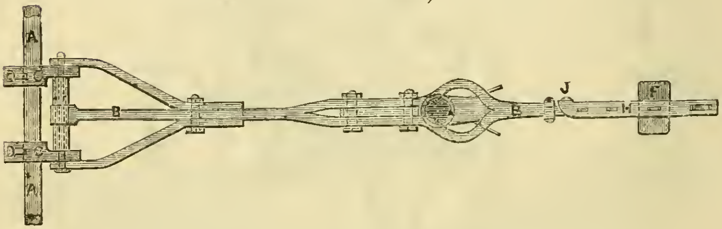


Fig. 6.—*Plan of Coulter-lever and Stay-bar in Messrs. B. Reid and Co.'s Drill, No.* 4412.



First Prize of 15*l.* to J. Coultas (2792), of Grantham.
Second Prize of 10*l.* to J. Holmes and Son (3821), of Norwich.
Commended.—W. Walker and Son (3411), of Bingham; A. W. Gower and Son (2847), of Winchfield.

For Table III., Corn Drills, see opposite page.

Class III. For the best adaptation to a Corn-Drill for Hill-side Delivery.—This class was tried on the Bedford turnpike road. Along the side of the road there was an incline, quite as steep as is generally met with in practice. The drills were run along this for a distance of about 220 yards. Although some of them seemed in a dangerous position, still they all kept their ground on it.

The number of entries on the list was eleven, and ten of these were presented for trial; these, with two not entered on the list, made up the number to twelve: but two of these were allowed to be withdrawn. The trial was with 1 bushel of oats.

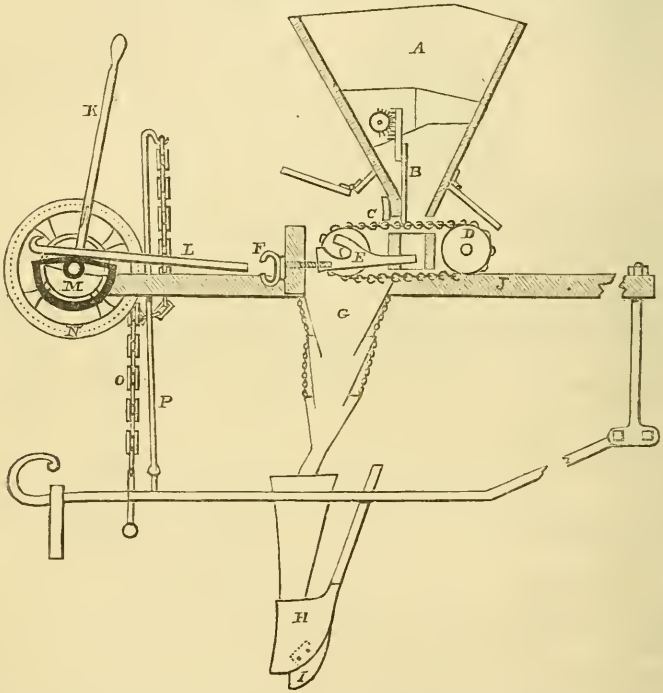
The prize was awarded to Dening and Co.'s Chain Drill—hereafter described—not for its good delivery or workmanship, but simply as an adaptation for delivering the seed on a hill-side.

TABLE III.—CORN DRILLS. (CLASS II.)

Name of Exhibitor		Coultas, J.	Holmes & Son.	Walker & Son.	Gower & Son.
Catalogue number		2792	3821	3411	2847
Order of Trial		16	6	1	19
Price		27*l.*	29*l.* 10*s.*	31*l.* 15*s.*	28*l.*
Width between centres and wheels		6′·6″	7′·1″	7′·7½″	6′·10″
Maximum width between end seed-distributors		6′·0″	6′·5″	7′·2″	6′·4″
Capacity of seed-box in bushels		2·6	3⅓	4½	1¾
Number of horses		2	3	3	2
Number of rows		12	13	14	13
POINTS OF MERIT :—	Perfection being				
1. Mechanical construction, soundness, and quality of materials and workmanship	200	186	140	148	136
2. Simplicity and lightness, combined with strength	100	95	80	78	77
3. Size, form, and general arrangement of seed-boxes	70	65	61	61	55
4. Construction and adaptation of seed-distributors	50	47	41	40	46
5. Facilities for regulating quantities of seed delivered	50	46	45	42	43
6. Form, materials and arrangement of conducting tubes and coulters	70	65	57	58	56
7. Efficiency of steerage arrangement	50	45	41	40	47
8. Arrangement of press bar	20	20	16	14	16
9. Regularity of distribution of seed, evenness of depth, draught, and general perfection of work done on trial	300	275	253	210	243
10. Price	90	90	72	76	82
Total	1000	934	806	767	801

No. 1571. *C. Dening and Co., of Chard, Somerset.*—By referring to the annexed woodcut (Fig. 7), this drill will be seen to consist of a seed-box, A, in which is placed a slide, B, acted on by a rack pinion for regulating the quantity to be sown. The seed is drawn from the seed-box by an endless chain, C, passing over its floor. This chain C passes round two revolving pulleys; the spindle of the front pulley D being fixed, while that of the hind pulley rests in a shifting bearing, E, acted on by a thumb-screw, F, for tightening the chain, or for throwing it out of gear by slackening it. This chain delivers the seed into the chain-cups G, and thus through the coulter H,

Fig. 7.—*Section of Messrs. C. Dening and Co.'s Chain Corn-Drill, No.* 1571, *showing Patent Lift and Cross-bar.*



which has a movable shoe, I, which may be replaced at a small cost when worn out. The coulter levers are raised and pressed by chains passing over and fixed to a pulley, N; this is turned by means of the handle K, which catches into notches on the pulley by means of a spring attached to it. A cam, M, is also attached to the pulley, by means of which, in raising the end of the lever L, simultaneously with the raising of the coulters, the seed-box is thrown out of gear. This is an ingenious invention, and is likely to prove the thing that is wanted for steam drilling; for in Class II., where this drill was also entered, it was drawn over the field at a gallop, and instead of the seed delivery being increased by this quick speed, it was slightly diminished. The respective weights of grain delivered by the chains in ounces were 22, 22, 22, 19¼, 21¼: while in Class II., in the first run at a slow pace, they were 17½, 17¼, 17½, 16, 16½; and in the run at a gallop 15, 15, 15, 13, 13¾.

The delivery of the first three chains is we may say equal, while the deficiency always appears in the last two chains; clearly proving that the seed delivery of this drill might be made very exact.

Prize of 10*l.* to C. Dening and Co. (1571), of Chard, Somerset.

TABLE IV.—CORN-DRILLS FOR HILL-SIDE DELIVERY. (CLASS III.)

Name of Exhibitor	Dening & Co.
Catalogue number	1571
Order of trial	2
Price	31*l.* 15*s.* 6*d.*
Width between centres of wheels	5′·8″
Maximum width between end seed-distributors	4′·11½″
Capacity of seed-box in bushels	2·6
Number of horses	1
Number of rows	11

Class IV. Corn-Drills for Small Occupations.—The number of entries in this class was sixteen, all of which were tried. With the exception of G. Lewis and Son, all the exhibitors had similar drills entered in Class II., their chief difference being in width.

The first trial run was with oats, which resulted in the selection of eleven drills for the second run with wheat, and out of this number the six following were selected for a third trial, again with oats: namely, W. Walker and Son, No. 3413; A. W. Gower and Son, of Winchfield, No. 2849; W. Coleman, of Northampton, No. 5001; James Coultas, of Grantham, No. 2794; and Holmes and Son, No. 3823. Of these the first five were selected for the distinctions, in the order in which they are here placed.

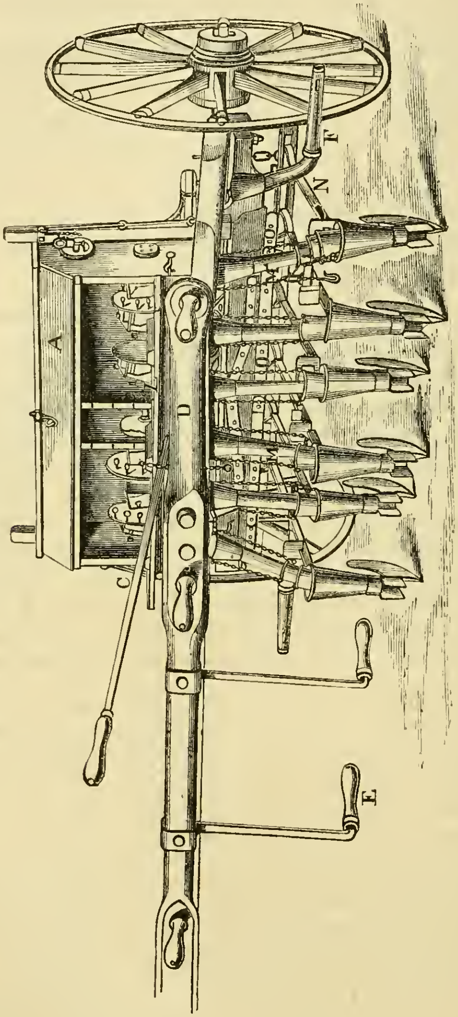
No. 3413. *W. Walker and Son, of Tithby, Bingham.*—The construction of this drill is in every respect similar to the one described in Class II.

Its effective width is 4 ft. 10 in., with 10 coulters. The seed-coulter levers, in this drill also, are all arranged on one stay-bar, which is a decided disadvantage. The lower seed-pipe is attached to the coulter by means of a projecting loop and pin; this is a good arrangement. The lever press-bar has an ordinary joint in the middle, which renders the middle coulter lever somewhat unsteady. The coulter levers are raised and pressed by means of the ordinary wooden roller and chains. The sides of the frame are made of wrought iron, and bolted through the wooden front and back cross-pieces. The two-wheeled fore-carriage steerage has a semicircular table behind, which moves in a staple on the pole, and is steadied by means of a spring; this arrangement enables the attendant to keep the drill steadier when at work.

It is a light and strongly constructed drill. Its price is 23*l.* 10*s.*

No. 2849. *A. W. Gower and Son, of Winchfield, Hants.*—The upper seed-box is provided with a water-tight cover, and the flow of seed from it into the lower seed-box is regulated by slides acted on by a rack and pinion. The seed is delivered by cups attached to the discs of a revolving barrel, and is thrown into a hopper, passing through wrought-iron seed-pipes. These latter are very strong and good, and are well protected against wet. The upper seed-pipe is fastened to a ball-joint by a spring, so that it may give way when the coulter gets a sudden shock: by this arrangement also, the seed-pipes may be bent to the side, in order to suit the coulters when they are altered. The lower seed-pipe extends through the coulter lever, and is fastened to it by a pin joint. The coulters are arranged on two stay-bars,

Fig. 8.—W. Coleman's Corn-Drill, No. 5001.



FRONT VIEW.

which is a good arrangement, giving plenty of space between the coulters. The coulter levers are raised and pressed by means of the ordinary wooden roller and chains, with five lever-handles attached, instead of four. The seed-box is raised and thrown out of gear by an inclined lever, which is placed loosely through a slot in the hand-lever, so that in pulling this hand-lever backwards or forwards the box is raised or lowered.

The frame has cast-metal sides—not good—with front and back wooden cross-pieces. The steerage was good, and has been already described in Class II.

It is not a nicely-finished machine, but made good work. Its price is 18*l*.

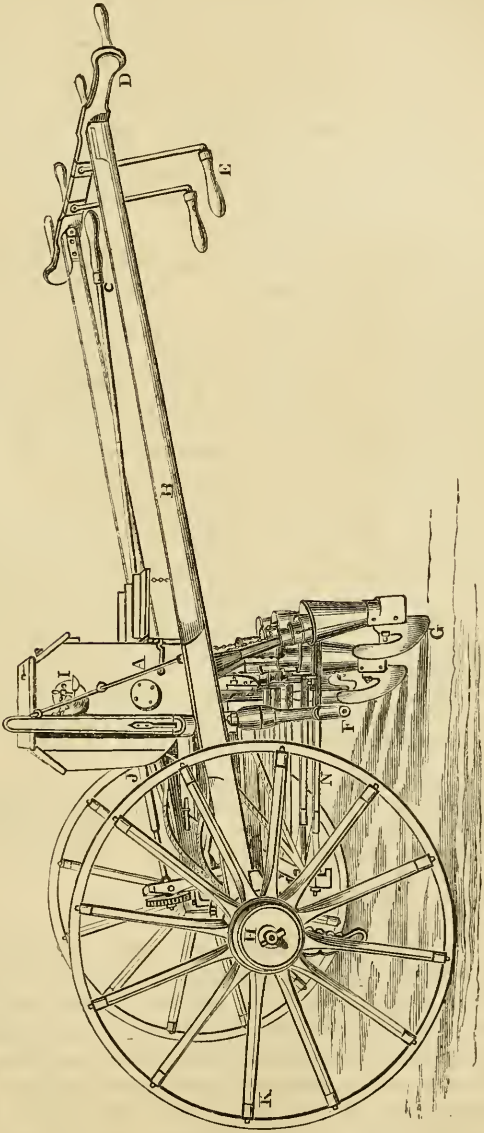


Fig. 9.—*W. Coleman's Corn-Drill, No. 5001.*

SIDE VIEW.

No. 5001. *W. Coleman, of Northampton.*—This kind of drill is of about sixty years' standing, having been in use long before the Suffolk drill. It is greatly used in Bedfordshire and Northamptonshire, and is especially useful for hilly districts.

The seed-box, A (Figs. 8 and 9, pp. 644 and 645), hangs upon two pivots, J, which are attached to wooden upright supports, so that it is made to keep always level in going up or down hill. Side handles, B, act as steerage levers, and are fixed to a cross beam, which is in two pieces, joined together by a plate, and works upon a centre pin. A cross handle, D, is bolted to the side handles by means of which the drill is steered. The two handles, E, are used at the headland for raising the coulters off the ground and carrying them round. The wheels, K, consist of wooden nave and spokes; these latter being fastened to a malleable iron tyre, and thus dispensing with felloes.

In travelling from field to field the wheels are taken off the axle H, and are placed on the upward cranked axle F; thus balancing the machine on the wheels and raising it off the ground.

The whole weight of the drill rests upon the coulters, P, and in this respect differs from all other drills entered for trial. The weight of the drill is distributed from its centre over the coulter levers, by balance-irons, O, so that each lever may work independently.

The gearing consists in a spindle working in a socket, a slot being cut in the socket, and a cotter slot in the spindle; in this latter slot a cotter is placed, which works in the slot of the socket. Thus by a bevel gearing and two pinion wheels, a rotary motion is given to a spindle, the end of which, by means of a ball-and-socket joint, is connected with the gearing in the seed-box, and by this arrangement the gearing accommodates itself to the backward and forward motion of the box in going up or down hill.

Not one of the drills on trial equalled this one in going to any required depth. When the man presses the handles, D, a great weight is thrown on to the coulter-levers, because he is assisted by the weight of the drill, which also acts on the leverage. In the trial, the coulters were made to penetrate the soil to a depth of from 6 to 7 inches; this drill is thus admirably adapted for hard soils. It is well constructed, and its price, 17*l.* 5*s.*, is moderate.

No. 177. *William Gilbert, of Shippon, Abingdon.*—This is not a highly-finished machine, but delivered its seed more regularly than any other drill on trial. Its price is 18*l.*

No. 2794. *James Coultas, of Grantham.*—This drill is of the same construction as that described in Class II., differing only in width, being 3 ft. 11 in., with 8 coulters. Its price is 20*l.*

First Prize of 10*l.* to W. Walker and Son (3413), of Bingham.
Second Prize of 5*l.* to A. W. Gower and Son (2849), of Winchfield.
Highly Commended.—W. Coleman (5001), of Northampton; W. Gilbert (177), of Abingdon, Berks; J. Coultas (2794), of Grantham.

For Table V., Corn-Drills, &c., see opposite page.

Class V. Drills for Turnips and other Roots on the Flat.—There were twelve entries, and eight of these were presented for trial. This was a good class, and the honours were carried off by Messrs. Coultas and Reeves and Son. At Plymouth Coultas stood second, and Reeves fourth, against two competitors who did not enter any machines for trial at Bedford. This class was tried in field No. 2, the manure distributor being tested with damped ashes. Each drill was run for about 200 yards, and, after the first run, three were selected for a second trial,

TABLE V.—CORN-DRILLS for SMALL OCCUPATIONS. (CLASS IV.)

	Perfection being	Walker & Son.	Coleman, W.	Gower & Son.	Coultas, J.	Gilbert, W.
Name of Exhibitor		Walker & Son.	Coleman, W.	Gower & Son.	Coultas, J.	Gilbert, W.
Catalogue number		3413	5001	2849	2794	177
Order of trial		16	10	6	5	1
Price		23*l.* 10*s.*	17*l.* 5*s.*	18*l.*	20*l.*	18*l.*
Width between centres of wheels		5′·6″	5′·6″	4′·10″	4′·7½″	5′·1½″
Maximum width between end seed-distributors		4′·11″	3′·10″	4′·6″	4′·0″	4′·9″
Capacity of seed-box in bushels		1½	1	1¼	1⅓	1¼
Number of horses		2	2	2	2	2
Number of rows		10	6	9	8	9
POINTS OF MERIT:—						
1. Mechanical construction, soundness, and quality of materials and workmanship	200	160	150	150	160	147
2. Simplicity and lightness, combined with strength	100	80	80	77	85	68
3. Size, form, and general arrangement of seed-boxes	70	60	50	56	60	50
4. Construction and adaptation of seed-distributors	50	40	40	43	45	40
5. Facilities for regulating quantities of seed delivered	50	45	40	43	45	35
6. Form, materials, and arrangement of conducting tubes and coulters	70	60	50	65	50	53
7. Efficiency of steerage arrangement	50	40	45	40	40	40
8. Arrangement of press bar	20	14	20	18	5	18
9. Regularity of distribution of seed, evenness of depth, draught, and general perfection of work done on trial	300	250	225	225	220	255
10. Price	90	70	60	70	80	85
Total	1000	819	790	817	790	791

namely, J. Coultas, Reeves and Son, and Holmes and Son; the two former gained the honours.

No. 2795. *James Coultas, of Grantham.*—The dry manure is placed in a manure-box, which may be cleaned out from the front; from this it is deposited by a notched roller with spring scrapers, in a similar manner to that described in Coultas's Dry Manure Distributor in Class XIX., through chain-cups into six coulters. The seed is placed in an upper seed-box, from which it falls into the lower seed-box, its flow being regulated by movable slides. This lower seed-box has a bolster between each of the discs, so that the seed is kept in regular and close contact with the disc and cups. The seed is raised by the cups and thrown into hoppers, passing through india-rubber seed pipes—already described—into the coulters. The manure coulter-levers have their fulcrum on the coulter stay-bar, while the seed coulter-levers have their fulcrum on a bracket fixed to, and below, the manure coulter-levers, upon which the point of attachment may be placed either higher or lower. Thus the seed coulter-lever is in no way controlled by the manure coulter-lever, and the manure and seed may respectively be deposited at any depth; this arrangement seems a little complicated, but is good, and in this respect the drill possesses a great advantage over the second-prize drill, where the seed and manure coulter-levers are fixed to each other. The coulter-levers are raised and pressed by a roller and chains, acted on by a bevel gearing and crank-handle behind.

This is a well-constructed drill, and made good work during the trial. Its price is 25*l.*

No. 1587. *R. and J. Reeves and Son, of Bratton, Westbury.*—The manure is distributed from the manure-box by a revolving barrel with projecting blades on it, through a false bottom regulated by a slide at the bottom of the manure-box, in the same manner as described in Reeves's Dry Manure Distributor, Class XIX.; passing through chain-cups into five coulters. The seed is placed in an upper seed-box and passes from this into a lower one, from which it is delivered by the ordinary cups attached to a revolving disc; being thrown into hoppers and thus passing through chain-cups into the coulters. The seed and manure coulters are both fixed to one lever, which has its fulcrum on the coulter-lever stay-bar in front; this is certainly a simpler arrangement than in the last-described drill, but it cannot be so effective in putting in the seed regularly; for if the manure coulter receives a jerk from any obstacle, the seed coulter is also thrown up, which is not the case in the first-prize drill.

The price of this drill is 19*l.*; it is well-constructed, although the principle upon which the manure is distributed is not so good as that of Chambers's notched barrel.

First Prize of 10*l.* to J. Coultas (2795), of Grantham.
Second Prize of 5*l.* to R. & J. Reeves and Son (1587), of Bratton, Westbury.

For Table VI., Drills for Turnips, &c. see opposite page.

Class VI. Drills for Turnips and other Roots on the Ridge.—There were eleven entries on the list; of these, five were tried on ridged-up land in the field which had been prepared for turnips. The two machines which gained the distinctions were entered by Coultas and Reeves; the mode of distributing both manure and seed is similar to that in the machines by these makers, described in the last class; only, being for ridges, they were provided with two concave rollers and a back roller for covering

TABLE VI.—DRILLS for TURNIPS and other ROOTS on the FLAT. (CLASS V.)

Name of Exhibitor		Gower & Son.	Holmes & Son.	Harrison, T.	Rainforth, W.
Catalogue number		4973	3824	856	3362
Order of trial		3	6	9	10
Price		15*l.*	28*l.* 10*s.*	30*l.*	35*l.*
Width between centres of wheels		5′ 0″	6′ 9″	7′ 6″	6′ 7″
Number of horses		1	2	2	2
Number of rows		2 and 3	3, 4, and 5	3, 4, and 5	3, 4, and 5
Mean draught in pounds ..		..	..	..	..
POINTS OF MERIT :—	Perfection being				
1. Mechanical construction, soundness, and quality of materials and workmanship ..	200	50	50	50	50
2. Simplicity and lightness, combined with strength	100	40	20	20	20
3. Size, form, and general arrangement of seed and manure-boxes ..	70	20	30	30	30
4. Construction and adaptation of seed and manure distributors ..	50	20	20	20	20
5. Facilities for regulating quantities of seed and manure delivered	50	20	40	30	30
6. Form, materials, and arrangement of conducting tubes and coulters	70	50	30	30	30
7. Efficiency of steerage arrangements	50	..	35	30	30
8. Arrangement of press bar	20	..	..	..	..
9. Regularity of distribution of seed and manure, evenness of depth, draught, and general perfection of work done on trial ..	300	80	150	90	90
10. Price	90	40	40	35	30
Total	1000	320	415	335	330

the seed. One point of difference between these two drills is, that in Coultas's drill the manure-coulters precede the concave rollers, so that these cover in the manure before the seed is sown, while the seed is covered by the hind roller. In Reeves and Son's drill the manure-coulters follow the concave rollers, and the seed is deposited directly on the manure, while both are covered by the hind roller. The former plan is decidedly the best, for it cannot be good for the seed to be in such close contact with the manure.

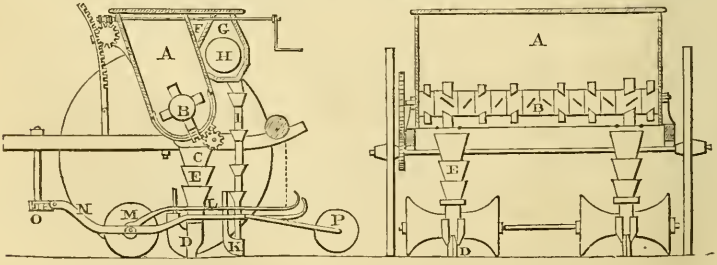
No. 2769. *James Coultas, of Grantham.*—The dry manure is placed in a manure-box, in which it is stirred by inclined, laterally-working stirrers, and delivered into two coulters by a notched roller with spring scrapers, described in Class XIX. The seed is placed in an upper seed-box, and falls through regulating slides into a lower seed-box with a bolster in the centre; from this it is delivered by cups, attached to revolving discs, into india-rubber seed-pipes, and thus into the coulters. The manure-coulters have their fulcrum on the coulter-lever stay-bar, while the seed-coulter levers are quite distinct, having their fulcrum on a bracket fixed to the manure-coulter lever. The concave rollers are fitted on a common axle, upon which they move freely in a lateral direction, in order to suit themselves to the width of the ridges. This axle is attached to a lever-bar on each side, which is in turn attached to, and has its fulcrum on, the coulter-lever stay-bar. The seed-roller, which follows up, is attached by a frame to the ends of the concave roller-axle, and is provided with a scraper behind; this is a good arrangement, for, if the soil is not quite dry, it is always liable to stick to the seed-roller. The concave rollers are deep and wide, and made excellent work during the trial, leaving the ridges loose; they are also provided with scrapers, which is another very good arrangement. As mentioned before, the concave rollers follow the manure-coulters, while they are followed by the seed-coulters.

The manure and seed-box may be levelled in going up or down hill, and the manure-barrel is geared off both driving-wheels so as to equalise the draught. The manure-box is cleaned out from before by a movable board.

It is a well-constructed drill, but somewhat costly, its price being 20*l.*

No. 1588. *R. and J. Reeves and Son, of Bratton, Westbury.*—The construction of this drill will be best understood by referring to the accompanying engravings of cross and longitudinal sections.

Fig. 10.—*Messrs. R. and J. Reeves and Son's Drill for Turnips and other Roots on the Ridge, No.* 1588.



Cross Section. Longitudinal Section.

The manure is delivered from the manure-box, A, by the revolving barrel B having blades on it, through the false bottom regulated by slide C, in a similar

TABLE VII.—DRILLS for TURNIPS and other ROOTS on the RIDGE. (CLASS VI.)

	Perfection being	Murray & Co.	Reeves & Son.	Coultas, J.	Gower, A. W.
Name of Exhibitor		Murray & Co.	Reeves & Son.	Coultas, J.	Gower, A. W.
Catalogue number		4264	1588	2796	4976
Order of trial		1	2	6	8
Price		11*l.*	15*l.* 10*s.*	20*l.*	12*l.*
Width between centres of wheels		..	4′ 6″	4′ 6″	
Number of horses		1	1	2	1
Number of rows		2	2	2	2
POINTS OF MERIT :—					
1. Mechanical construction, soundness, and quality of materials and workmanship	180	80	140	160	90
2. Simplicity and lightness, combined with strength	90	50	70	70	50
3. Size, form, and general arrangement of seed and manure-boxes ..	60	20	45	50	30
4. Construction and adaptation of seed and manure-distributors ..	50	30	40	50	35
5. Facilities for regulating quantities of seed and manure delivered	50	25	40	50	35
6. Form, materials, and arrangement of conducting tubes and coulters	60	35	45	50	40
7. Form and arrangement of rollers	150	90	110	130	75
8. Regularity of distribution of seed and manure, evenness of depth, draught and general perfection of work done on trial ..	270	130	200	230	145
9. Price	90	80	80	85	60
Total	1000	520	770	875	560

manner to that described in Class XIX., and passing through chain-cups into two coulters. The seed is placed in an upper seed-box, F, and falls from it into the lower seed-box G, from which it is raised by a revolving disc, H, with attached cups; being thus thrown into hoppers and passing down through the chain-cups I, to the seed-coulters K. Both manure and seed coulters are attached to a common lever, thus again differing from Coultas's drill; this lever has its fulcrum on the concave roller-axle. The concave rollers, M, precede the manure coulters, and are placed on a common axle, upon which they move laterally to suit themselves to the ridges; this axle is attached to a weighted lever, N, which has its fulcrum on, and is attached in front to, the stay-bar O. The seed-covering roller, P, follows up, having its frame attached on each side to the concave roller lever. The box is levelled by a rack and pinion and crank-handle behind. The coulters are raised by a wooden roller and chains.

This implement also made good work, although, of course, the mode of distributing the manure is not so good as that of the notched barrel: the concave rollers were also not so deep and wide as in the last-described drill, and consequently did not leave the ridge quite so loose. Its price is moderate, being 15*l.* 10*s.*

No. 604. *W. S. Underhill, of Newport, Salop.*—This drill sows four ridges at one time. The frame is carried on two wrought-iron wheels of 3 ft. 6 in. diameter, which are adjustable. The concave rollers may be set to any width of ridge, and they may be raised by a winding apparatus simultaneously with the coulters. The delivering cups are driven by means of a strap running on a cone pulley, with different speeds for regulating the quantity of seed sown. The seed is covered by rollers, which follow up. When sowing on the flat the concave rollers may be removed. The price of this drill is 10*l.* 10*s.* Only one horse was attached to this implement in the trial, and worked it freely.

First Prize of 10*l.* to J. Coultas (2796), of Grantham.
Second Prize of 5*l.* to R. & J. Reeves and Son (1588), of Bratton, Westbury.

For TABLE VII., DRILLS FOR TURNIPS, &c., ON THE RIDGE, see p. 651.

Class VII. Drills for Turnips and other Roots on the Ridge, without Manure Box.—There were twenty entries, and twelve of these machines were tried. The greater part of them were furnished with concave rollers, the concavity of which was in most cases too shallow and too narrow, thus causing the drills to be too much pressed.

No. 364. *J. D. Snowden, of Doncaster.*—The seed-box is provided with a water-tight lid, and has three divisions in it, forming two compartments for mangold wurzels in the centre, and two turnip-seed compartments at the sides. The seed-box is hung upon two pivots, and may be levelled in going up or down hill by a handle at the side. The seed is raised from the seed-box by seed-cups attached to a revolving barrel, which gears directly with the driving-wheels. In changing the cog-wheels for sowing different quantities of seed, the whole box is moved either up or down an inclined slide, upon which the ends of the seed-box rest.

The weight of the machine is carried by a pair of driving-wheels, which may be either left on the machine or taken off, to suit the class of soil upon which it may be working. The two concave rollers fit loosely on their axle, and are free to move laterally, so as to suit themselves to the ridges; they are deep and wide, and leave the sides of the drill in a loose condition. The roller which follows for covering the seed is 5 inches in diameter, and is attached to a weighted leverage, which is connected with the concave roller axle. The machine made good work, and was specially noticed for its deep concave rollers and large seed-box. Its price is 8*l.*

No. 4265. *G. W. Murray and Co., of Banff, N.B.*—There is a separate seed-box for each of the coulters; these being made of cast metal, with a water-tight lid which laps over all round. Each of the seed-boxes has a division in it, thus forming a smaller compartment for the turnip-seed, and a larger one for the mangold-seed. Stirrers, placed at the extremities of a small revolving spindle, insure a regular flow of mangold-seed to the delivery discs.

The delivery discs are of small diameter, and have small cups embossed on their circumference; they revolve in the middle of the seed, so that there is no danger of crushing any of the seeds. The mangold discs (one of which is in each mangold-seed box, separate from the turnip-seed discs) are of larger diameter than those for turnip-seed, and have also larger cups embossed on their circumference.

The seed passes down telescopic seed-pipes to the coulters, which are each connected with a concave roller at its centre, so that as the roller moves laterally to suit the width of the rows, the seed will always be deposited in the centre of the ridge. The concave rollers are well hollowed out and wide, although in this respect not so good as in the last-described drill. They fit loosely on an axle, and may move along it laterally to suit the width of the rows.

The coulters are kept in the ground by lever-handles behind, and their depth is regulated by the higher or lower attachment of these handles to the rod which connects them with the coulters. As the work proceeds the coulters are easily cleared of weeds or other obstacles, by simply raising them. A small roller follows to cover the seed, this being attached to the concave roller axle.

This is a light, useful drill, well adapted for hilly ground; it is also very simple and strong in construction, all the framing being made of wrought iron; larger mangold-seed boxes would, however, be an improvement. It made good work in the trial. Its price is 7*l.* 10*s.*

No. 1375. *Corbett and Peele, of Shrewsbury.*—This machine rests upon a front guide-wheel of large diameter, which travels in the furrow between the two ridges, and behind upon the two concave rollers which travel on the ridges. The seed-box has two compartments, one for each coulter; these may be used for either mangold-seed or turnip-seed. It may be levelled on hilly ground by a handle behind. The seed falls from the upper seed-box into a lower compartment, from which it is raised by cups attached to barrel discs, being thus delivered into hoppers which communicate with the seed-pipes and coulters. Motion is given to the seed-barrels by a strap passing round the front guide-wheel axle, and also round a cone pulley on the seed-barrel axle, upon which the strap may be changed to suit the different quantities to be sown.

The concave rollers move laterally on their axle, to suit themselves to the width between the rows. Attached to the concave rollers are the coulters, which always keep in the centre of the ridge, also small rollers which cover in the seed.

This is a good machine, and made good work during the trial; but the use of a strap for gearing the seed-barrel was considered objectionable in such an out-of-door machine. Its price is 6*l.* 7*s.* 6*d.*

First Prize of 10*l.* to J. D. Snowden (364), of Doncaster.
Second Prize of 5*l.* to G. W. Murray and Co. (4265), of Banff, N.B.
Commended.—Corbett and Peele (1375), of Shrewsbury.

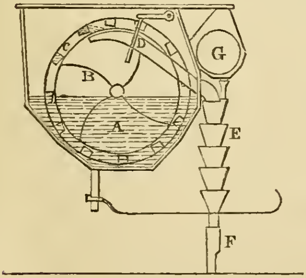
TABLE VIII.—DRILLS for TURNIPS and other ROOTS on the RIDGE without MANURE-BOX. (CLASS VII.)

Name of Exhibitor		Murray & Co.	Snowden, J.	Corbett & Peele.
Catalogue number		4265	364	1375
Order of trial		5	8	12
Price		7*l.* 10*s.*	8*l.*	6*l.* 7*s.* 6*d.*
Number of horses		1	1	1
Number of rows		2	2	2
POINTS OF MERIT:—	Perfection being			
1. Mechanical construction, soundness, and quality of materials and workmanship ..	180	160	160	140
2. Simplicity and lightness, combined with strength	90	75	80	70
3. Size, form, and general arrangement of seed-boxes	60	40	60	40
4. Construction and adaptation of seed-distributors	50	40	40	40
5. Facilities for regulating quantities of seed delivered	50	30	40	35
6. Form, materials, and arrangement of conducting tubes and coulters	60	40	40	35
7. Form and arrangement of rollers	150	130	140	110
8. Regularity of distribution of seed, evenness of depth, draught, and general perfection of work done on trial ..	270	210	230	200
9. Price	90	70	25	70
Total	1000	795	815	740

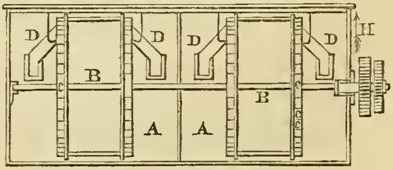
Class VIII. Water-Drills.—There were five entries, all of which were presented for trial. The cisterns were each filled with water up to the axle of the cylinder, and then one bushel of superphosphate was thrown in. Before starting, each machine had the manure stirred up by turning the cylinder. The distance run was about 500 to 600 yards, each machine being emptied before stopping, so that it might be observed whether the manure had been properly stirred up and worked out. The machines were first made to deliver the smallest possible, and then the largest possible quantity. The awards are identically the same as at the Plymouth Meeting; for there also Reeves and Sons were first with two Drills, and James Coultas second. The machines of both these makers are constructed on Chandler's patent, but Reeves's drill excels that of Coultas, by having a greater speed for the delivering cylinder, so that large quantities may be delivered by it; it is also provided with better stirrers, which always keep the manure and water well mixed.

No. 1590. *Reeves & Son, of Bratton, Westbury.*—This machine is constructed on Chandler's patent, and, by the appended sections (Fig. 11), will be seen to consist of a cistern in two halves, in each of which is placed a revolving cylinder, B, having cups, C, attached to the sides of the discs; these cups are cast together with the discs, forming part of them, which gives them great strength, although there is this disadvantage, that should one of the cups be broken, it cannot be so readily replaced as if it had been bolted to the disc. Stirrers are fastened to, and project beyond the outer circumference of the cylinder, always keeping the artificial manure and water well mixed. The four sets of cups each deliver their contents into hoppers, D; these being provided with valves at the top, which may be more or less opened to suit the quantity to be delivered, and are attached to a spindle, which is worked by a lever-handle, H, and index at the side of the drill. From the hopper the seed passes down the chain cups, E, to the coulters, F. The seed is delivered from a seed-box, G, attached to the drill behind, by the ordinary seed-cups and hoppers, thus passing into the same chain-cups with the liquid manure, and carried down by it into the soil, so that they are deposited together. The delivering cylinder is geared with the driving-wheel on one side only, which is a disadvantage; for it throws the greatest draught on to that side of the drill, and therefore makes it unequal for the horses. The driving-wheel cog is geared with the cylinder cog by means of a clutch.

Fig. 11.—*Sections of Messrs. R. and J. Reeves and Son's Water-Drill, No.* 1590.



Cross Section.



Longitudinal Section.

This is a strong and well-constructed machine, and made good work during the trial; delivering both small and very large quantities in an excellent manner. At the close of its trial all the manure and water had been worked out. Its price is somewhat high, being 31*l.*

No. 2797. *James Coultas, Grantham.*—This machine is constructed on the same principle as the last, differing only in having the cylinder geared with the driving-wheels on both sides, so as to equalise the draught. The speed of the delivering cylinder is too small, which prevented it from delivering such large quantities as the last-described drill; this was considered a disadvantage.

A crank-handle may be fixed on to the end of the cylinder spindle at the side in order to stir up the manure before starting, by turning the cylinder; this is a very good arrangement, although the handle is in a somewhat awkward position. The construction of the coulters is good; the flaps being turned in from both sides, so as to keep the water well together, which they did effectually during the trial.

The seed is delivered by seed-cups and hoppers, and passes into the same coulters with the liquid manure, being carried down by it into the soil. The price of this machine is 25*l.*

First Prize of 10*l.* to Reeves and Son (1590), of Westbury.
Second Prize of 5*l.* to J. Coultas (2797), of Grantham.

Table IX.—Water-Drills. (Class VIII.)

Name of Exhibitor		Reeves & Son.	Coultas, J.
Catalogue number		1590	2797
Order of trial		4	2
Price		31*l.*	25*l*
Points of Merit:—	Perfection being		
1 Mechanical construction, soundness, and quality of materials and workmanship	200	180	150
2. Simplicity and lightness, combined with strength	100	80	80
3. Size, form, and general arrangement of seed-boxes	70	65	50
4. Construction and adaptation of seed-distributors	50	40	30
5. Facilities for regulating quantities of seed delivered	50	40	40
6. Form, materials, and arrangement of conducting tubes and coulters ..	70	50	60
7. Regularity of distribution of seed, evenness of depth, draught, and general perfection of work done on trial	300	230	200
8. Price	90	60	80
Total	930	745	690

Class IX. Drills for Small Seeds.—In this class there were nine entries on the list, and four of these were tried. One peck of perennial rye-grass and 14 lbs. of trefoil were placed in the seed-box of each of the drills; which were then run until the seed was nearly all delivered, in order that the Judges might observe whether the rye-grass seed and clover seed were kept equally mixed. During the first part of the run the coulters were kept on the ground, while during the latter part the coulters were raised. James Coultas, of Grantham, obtained the first prize, with a drill for which he was placed third at the Plymouth trials. The coulters are small and well constructed, and made good work during the trial. In some of the other machines the coulters were too large and too broad, the consequence of which was, that the back row of coulters covered in the drills of the front row unevenly and too deep, which is a great disadvantage in sowing clover seeds.

No. 2798. *James Coultas, of Grantham.*—The upper seed-box has a stirrer in it, which keeps the seed mixed and assists in its delivery. The lid of the upper seed-box is unfortunately not made watertight, which is a great disadvantage. From the upper seed-box the seed passes into a lower one, in which a number of disc wheels revolve, these delivering the seed. Between each of the wheels are bolsters, which always keep the seed in close and regular contact with the wheels. The circumference of the disc wheels is grooved, and has recesses on it, at the end of which small cups are indented. The cups catch up the seed; and as the seed-barrel turns, the seed passes along the grooves, the rye-grass seed always keeping in them in a longitudinal position; this arrangement was observed to be very effective during the trial. The seed is delivered into hoppers, and thus passes through chain-cups to the coulters.

The coulters are arranged on two coulter stay-bars, and are placed 3½ inches apart laterally. The distance between the front and back row of coulters is 5½ inches; this might be a little greater, for it was observed during the trial that they could only just clear themselves. They are well constructed, being small and narrow, and they made good work. The coulters are raised by means of a roller, and chains attached to it and to the ends of the coulter-levers. There is no fore-steerage, the horse walking in shafts. The price of this drill is 27*l*., which is moderate, for it is well constructed. Its width is 7 ft. 9 in., with 27 coulters.

No. 3414. *W. Walker and Son, of Tithby, Bingham.*—The lid of the upper seed-box is watertight; from this the seed passes into a lower seed-box, its flow being regulated by slides. The seed is raised by ordinary cups attached to disc wheels, delivered into hoppers, and thence passes into tin telescopic seed-pipes, the lower one of which is fastened to the coulter by a loop and cotterel behind; this is a good arrangement. All the coulter-levers are attached to one coulter stay-bar, which necessitates the levers being made unequal, for the front row must be a little in advance of the back row; this is a disadvantage. The coulters are well constructed, and made neat work during the trial. They are raised by an ingenious leverage shown in Fig. 12 (p. 659). The ends of the coulter-levers, A, are all hung by chains, B, to an iron cross-bar, C, which is attached to one arm of the lever D. By lowering the lever-handle D, the projecting bar E presses up the change-cog lever F, and thus throws the seed-barrel out of gear simultaneously with the raising of the coulters, and the cross-bar C is caught up and held by the catch G.

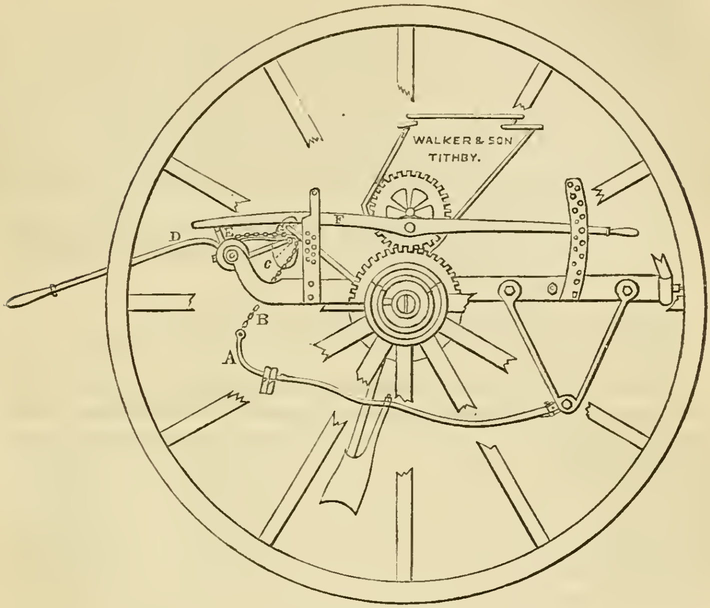
This is a light and strongly-constructed drill, and made good work during the trial. Its price, 32*l.* 5*s.*, is somewhat high. Width, 8 ft. 8 in.

First Prize of 10*l.* to J. Coultas (2798), of Grantham.
Second Prize of 5*l.* to W. Walker and Son (3414), of Bingham.

TABLE X.—DRILLS for SMALL SEEDS. (CLASS IX.)

Name of Exhibitor		Walker & Son.	Coultas, J.	Holmes & Son.
Catalogue number		3414	2798	3827
Order of trial		8	2	4
Price		32*l.* 5*s.*	27*l.*	27*l.* 10*s.*
Width between centres of wheels ..		8′·8″	7′·9″	8′·3″
Weight in cwts.		6	8	$8\frac{1}{2}$
POINTS OF MERIT :—	Perfection being			
1. Mechanical, construction, soundness, and quality of materials and workmanship ..	200	150	160	130
2. Simplicity *and lightness*, combined with strength	100	75	80	70
3. Size, form, and general arrangement of seed-boxes	70	60	60	50
4. Construction and adaptation of seed-distributors	50	40	45	40
5. Facilities for regulating quantities of seed delivered	50	40	40	40
6. Form, materials, and arrangement of conducting tubes *and coulters*	70	65	70	40
7. Regularity of distribution of seed, evenness of depth, draught, and general perfection of work done on trial ..	300	250	280	200
8. Price	90	75	80	65
Total	930	755	815	635

Fig. 12.—*Messrs. W. Walker and Son's Leverage for Raising the Coulter-levers, No.* 3414.



Class X. Barrows for Sowing Small Seeds.—In this class there were twelve entries, and eight machines were tried in one of the main avenues of the show-yard. The seed used for this purpose was perennial rye-grass.

With one exception, all the barrows were well constructed. In some of them the seed was delivered from a single seed-box; in others there were separate boxes for rye-grass and clover seeds,—an arrangement which, as will be seen by the award, the Judges thoroughly appreciated the advantage of. There is a difficulty in keeping the rye-grass and clover seeds equally mixed, as well as in ensuring an even delivery, and this is overcome by the use of separate seed-boxes, for the slides may be regulated to sow either clover or rye-grass seed, as the case may be.

No. 1380. *Corbett and Peele.*—In this implement we have an upper and lower seed-box, each provided with a false bottom and copper slide. These slides are regulated and shut by a rack and pinion, by which means the slides may be easily shut off; but the old plan is preferable, namely, a screw at the end, by means of which the slides may be more accurately adjusted.

Spindles bearing disc brushes are placed in each box, and these are both made to revolve in the same direction, thus delivering both clover and rye-grass seed behind, where the attendant may watch them, and it is also immaterial whether the rye-grass or clover seeds are discharged from the upper or from the lower box.

The machine delivers the seed well, but is somewhat heavy in construction. Its price is 5*l.* 15*s.*

No. 4985. *A. W. Gower and Son, Market Drayton.*—This implement obtained a silver medal at the Plymouth Meeting, and was there much commended by the Judges as a good invention. It is similar in construction to the one last-described, excepting that the spindles revolve in opposite directions, thus necessitating delivery from opposite sides of the box, which is of course a disadvantage. The attendant can only see the slides of the lower box, and, for this reason, the rye-grass, which most readily chokes the slide, must be discharged from behind, by the lower box, while the clover seed is discharged in front from the upper box.

The slides may be accurately adjusted by screws on the end of the boxes; but cannot be shut off when required. It is a cheap implement, easily pushed, but not very strongly constructed. Its price is 5*l.*

Prize of 5*l.* to Corbett and Peele (1380), of Shrewsbury.
Highly Commended.—Gower and Son (4985), of Market Drayton.

Table XI.—Barrows for Sowing Small Seeds. (Class X.)

Name of Exhibitor		Gower, A. W.	Corbett & Peele.
Catalogue number		4985	1380
Order of trial		2	11
Price		5*l.*	5*l.* 15*s.*
Useful width		12′·0″	Not given.
Size of wheel		3′·0″	Not given.
Number of rows		21	Not given.
Weight in qrs.		2	Not given.
Points of Merit :—	Perfection being		
1. Mechanical construction, materials, and workmanship	240	170	200
2. Simplicity and lightness, combined with strength	110	80	100
3. Size, form, and general arrangement of seed-boxes	80	65	70
4. Construction and adaptation of seed-distributors	60	60	55
5. Facilities for regulating quantity of seed delivered	60	40	60
6. Regularity of distribution of seed, draught, and general perfection of work done on trial	350	280	300
7. Price	100	80	90
Total	1000	775	875

Class XI. Drill Pressers.—These implements are admirably adapted for putting in winter wheat after seeds, giving the land a firm bottom, and thus preventing it being raised by frost. It is also considered a preventive against wire-worm.

Three implements were entered on the list, but only one of them appeared for trial; and as the Judges had had a previous opportunity for testing it, a further trial was considered unnecessary, and the prize was awarded to it.

No. 4989. *Gower and Son, Market Drayton.*—This implement is constructed to follow two ploughs. One heavy disc-roller moves along each furrow, compressing the bottom of it. The seed is delivered from a box, attached to the frame, into a seed-pipe by a moveable slide delivery. These slides are worked by an adjustable eccentric, which gears with the main driving-wheel, by a bevel gearing. Miniature double mould-board ploughs, attached to a lever frame, follow up, and cover in the seed.

Prize of 5*l.* to Gower and Son (4989), of Market Drayton.

Class XII. Potato Drills.—The want of some implement to facilitate the operation of potato planting has been much felt of late years by large growers of potatoes, who have found it difficult to obtain a sufficient number of hands; therefore, apart from the comparative cost of the operation as performed by hand or by machine, these implements are calculated to make a farmer less dependent upon his work-people, and to ensure his potatoes being planted at the proper time; it cannot, however, be expected that the sets will be deposited so regularly by a machine as by careful hands, and in this respect the implements tried were inefficient, frequently depositing two potatoes in place of one.

The trial took place in a field, the soil of which had crumbled down, owing to the rain on the previous evening, and the severe baking during the previous fortnight, and now presented a very good mould. Of six drills entered, three were tried; one bushel of potatoes of various sizes having been placed in the hopper of each. The distance of run was 200 yards; during the first 100 yards of which, the potatoes were dropped at 9 inches apart, and during the latter 100 yards at 12 inches apart.

No. 2799. *James Coultas, of Grantham.*—This implement was awarded a silver medal in the Miscellaneous class at Hull last year, and was again presented for trial, with some improvements. The potatoes are placed in a hopper provided with a slide, which is regulated to suit the size of the seed, so that the tubers are let out gradually on to a sparred inclined plane, from the lower end of which they are raised by wooden cups attached to an endless chain, and, passing over a pulley, they are carried down a spout, and thus deposited in the furrow. Double mould-board ploughs attached to a lever, in a similar manner to a corn-drill lever, open the furrows, and two small side scoops push the soil on to the tubers when deposited. The artificial manure is distributed from a hopper by a narrow Chambers's manure barrel into a separate spout, which deposits the manure in the furrows.

The quantity of potatoes planted is regulated by change speed-wheels. The furrows were opened and closed in an inferior manner, this implement possessing the fault of combining too many operations, which would each be more satisfactorily performed by separate implements. Its price, 45*l.*, is high, considering that it can only be used for this one operation. The tubers were not dropped regularly, for two instead of one were frequently noticed, although in this respect it was far superior to the other drills in the trial.

No. 2432. *Louis Conteau.*—This implement was placed on four wheels; it opened the furrow, planted the tubers, and covered in its work.

The potatoes are placed in a hopper which moves on rollers. A web is attached to the front of the hopper—which constitutes its bottom—and is gradually wound up on a roller, thus throwing the potatoes upon a sparred inclined plane, from which they are caught up by a revolving cylinder with claws fixed to its circumference; they are then dropped down a spout, and thus deposited in the furrow. The claws were too large for the size of the seed, and consequently nearly always two, and sometimes three, potatoes were dropped at once.

First Prize of 15*l.* to J. Coultas (2799), of Grantham.
Second Prize withheld.

Table XII.—Potato Drills. (Class XII.)

Name of Exhibitor		Coultas, J.
Catalogue number		2799
Order of trial		2
Price		45*l.*
Width between centres of wheels		None given.
Maximum width between end seed-distributors		
Size of seed-box		
Number of horses		3
,, rows		2
Points of Merit :—	Perfection being	
1. Mechanical construction, soundness, and quality of materials and workmanship	200	200
2. Simplicity and lightness, combined with strength	100	80
3. Size, form, and general arrangement of seed and manure-boxes	70	70
4. Construction and adaptation of seed and manure distributors	50	40
5. Facilities for regulating quantities of seed and manure delivered	50	50
6. Form, materials, and arrangement of conducting tubes and coulters	70	70
7. Regularity of distribution of seed and manure, evenness of depth, draught, and general perfection of work done on trial	300	280
8. Price	90	80
Total	930	870

Section II.—Horse-Hoes.

Class XIII. Horse-Hoes for General Purposes.—There were twenty-nine entries in this class, and seventeen of these implements were tried. Being for general purposes, it was necessary to try them both on turnips and corn.

The first trial took place in a field of swedes on Mr. Prolle's farm at Elstowe, where the soil was loose and clean, and the rows were 27 inches apart.

The second trial was made on a field of oats; these were considerably overgrown and full of bineweeds and thistles. The whole field was also not equal as regards cleanness; the consequence was, that the last-tried hoes had much cleaner ground than the first ones, but this was duly taken into consideration by the Judges.

In the turnip-field most of the implements were worked with three hoes, namely, a duck-foot hoe in the centre and two semi-duck-foot hoes on each side— , and good work was made; but in the oat-field few of these implements went 20 yards without choking up. Here, also, those implements having single duck-foot hoes attached, left many of the thistles uncut even in the centre of the interspaces; they also did not cut close into the edge of the rows, and frequently cut up the corn unobserved by the attendant. Where semi-duck-foot hoes were worked on either side of the rows of corn, fair work was made, for the thistles and other weeds were cut close into the rows; they also kept clean, especially those where the alternate hoes were placed well apart: there is, however, some danger of cutting up the corn, if the implement is not very carefully guided. Two implements were fitted with hoes placed across the interspaces, being bent at right angles to the stem— , but the hoes were placed too close together, and frequently choked up; they, however, possess the great advantage that there is less danger of cutting up the rows of corn with them.

The Judges were of opinion that for light soils the hoes bent at right angles to the stem are best; but for stiffer soils, they prefer the chisel-pointed semi-duck-foot hoe: they also prefer independent lever hoes to those fastened on a rigid frame.

No. 972. *Smith and Grace, of Thrapstone.*—This is an independent lever horse-hoe without a fore steerage, the horse being attached to a two-wheeled carriage by means of shafts. The axles of the wheels are cranked upwards and fastened below the carriage frame; they may be adjusted laterally to different widths. The frame is suspended below the carriage, its forepart moving on friction rollers, and resting on a wrought-iron bar which is fastened below the carriage by a bracket; its back part is composed of an upper bar, to which the two suspending chains are attached. Thus the frame is hung upon three different points. To the lower bar of the frame, chains are attached, communicating with the lever handle and pulleys for raising the hoes off the ground. In raising the hoes, the lower bar catches up the levers close to where the stems of the hoes are inserted.

Vertical guide rods, fastened above and below by clips to the back frame, pass through slots in the levers. The levers are of wood braced with iron.

The hoe stems are inserted into the ends of the levers and are fastened and adjusted by a set screw.

The hoes are guided laterally by two lever handles; these are attached in front to the carriage, and constitute the fulcrum, and are again connected by a moveable joint with the upper bar, constituting the weight. The implement made good work, and is easily guided. Its construction is simple, and all the screw nuts are of the same size. All the parts liable to be subjected to strain are of wrought iron, and the materials and workmanship are good. The price is moderate as compared with the other independent lever horse-hoes that were entered, being 12*l.* 12*s.*

It would be a great improvement to construct the levers entirely of iron, instead of a combination of wood and iron.

No. 866. *F. Mote, of Wisbech Road, March.*—This is an improved rigid-frame horse-hoe, inasmuch as the frame is divided into three sections, each of which is fitted with a compound lever for raising and lowering the hoes, or for altering their pitch. In working along ridges, the sections may each be regulated independently to suit the level of the ground along which they are travelling, and the attendant may with ease, while the implement is at work, alter either the depth or the pitch of hoes.

The hoe frame is carried by a two-wheeled carriage, to which the horse is attached by shafts. The frame is well placed below the carriage, so as to balance the whole implement upon the centre axis. The hoes are steered by a lever handle and rack and pinion.

The materials are good and mostly malleable iron, while the wheels are of wood. Workmanship is good. Price 14*l.*

No. 778. *Vipan and Headley, of Leicester.*—This implement moved the soil well, but having the single duckfoot-hoe in each row, it left many of the thistles on the sides of the rows of corn, uncut.

No. 2963. *G. Lewis and Son, of Albert Works, Kettering.*—This is a rigid-frame horse-hoe; it did not thoroughly clean the rows.

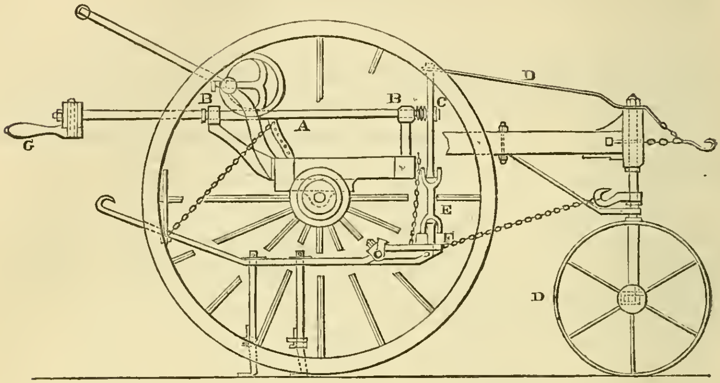
No. 649. *J. L. Baker and Co., of Hargrave, Kimbolton.*—The improved steerage of this implement may also be noticed (Fig. 13, p. 666). It consists in a long shaft, A, fastened by bearings, B, B, across the frame of the carriage, bearing at the front end an upper and lower lever—the former, C, D, communicating with the steerage wheels, and the latter, E, connected with one end of the hoe frame, F. The shaft is turned by means of a lever handle, G, behind, and in guiding the implement either right or left, the steerage wheels and the hoe frame are both moved in the same direction, thus working in complete harmony with each other.

First Prize of 10*l.* to Smith and Grace (972), of Thrapstone.
Second Prize of 5*l.* to F. Mote (866), of Wisbech Road, March.
Highly Commended.—Vipan and Headley (778), of Leicester.
Commended.—G. Lewis and Son (2963), of Kettering.

Table XIII.—Horse-Hoes for General Purposes. (Class XIII.)

Name of Exhibitor		Lewis & Son.	Smith & Grace.	Mote, F.	Vipan & Headley.
Catalogue number		2963	972	866	778
Order of trial		15	21	26	1
Price		9*l.*	12*l.* 12*s.*	14*l.*	8*l.*
Extreme effective width		5′ 9″	5′ 6″	..	5′ 10″
Maximum number of hoes ..		9	8	..	9
Tillage of field		Turnips.	Turnips.	Turnips.	Turnips.
Number of horses		1	1	..	1
Number of rows hoed at one time		3	2	..	3
Points of Merit :—	Perfection being				
1. Mechanical construction, strength, soundness, and quality of materials and workmanship	200	140	180	180	—
2. Simplicity of adjustment	70	50	60	60	—
3. Steerage and ease of management	150	135	140	130	—
4. Adaptation to inequalities of surface	80	10	20	50	—
5. Suitability of hoes supplied to meet general purposes, and quality of same	100	40	90	90	—
6. Evenness of depth, cleanness of cut, and general perfection of work done on trial ..	300	200	260	250	—
7. Lightness of draught	50	40	40	40	—
8. Price	50	50	50	45	—
Total	1000	665	890	845	

Fig. 13.—*Messrs. J. L. Baker and Co.'s Improved Horse-hoe Steerage, No.* 649.



A. Horizontal Shaft.
B. Bearings.
C. Vertical Lever.
D. Connecting Lever for Steerage-wheels.
E. Connecting-rod for Hoe-frame.
F. End of Hoe-frame.
G. Lever Handle.

Class XIV. Horse-Hoes combined with Drill for Small Seeds.—This is another combination of two implements in one, both of which would perform their work better separately, and at little extra cost.

As the seed-box is placed in front of the hoes, it is evident that some of the seed must fall into the crevices which are formed in the land during dry weather, and as clover-seed will rarely germinate if deposited at a greater depth than from $1\frac{1}{4}$ to $1\frac{3}{4}$ inch, seed thus falling would be lost. Neither can it be expected that the hoes will at the same time cut all the weeds and cover in the seed regularly. The cost of sowing by hand-barrow is so trifling, that little, if any, expense is saved by combining a hand-barrow with a horse-hoe, and the only extra item is the light harrowing.

There were five entries on the list, and three of these were tried in the oat-field.

No. 1382. *Corbett and Peele, of Shrewsbury.*—The seed-box, which has already been described in Class X., is geared with the driving-wheels of the fore-carriage hoe steerage.

The hoe is rigid, guided by two upper handles, and lifted round the headland by two lower handles. The hoes are arranged laterally in two rows, being fixed to the frame by clips with set screws. The shape of the hoes was a chisel-pointed duckfoot.

The hoe frame is hooked to the projecting frame which carries the seed-box; and when the seed-box is not used, it may be hooked on below the fore-carriage as in an ordinary horse-hoe. When travelling to the field, the seed-box is supported on two brackets; one on the shaft, and the other on the fore-carriage. It is a well-constructed implement. Price 11*l.* 15*s.*

No. 722. *Wm. Smith, of Kettering.*—This is also a rigid-frame horse-hoe, with a two-wheeled fore-carriage steerage, similar to the one last described. The seed-box is placed in front of the hoes near the ground, so as to prevent blowing in windy weather. It is also well constructed. Price 11*l.* 10*s.*

First Prize to Corbett and Peele (1382), of Shrewsbury.
Commended.—Wm. Smith (722), of Kettering.

TABLE XIV.—HORSE-HOES combined with DRILL for SMALL SEEDS. (CLASS XIV.)

Name of Exhibitor		Baker & Co.	Smith, W.	Corbett & Peele.
Catalogue number		650	722	1382
Order of trial		1	2	5
Price		40*l.*	11*l.* 10*s.*	11*l.* 15*s.*
Extreme effective width		6′ 0″	6′ 0″	5′ 6″
Maximum number of hoes		18	9	9
Tillage of field		Oats.	Oats.	Oats.
Number of horses		2	1	1
Number of rows hoed at one time ..		7	9	9
POINTS OF MERIT :—	Perfection being			
1. Mechanical construction	200	100	160	180
2. Simplicity	100	40	100	100
3. Perfection of work done by drill	250	200	245	250
4. Perfection of work done by horse-hoe	350	150	180	200
5. Price	100	40	80	80
Total	1000	530	765	810

Class XV. Single-Row Horse-Hoes for Ridge and Flat.—In this class there were twenty-nine entries, and twenty-six of these were tried in a field, where, unfortunately, owing to the continued dry weather, there were neither turnip-plants nor weeds, so that the task of the Judges was rendered somewhat difficult. It was a very good class.

No. 1386. *Corbett and Peele, of Shrewsbury.*—This implement consists of a central beam in front, bent slightly upwards and forwards to suit the guide-wheel; and connected behind with two handles for guiding the implement. A very strong cast-iron body, carrying a broad-winged share with a chisel point, is bolted to the central beam; the chisel point goes below the level of the wings, so as to keep the implement to its depth. The share is fixed to the body by a screw and nut.

Behind the front tine is a parallel jointed frame, similar to a parallel roller;

connected with a lever-handle at the side, so that the width may be altered while at work. Two hoes are attached to each of the side bars of this parallel frame, their stems being fastened to it by clips with set screws. The two front hoes are chisel-pointed, while the hind hoes are bent inwards at right angles to the stem. The front wheel is altered for depth by a lever-handle behind, with which it is connected by a rod.

This is a very ingenious invention, and the implement did its work well; but there are rather too many joints and levers about it, which would require careful management to keep them in order: this feature seems objectionable in a tillage implement, which is a good deal exposed to the weather and generally roughly handled. The tine in front is very good. The price is 3*l.* 17*s.* 6*d.*

No. 779. *Vipan and Headley, of Leicester.*—This implement consists of a central beam carrying before it two travelling wheels, the stems of which are attached by clips to a cross-bar of iron. The beam carries a central front tine, the stem of which passes through a slot, and is fastened with a wedge and set screw. Two side-beams are affixed to projecting arms on the central beam, and are coupled at the back by two wings having holes at regular distances apart, through which a screw bolt passes to secure them, allowing the beams to expand to any width of hoe, from 14 inches to 30 inches. Two hoes are fixed in slots on each side-beam by a wedge and set screw. The front wheels may be slid along the cross-bar, to which they are attached, to suit the width of the row; and they may also be either raised or lowered to suit the depth. The hoes are fixed to the stems by a socket-joint, and different hoes may be attached to suit different classes of soil. The price of this implement is 3*l.* 10*s.* It made good work.

No. 4884. *Carson and Toone, of Warminster.*—This implement was awarded the first prize at the Plymouth Meeting as well as at the Leeds Meeting. It consists of a strong central beam, which carries in front a wheel with a round stem. The front tine carries a broad-winged hoe, and has its stem inserted vertically into a slot in the beam, being there fastened by a wedge and set screw. Four hoes have their stems bent at a right angle, and are inserted through the side of the beam, which here is double. These hoes are fastened by clips and set screws; the two hind hoes are bent at right angles to their stems, and have projecting tines behind for loosening the weeds. This is a simple, strongly and well made implement, and all its parts could be easily repaired by any country blacksmith. There is a good width between the hoes, which allows them to clear themselves of weeds. Its price is 3*l.* 15*s.*

First Prize of 10*l.* to Corbett and Peele (1386), of Shrewsbury.

Second Prize of 5*l.* to Vipan and Headley (779), of Leicester.

Highly Commended.—Carson and Toone (4884), of Warminster; Corbett and Peele (1383), of Shrewsbury.

Commended.—W. Ashton (768), of Horncastle; J. Gillett (759), of Northampton; J. D. Snowden (365), of Doncaster.

For Table XV., Single-Row Horse-Hoes for Ridge and Flat, see opposite page.

Class XVI. Single-Row Grubbers.—In this class there were nineteen entries, and eighteen of these were tried. The Judges considered that these implements ought to grub-up the soil between the rows of turnips to a depth of 6 or 7 inches; this point does not seem to have been understood by most of the exhibitors, for all the implements in this class, excepting one, were horse-hoes similar to those in the previous class. These

TABLE XV.—SINGLE-ROW HORSE-HOES for RIDGE and FLAT. (CLASS XV.)

Name of Exhibitor		Ashton, W.	Gillett, J.	Corbett & Peele.	Snowden, J. D.	Vipan & Headley.	Carson & Toone.	Corbett & Peele.
Catalogue number		768	559	1383	365	779	4884	1386
Order of trial		6	17	7	25	26	28	29
Price		2*l.* 15*s.*	3*l.* 10*s.*	2*l.* 17*s.* 6*d.*	4*l.*	3*l.* 10*s.*	3*l.* 15*s.*	3*l.* 17*s.* 6*d.*
Extreme effective width ..		2′ 6″	1′ 8″	2′ 1″	1′ 8″	1′ 11″	2′ 6″	1′ 6″
Maximum number of hoes ..		3	4	3	5	5	5	4
Tillage of field		Turnips.	Turnips.	Turnips.	Turnips.	Turnips.	Turnips.	Turnips.
Number of horses		1	1	1	1	1	1	1
Number of rows hoed at one time		3	4	3	5	5	3	3
POINTS OF MERIT:—	Perfection being							
1. Mechanical construction, materials, and workmanship ..	200	120	110	170	100	170	160	170
2. Simplicity of adjustment ..	100	55	60	100	65	90	60	100
3. Suitability of hoes and shares for ridge and flat	100	60	60	100	70	90	80	100
4. Evenness of depth, cleanness of cut, and general perfection of work done on ridge	200	140	140	140	140	170	125	180
5. Ditto, ditto, on flat	200	140	140	140	140	170	125	180
6. Lightness of draught ..	100	..	..	..	..	..	..	..
7. Price	100	90	85	100	65	100	90	100
Total	1000	605	595	750	580	790	640	830

were of course constructed to grub-up the soil to a depth of only 3 or 4 inches. Corbett and Peele's horse-hoe, which was highly commended in this class, and has been already described in the previous class, was the only horse-hoe which could approach the required depth; and its success may be attributed to its powerful tine in front. The prize was awarded to a three-tined grubber, entered by Mellard's Trent Foundry.

No. 3016. *Mellard's Trent Foundry, of Rugeley.*—A strong iron beam is in front bent upwards and forwards for the reception of the guide-wheel, and has two projecting handles behind.

The stem of the guide-wheel is rectangular, fitting into a similar slot in the beam, where it may be moved up or down to suit the required depth. The grubber carries three tines; the front one is shouldered, and fastened into a slot in the beam, while the two hind tines, one on either side of the beam, are fastened by a wedge through a slot in their stems to laterally-projecting square bars of iron. These lateral bars of iron seemed to be rather weak for resisting any great strain, and would therefore not be very suitable where many boulders are met with in the soil. During the trial this implement made good work. Its price is 3*l.* 5*s.*

No. 1388. *Corbett and Peele, of Shrewsbury.*—This implement is similar to No. 1386, already described in the previous class. It made fair work. Its price is 3*l.* 12*s.* 6*d.*

Prize of 5*l.* to Mellard's Trent Foundry (3016), of Rugeley.
Highly Commended.—Corbett and Peele (1388), of Shrewsbury.

TABLE XVI.—SINGLE-ROW GRUBBERS. (CLASS XVI.)

Name of Exhibitor		Mellard's Foundry.	Corbett & Peele.
Catalogue number		3016	1388
Order of trial		6	12
Price		3*l.* 5*s.*	3*l.* 12*s.* 6*d.*
Extreme effective width		2′ 6″	2′ 0″
Maximum number of hoes		3	4
Tillage of field		Turnips.	Turnips.
Number of horses		2	2
Number of rows hoed at one time		3	3
POINTS OF MERIT :—	Perfection being		
1. Mechanical construction, materials and workmanship	150	150	130
2. Simplicity	100	100	90
3. Suitability and quality of tines	100	100	90
4. Perfection of work	350	350	300
5. Lightness of draught	150	..	..
6. Price	150	150	150
Total	1000	850	760

Class XVII. Horse-Hoes for thinning Turnips.—On referring to the reports on the Plymouth trials it will be found that only one machine in this class was entered for trial there, while at Bedford there were twenty-four entries, and eleven machines were tried. This indicates that implement-makers are beginning to turn their attention to a class of implements which are likely to prove very useful to farmers growing a large acreage of turnips, hand labour being not only considerably increased in price, but sometimes also unobtainable at a time when it is specially required. The implements tried simply bunched the plants; this would of course be a direct saving of hand labour, where it is the practice first to bunch by hand-hoe, and afterwards thin-out by hand; but in the Northern counties of England, where turnips are extensively cultivated, the workpeople are expert in thinning by hand-hoe, and would find no more, if not less, difficulty in thinning an entire row than a bunched one. There the only use of such implements would be in a difficult season, when it is frequently found impossible, with the ordinary staff of workpeople, to thin the turnips at their proper stage of growth. Turnips should be thinned when they reach a height of from 3 to 4 inches, for when they exceed this and reach to 6 or 7 inches, their leaves, and frequently also their stems become entwined, thus rendering the hand-hoeing more difficult and expensive; the plants are then also more liable to injury. Had these plants been bunched by a turnip-thinning machine when 3 inches high, the plants constituting the bunches would have become separated and allowed a freer development.

Where the rows of plants are irregular, these implements would be useless, for, as was noticed in the trial, the single plants which would have completed the row, were frequently cut up.

The field originally intended for the trial had been ridged up and sown with turnips; but, owing to the continued dry weather, these were a complete failure. However, a field of swedes was obtained from Mr. Prolle of Elstowe, within a quarter of a mile of the former field. These swedes were sown on the flat, 27 inches apart. The soil was loose and the plants were irregular. Here ten implements were tried; but the trial was considered by the Judges as insufficient, especially as Messrs. Kennan's implement was constructed to thin turnips on the ridge only. Accordingly, a field of swedes on Mr. Horrel's farm at Oakley, about eight miles from the show-ground, was procured. This soil was a brashy clay loam, which had become indurated by the dry weather, and was therefore admirably adapted for testing the weak points of the implements.

The distance of the run was about 200 yards.

No. 738. *Wm. Smith, of Kettering.*—In this implement, knives are attached to the projecting arms of a wheel, which revolves on the top of the rows at an angle of about 30° to them, and may be described as a slow-screw motion. The tap roots of the plants were cut, and the motion was so regular, that many of the plants were left in their original position. The work done was fair and

Fig. 14.—*Frame and Gearing of Smith's Turnip-thinner, No.* 735.

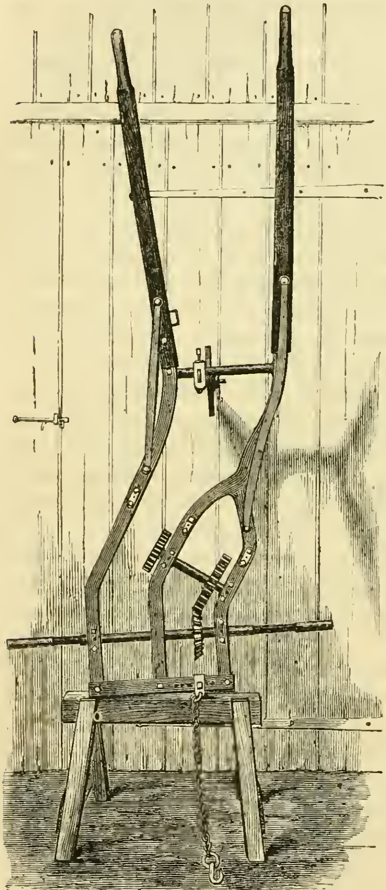
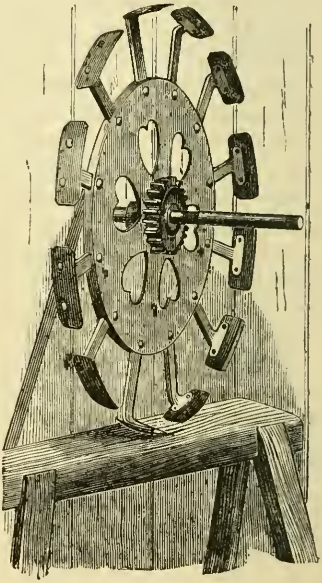


Fig. 15.—*Wheel and Blade of Smith's Turnip-thinner, No.* 735.



regular; the plants were not injured; the draught of the machine was light, and its construction simple, although it involved a mechanical error, namely, in communicating the power from the axle of the driving wheels by means of a bevel gearing, an ordinary cog-wheel is made to gear with a bevel wheel, instead of having two bevel wheels. A set of hoes of various sizes is sent out along with the implement, by means of which various widths may be obtained. The horse required to travel somewhat slowly, in order to perform the work well. The knives will also either require to be frequently sharpened or replaced, for the whole work depends on the sharpness of the knives, and it is improbable that these would remain sharp many hours when working on hard, brashy land, such as we had at Oakley. This implement was invented by Mr. Eaton of Troywell, near Thrapston, some thirty years ago. It is a double-row thinner. Its price is 8*l.* 10*s.*

No. 735. By the same maker, simply differs from the last by being a single-row thinner (see Figs. 14 and 15). The implement was more easily guided, but of course did only one-half the amount of work of the former, and seeing that the difference in price is only 2*l.*, the first is decidedly the preferable implement.

No. 734 is also a single-row thinner of similar construction, by the same maker as the last two. Price 6*l.* 10*s.*

No. 3830. *Holmes and Son, of Norwich.*—The plants were bunched by means of rectangular hoes, worked at right angles through the rows by a crank motion, in imitation of hand-hoeing. Two hoes alternately chopped out the intervening plants. The work was fair, especially on the ridge. There was a little difficulty in guiding the implement between the rows of turnips on the flat; but between those on the ridge it was easily guided, because two small wheels preceded the hoes, one running on each side of the ridge. This invention is a clever one; but the implement must be made less complicated in construction, and to do its work more regularly. The price, 12*l.*, is also higher than Smith's implement.

No. 3832. *Holmes and Son.*—The plants were thinned out by means of revolving scoops moving on the top of the rows at right angles. The implement takes two rows at one time, and may be converted into a corn hoe; cuts out the plants fairly, but throws them, as well as a good deal of soil, on to the adjoining row. It moves too much soil. Price 11*l.* 10*s.*

No. 3443. *Ransomes, Sims, and Head, of Ipswich.*—This implement bunches the plants by means of hoes placed horizontally, and working in an eccentric motion vertically. It may easily be converted into a corn hoe, but the mechanism is somewhat complicated. It made good work in the field of turnips on the flat at Elstowe, where the soil was loose; but on the hardened brashy soil at Oakley the work was unsatisfactory. Price 11*l.* 10*s.*

No. 3847. *Thomas Chambers, of Colkirk Hall, Fakenham.*—This consists of a corn hoe frame bearing two small wheels, which revolve on the top of the row at right angles, and chop out the plants by means of small spuds placed obliquely on the circumference of the wheels; chopping first before and then behind the plants to be left. By an ingenious mechanism the hoes may be reversed in turning at the head of a field, so that the implement may work regularly across the field and leave all the plants on the same side of the rows. The gearing is complicated and placed too near to the ground. It chops out the plants pretty regularly, but covers the adjoining row with soil and plants. Price 12*l.* 12*s.*

No. 689. *Thomas Hunter, of Maybole.*—In this implement the thinning is performed by means of hoes attached longitudinally to the projecting spokes of a wheel, which revolves on the top of the rows at right angles. This wheel is geared with the axle of the driving wheels by a bevel gearing. The depth may be regulated while the implement is at work. This implement cuts out the plants regularly, but throws them about, and, as in many of the others, covers up the adjoining row.

No. 3013. *Kennan and Sons, of Dublin.*—This implement consists of a wooden frame with sliders attached below, and is jolted across the ridges, thus cutting out the intervening plants. As previously stated, it is only adapted for the ridge, and was therefore only tried at Oakley, where the work was not regular, for some of the intervening plants simply had their leaves torn off; in fact, the hoes could not penetrate the hardened soil, but no doubt in a loose soil much better work would have been made. It was considered that in a damp soil the hoes would easily clog up, and during the trial some stones got wedged in between them. One advantage of the implement is that little or no soil is moved, and the form of the ridge is not destroyed.

No. 649. *J. L. Baker and Co., of Hargrave, Kimbolton.*—This is an ordinary corn hoe, and was worked across the rows.

Prize of 15*l.* to W. Smith (738), of Kettering.
Second Prize of 10*l.* to W. Smith (735), of Kettering.
Highly Commended.—W. Smith (734), of Kettering.
Commended.—Holmes and Son (3830), of Norwich.

TABLE XVII.—HORSE-HOES for thinning TURNIPS. (CLASS XVII.)

Name of Exhibitor		Holmes & Son.	Smith, W.	Smith, W.	Smith, W.
Catalogue number		3830	734	735	738
Order of trial		2	3	9	13
Price		12*l.*	6*l.* 10*s.*	6*l.* 10*s.*	8*l.* 10*s.*
Extreme effective width ..		3′ 0″	1′ 6″		
Maximum number of hoes ..		4	10		
Tillage of field		Turnips.	Turnips.	Turnips.	Turnips.
Number of horses		1	1	1	1
Number of rows hoed at one time		4	1	1	2
POINTS OF MERIT:—	Perfection being				
1. Mechanical construction, strength, soundness, and quality of materials and workmanship	250	150	240	240	240
2. Simplicity of adjustment	100	40	100	100	100
3. Ease of management	100	50	100	100	100
4. Adaptation to inequalities of surface	50	30	40	50	50
5. General perfection of work done on trial	400	150	380	400	400
6. Price	100	60	100	100	100
Total ..	1000	480	960	960	960

This class of implements must be considered as far from perfect, and it will be interesting, at the next trial of them by the Royal Agricultural Society, to notice how far these various inventions shall have been simplified and improved, so as to make neater and more regular work. All the revolving hoes moved at too great a speed, and covered the adjoining rows.

Section III.—Manure Distributors.

Class XVIII. Distributors for Liquid Manure.—There were nine entries on the list, six of which were tried. Some of these were simply water-barrels with a distributing board attached; while in the others the liquid manure was raised from a tank by cups attached to cylinders, similar to the mechanism in water drills.

The Judges considered that these distributors ought to deliver any kind of liquid manure, and even any small solid particles which might be in it; they therefore mixed ashes with water in a trough, from which the water was pumped up into the barrels; while, in the case of the latter kind of distributor, the tank was filled with water up to the central axle of the distributing cylinder, one bushel of ashes being then thrown in and mixed with it.

The barrels could not, of course, pump up all the ashes, in fact few or none of them, because they were not designed for this purpose; although had runnings of a farm-yard been used instead of water and ashes, they would doubtless have done their work well.

The cup-delivery distributors cleaned out their tanks very well, and delivered all their contents, both liquid and solid.

R. and J. Reeves and Son maintained the reputation that they gained at the Plymouth trials for this class of machine. James Coultas of Grantham was highly commended for a distributor similar in principle to Reeves's; they are both constructed on Chandler's patent. One great advantage which Reeves's implement possesses over Coultas's is that the cylinder is provided with better stirrers.

No. 1591. *R. and J. Reeves and Son, of Bratton Works, Westbury.* This machine is constructed on the same principle as the water drill already described in Class VIII. The liquid manure is delivered by means of cups, which are cast on the cylinder, and placed on each side, so that they will deliver into double hoppers. The cups empty themselves into cast-iron hoppers, the liquid manure being thus conveyed into a trough fixed on the outside of the tank. This trough has divisions inside, in order that the liquid manure may be evenly spread over the surface of the land.

The cylinder is driven by a cog-and-pinion gearing from one of the driving-wheels only; which is a disadvantage, inasmuch as the draught on one wheel is greater than that on the other. The capacity of the tank is 100 gallons, and the width of delivery 6 feet; the width between the travelling-wheels being also 6 feet, the machine, when at work returns on its own wheel-track. The ashes were thoroughly cleared out of the tank when it had emptied itself, this having been in great part effected by the stirrers which are fixed to the outer circumference of the cylinders. The price is 21*l.*

No. 2805. *James Coultas, of Grantham.*—This machine is also constructed on Chandler's patent; differing from the one last described in having the cups bolted to the cylinders instead of being cast together with them, and thus forming part of them. The cylinder is driven off both driving-wheels by a cog-and-pinion gearing, which equalizes the draught. A crank-handle may be fixed to one end of the cylinder-shaft, in order to turn it and stir up the manure before starting. The liquid manure is delivered by cups and hoppers into a trough with partitions in it. The work of this machine in the trial was fair. Its price is 20*l.*

Prize of 10*l.* to Reeves and Son (1591), of Westbury.
Highly Commended.—J. Coultas (2805), of Grantham.

TABLE XVIII.—DISTRIBUTORS for LIQUID MANURE. (CLASS XVIII.)

Name of Exhibitor		Reeves & Son.	Coultas, J.
Catalogue number		1591	2805
Order of trial		1	8
Price		21*l.*	20*l.*
Extreme effective width		6′ 0″	6′ 0″
Size of manure-box		4′ 9″ × 2′ 8″ × 2′ 6″	
Capacity of manure-box			
POINTS OF MERIT :—	Perfection being		
1. Soundness and quality of materials and workmanship, and durability	200	200	200
2. Balance and construction of carriage	150	150	150
3. Facilities for filling	100	90	80
4. Adjustment and evenness of distribution, and general efficiency on trial	450	420	400
5. Price	100	100	100
Total	1000	960	930

Class XIX. Distributors for Dry Manure.—In this class there were ten entries, eight of which were presented and tried.

They were, first of all, each supplied with one bushel of fine ashes, and run along the grass on the side of the field in order to notice evenness of delivery; first sowing the smallest possible quantity and increasing to the largest possible quantity. After this first trial three machines were selected,—T. Chambers's, J. Coultas's, and Reeves and Son's, and these were again tried, each being supplied with one bushel of superphosphate. The only really good distributors were constructed according to T. Chambers's patent, and consisted of a revolving notched barrel, with sloping laterally working stirrers. The first-prize distributor was entered by T. Chambers, the inventor of the above barrel; while James Coultas came in second, the barrel and stirrers being constructed on the same principle as Chambers's.

The difficulty of distributing all kinds of superphosphates, whether damp or dry, has not yet been overcome by implement-makers. There is therefore no class of implements in which a greater improvement might be effected. When even the driest superphosphate is subjected to a rubbing action, it at once becomes pasty, which is therefore the great drawback in Reeves and Son's distributor, where the manure is delivered from a false bottom by a revolving barrel working in the manure-box; this barrel being composed of a number of sections, with projecting blades. When the superphosphate is dry, Chambers's barrel delivers it very well, because the revolving notched barrel is placed at the bottom of the manure-box, and the superphosphate lying loosely on the barrel, is carried over by the small projections. The stirrers do not rub the manure, because they are placed against the side of the manure-box, near its opening.

No. 3845. *Thomas Chambers, of Colkirk Hall, Fakenham.*—This distributor, as has already been mentioned, was invented by the exhibitor, and was first exhibited at the Lincoln Meeting in 1854. The manure-box is made with wood sides and cast-metal ends, and it is levelled on uneven ground by a crank-handle behind, communicating by a horizontal shaft with a bevel gearing and screw in front.

A cylindrical barrel, having a number of small projections on its circumference, placed at the bottom of the manure-box, carries over the manure, and delivers it into a partitioned wooden hopper. A number of small steel spring scrapers, placed side by side against the barrel, clean every part of it at each revolution.

The stirrers are placed against the front inclined side of the manure-box, near its opening, a lateral motion being given to them. The width of delivery is 7 feet, while the price of the machine is 20*l.* 15*s.*—somewhat high. It made good work.

No. 2804. *James Coultas, of Grantham.*—This distributor is of similar construction to the one last-described. The manure-barrel is geared off both driving-wheels, which arrangement equalizes the pressure upon the horse's shoulder. Another improvement is that the box is cleaned out by a door at the bottom in front, while the gearing is capped and well protected from all dust and dirt. Its extreme effective width is 6 ft. 6 in., and its price 16*l.* The work of this distributor was also good.

No. 1592. *Reeves and Son, of Bratton, Westbury.*—The manure-barrel is made of cast-iron sections, fixed upon a wrought-iron spindle. The sections have blades on them, which are set so as to form a right and left-hand screw. The barrel is divided in the centre, and is geared with both driving-wheels, so as to equalize the draught.

The bottom of the manure-box has holes in it, the quantity being regulated by a slide below; the revolving barrel forces the manure through these openings, delivering it on to a partitioned wooden trough. The cog-wheels on either side may be raised by a lever-handle, and thus thrown out of gear; and in finishing a field, one-half of the barrel may be worked by itself. The width of delivery is 6 ft. 6 in., and the price 12*l.* 10*s.* The work with the ashes was good.

Prize of 5*l.* to T. Chambers (3845), of Fakenham.
Highly Commended.—J. Coultas (2804), of Grantham.
Commended.—Reeves and Son (1592), of Bratton, Westbury.

TABLE XIX.—DISTRIBUTORS for DRY MANURE. (CLASS XIX.)

Name of Exhibitor		Coultas, J.	Reeves & Son.	Chambers.
Catalogue number		2804	1593	3845
Order of trial		5	8	3
Price		16*l.*	12*l.* 10*s.*	20*l.* 15*s.*
Extreme effective width		6′ 6″	6′ 6″	7′ 0″
Size and capacity of manure-box		Not given	Not given	Not given.
Weight		..	6 cwt.	
POINTS OF MERIT:—	Perfection being			
1. Mechanical construction, soundness and quality of materials and workmanship	200	200	170	200
2. Simplicity and lightness of draught	100	100	100	100
3. Size, shape, and general arrangement of manure-box	100	100	100	100
4. Facilities for regulating quantity of manure delivered	100	100	80	100
5. Regularity of distribution and general perfection of work done on trial	400	350	300	400
6. Price	100	85	100	80
Total	1000	935	850	980

INTRODUCTION TO SECTIONS IV. AND V.

The trials of waggons and carts have this year been invested with more than ordinary interest; for instead of, as at Manchester, loading the carts and waggons with pig-iron and testing them with the plough dynamometer along a straight macadamised road, they were this year loaded with roots, bags of maize, and straw, while the draught was tested by Messrs. Easton and Anderson's new horse dynamometer. The course was 200 yards along the turnpike-road, and then 200 yards through an oat-field. On the hard road there is a rising gradient of 1 in 430, while in the field there is a rising gradient of 1 in 1000. The road might be considered a fair average of what is met with in practice: it was mainly made up of gravel, and although it was very dry during the entire trial, still it was somewhat soft, and offered a good deal more resistance than would be met with on a road made up of broken metal.

The field course was through a field of oats. The ground was very dry, but soft; and represented a fair average of stubble-fields in a dry autumn, but hardly an average for wet and dry all the year round.

The waggons and carts were each attached to the horse dynamometer, which was drawn by horses over the course; and to enable the reader to understand how the draughts were registered, a short description of the instrument is now given.

In the horse dynamometer (Figs. 16 and 17, pp. 680 and 681) we have almost a complete imitation of an ordinary draught-horse; the saddle-chain being passed over an imitation wrought-iron saddle, P, and the vehicle drawn by draught-chains, F, attached on each side to a draught-plate, E, in imitation of the horse's collar at the point of the shoulder.

This swivelling draught-plate E is loosely jointed to the spindle of the instrument by a pin passing through both, and beneath the plate are castors, G, G, which run on a bed-plate.

The spindle is coupled in front to a spring, A, formed of two untempered cast-steel plates connected at their ends, the front plate being connected with the frame of the instrument. The spindle is guided in front by a bracket, G, and behind by an oil cylinder, D, filled with oil, the flow of which from end to end is regulated by a screw plug fitted to the communicating passage. The lever H has its fulcrum on the bed-plate, oscillating freely on this point. At its first third it passes through a slot in the spindle, to which it is jointed by links and pins; at its upper end it is connected to a counter bar, which bears the integrating disc K, thus any movement on the spindle is multiplied three times on the counter bar. The counter bar is attached at its front end to a moving index, M; at its outer end it will also carry a suitable arm having a metallic pencil at its end, which will describe the variations of draught on a sheet of metallic paper wound round the cylinder N, which is set in motion at will at a speed proportional to the distance travelled. A large disc, L, is connected with the hind wheels of the instrument by a bevel gearing, and is thus driven at one revolution for every yard run. By a spring this large disc is kept in continual contact with a small integrating disc, K, placed at right angles to the former and attached to the movable counter bar. It is evident,

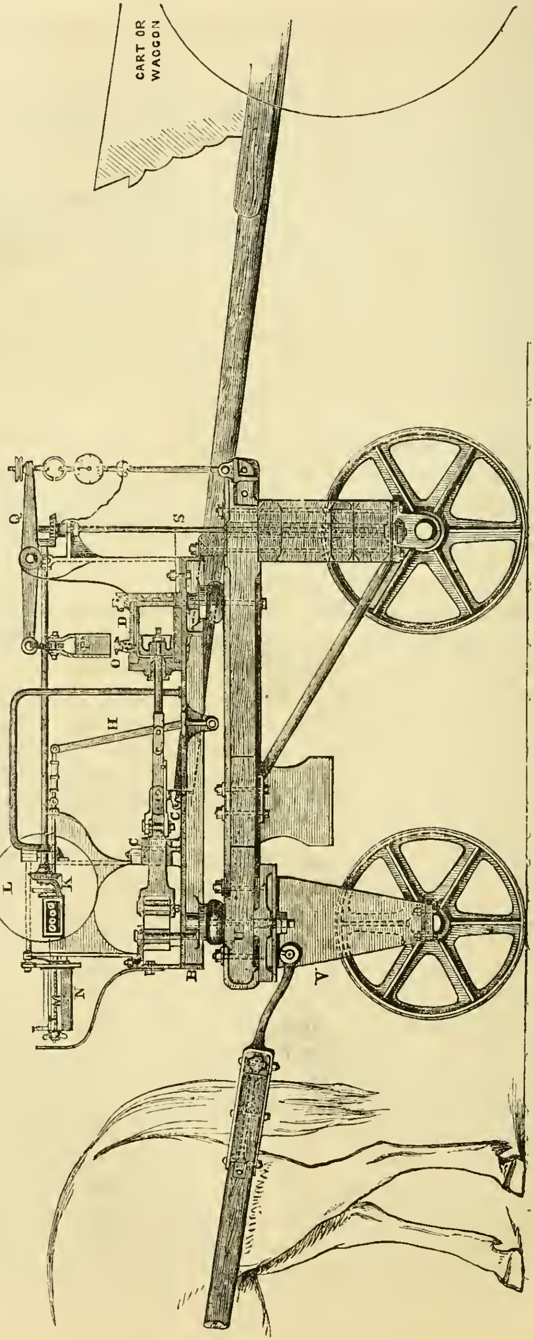


Fig. 16.—*Longitudinal Section of Messrs. Easton and Anderson's New Horse Dynamometer.*

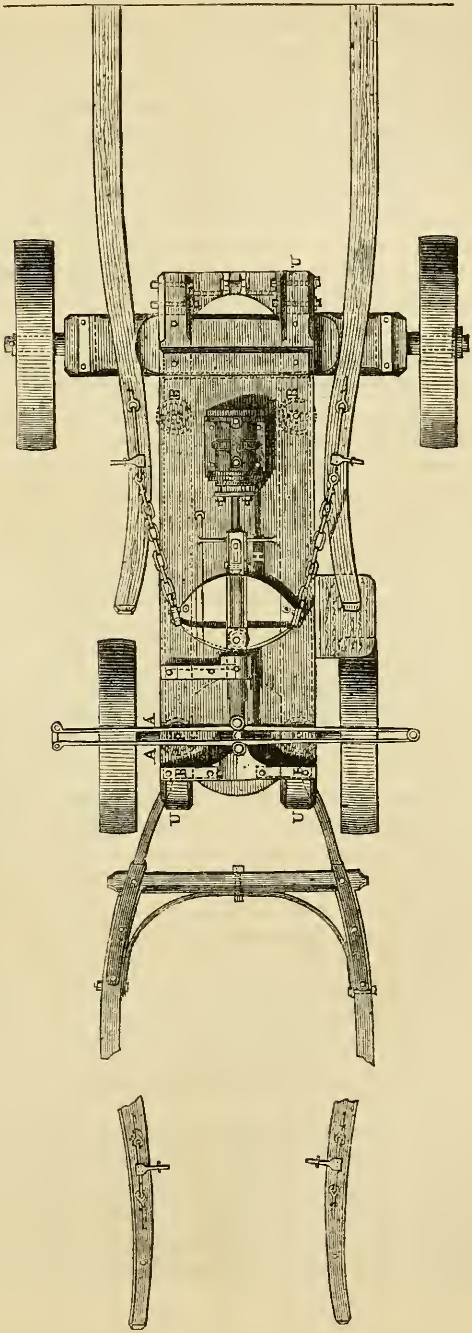


Fig. 17.—*Plan of Messrs. Easton and Anderson's New Horse Dynamometer.*

that if the small disc makes one revolution when it is 1 inch from the centre of the large one, it will make two revolutions if it be 2 inches removed. This small disc communicates with a mechanism by means of which the mean draught is indicated.

The saddle-chain is hung over the saddle-plate P, and attached to the ordinary shaft hooks on either side. The saddle-plate is hung from one end of an equal-armed lever, Q, to the other end of which is attached a spring balance, R, the movements of the indicator being noted by an assistant who walks alongside.

The weight thrown upon the draught-plate by the vertical component of the pull is received by the castors, and duly taken into account.

No transverse components of angular pulls, whether in a horizontal or vertical direction, are communicated to the spindle, for the draught-plate E, with its joints and castors, will transmit the direct horizontal components only.

The instrument is supplied with three pairs of springs, suited for maximum loads of 500, 1000, and 2000 lbs. respectively.

The following explanations may be considered in connection with the first column in the Tables showing the results of the trials (pp. 700, 701). The waggons were weighed on two weighing-machines, placed near each other, so that first the pair of fore wheels and then the hind pair were weighed. These weights are recorded in lines 4 and 5 and their sum in line 6. The waggons were then loaded and again weighed as before; this we find in lines 7, 8, and 9, while the weights of useful load are given in line 10. The maximum load per inch-width of tyre is given in line 13. The gauge width of wheel-centres on the ground in line 18 is the distance between the centres of the two fore wheels, or of the two hind wheels. The wheel base, given in line 19, is the horizontal distance between the centres of the fore and hind wheels on either side of the waggon. Each waggon and cart was attached to the horse dynamometer as already described, and drawn along the macadamised road for 200 yards. The mean draughts in pounds there registered are recorded in line 23. The mean draught per ton gross load in line 24 is calculated by dividing the pounds draught in line 23 by the weight in tons line 9; while the mean draught per ton of useful load in line 25 is calculated in a similar manner from the tons of useful load found in line 10.

The mean draught in pounds registered when passing over the field course and reduced to a level road, will be found in line 23, while the figures in lines 28 and 29 are obtained as already described in the case of the macadamised road.

The draught of any carriage is made up of friction at the axle and resistance on the road. When the axles are well lubricated, the former is only a small proportion of the total draught—about one-twentieth,—while the remaining nineteen-twentieths represent resistance on the road.

No experiments were made to test friction at the axle, and as this is only a trifling proportion, the actual results in the trials show nearly how far the resistance on the road was influenced by the diameter of the wheels, the form of the wheels, the width of tyres, form of tyres, and steadiness of load by the use of springs and from other causes.

In order to see the effect of diameter of wheels, Hayes and Son's cart, No. 1445, in Class XXVII., may be compared with their waggon, No. 1431, in Class XX.

Number.	Name of Exhibitor.	Total Weight on Fore Wheels.	Total Weight on Hind Wheels.	Width of Tyre.	Inclination to Vertical.		Diameter of Wheels.		Mean Draught in lbs. on Level Road.
					Front Wheels.	Hind Wheels.	Front.	Hind.	
			Cwt.	"	°	°	′ ″	′	
1445 Cart	Hayes & Son	Cart	45·0·14	$4\frac{1}{2}$	..	$3\frac{1}{2}$	..	5·0	86·
1431 Waggon	Ditto ..	33·0·19	37·2·17	3	$5\frac{3}{4}$	$4\frac{3}{4}$	3·5	5·0	177·6

As the hind wheels of the waggon are 5 feet in diameter, and therefore the same as the cart wheels, it may be assumed that the proportional force required to move the weight resting on the hind wheels of the waggon, will be nearly the same as that required to move the total weight resting upon the wheels of the cart. The width of tyre in the waggon is less by $1\frac{1}{2}$ inch than in the case of the cart; and in order that this may be less taken into account, we shall only consider the mean draught on the macadamised road, where, as will be seen afterwards, the width of tyre had much less effect in altering the draughts than on the field course. It will also be noticed that the inclination of the wheels is greater in the waggon than in the cart, which will have some effect, although not very much, in increasing the draught of the waggon.

By a short calculation we shall find that, in order to pull the cart, a force of one pound is exerted for every 58·76 lbs. resting upon the wheels, and by dividing the total weight resting upon the hind wheels of the waggon by 58·76 we find that 71·7 lbs. of the mean draught is absorbed in moving the latter weight; we have therefore remaining 105·9 lbs, which is the mean draught expended in moving the weight on the fore wheels of the waggon. Thus we see that 1 lb. of draught is expended in moving every 35·1 lbs. of weight resting on the fore wheels of

3 feet 5 inches diameter, as compared with 58·7 lbs on the hind wheels of 5 feet diameter, which difference is 40 per cent. This sufficiently proves that the diameter of the wheels has much influence upon the draught of any cart or waggon.

Now, by referring to the following Table, it will be seen what effect *inclination of wheels* has on the draught. Here Nos. 4875, 1431, 1306, and 1567 in Class XX. are compared—

	4875.	1431.	1306.	1567.
Inclination of Front wheels	$1\frac{1}{2}^\circ$	$5\frac{3}{4}^\circ$	$4\frac{1}{4}^\circ$	4°
Ditto Hind wheels	2°	$4\frac{3}{4}^\circ$	$3\frac{3}{4}^\circ$	4°
Mean Draught per Ton gross load on macadamised road	43·8	50·2	49·4	50·5
Ditto per Ton gross load on Field course	205·	224·	229·6	189·1
Width of tyre	$2\frac{1}{2}''$	$3''$	$2\frac{3}{4}''$	$4''$

In looking at the inclination of the wheels it will be observed, in the trial upon the road, that where the angle of inclination is smallest, there is the lowest mean draught; and it will be as well to compare simply the draught on the road, because it was found that on the field course the draught was greatly influenced by other causes, such as, for instance, the broader tyre in No. 1567. Of course these results must only be compared in a general way, for there are so many even unnoticed causes by which the draught of any waggon is influenced.

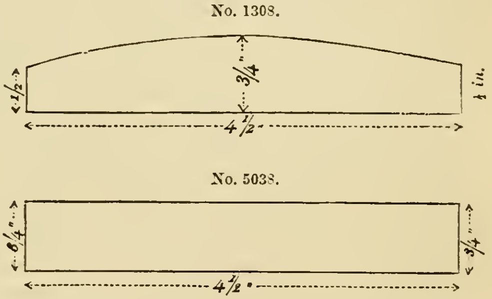
In order to notice the effect of *width of tyre*, I may again refer to the last Table and there compare No. 4875, T. Milford and Son, with No. 1567, W. Glover and Sons. The width of tyre in the former is $2\frac{1}{2}$ inches, and in the latter 4 inches, and, owing to the smaller degree of inclination in the wheels of No. 4875, the draught on the road is considerably less in this one than in No. 1567; but it must also be noticed that although the wider tyre in Glover's waggon no doubt has a certain effect in reducing the draught on the road, especially if the road is in any way soft or damp, still this is here less noticeable than on the arable land, where the figures are reversed, Milford's waggon having a draught of 205 lbs. and Glover's one of only 189 lbs. This difference must be entirely due to the greater width of tyre, which to some extent keeps the wheels from sinking in the soft ground, and thereby reduces the draught.

The next point to be noticed is the effect of *form of tyre*, and this will be best seen by comparing W. Ball and Son's waggon, No. 1308, with F. P. Milford's, No. 5038, both in Class XXII.

Number.	Name of Exhibitor.	Weight Loaded on Front Wheels.	Ditto Hind Wheels.	Inclination to vertical of Fore Wheels.	Ditto Hind Wheels.	Mean Draught per Ton Gross Load on Road.	Ditto on Field.	Diameter of Front Wheels.	Diameter of Hind Wheels.	Width and thickness of Tyres.
		Cwt.	Cwt.	°	°			′ ″	′ ″	
1308	W. Ball & Son	43·1·22	58·1·8	$3\frac{1}{4}$	$3\frac{1}{2}$	26·8	188·	3·5	4·10$\frac{1}{2}$	4$\frac{1}{2}$″ × $\frac{3}{4}$″ to $\frac{1}{2}$″
5038	F. P. Milford	47·2·13	55·2·9	3	$3\frac{1}{2}$	19·9	187·6	3·4	5· 1$\frac{1}{2}$	4$\frac{1}{2}$″ × $\frac{3}{4}$″

Here in No. 1308 we have a greater proportion of the total weight resting upon the hind wheels, which however are of smaller diameter than in No. 5038; therefore it may be assumed that these differences would nearly balance each other. The difference in the angle of inclination of the front wheels is trifling, being $\frac{1}{4}°$ in favour of No. 5038, while those of the hind wheels are equal; this difference may therefore be left out of account in the present comparison.

Figs. 18 and 19.—*Sections of Tyres.*



In No. 1308 the form of the tyre is convex, while in No. 5038 it is flat.

If we now look at the mean draught per ton of gross load on the road, we shall find that No. 1308 exceeds No. 5038 by 6·9 lbs.; but on the arable land we find that their difference is only ·4 lb. The reason for this must be the difference in the form of the tyre, for No. 1308 has convex tyres, while No. 5038 has flat tyres, the former causing the wheel to move along in a much truer line, and thus preventing jarring at the edges of the wheel. On the hard road we should find that flat tyres were preferable; and they would also be so on arable land, but there is great difficulty in making wheels with square tyres to run in exactly true line and level; of course if they do not there will be jarring, while convex tyres, even if not so exactly made, will still enable the wheel to run in a true line.

This brings us to the next point, namely, *the effect of springs in reducing draughts*, and to illustrate this point, we cannot do better than compare W. Ball and Son's waggon without springs, No. 1306, in Class XX., with their waggon on springs, No. 1307, in Class XXI., as they were both tested with the same weight of roots.

Number.	Name of Exhibitor.	Weight Loaded on Fore Wheels.	Weight Loaded on Hind Wheels.	Useful Load.	Width of Tyres.	Diameter of Fore Wheels.	Ditto of Hind Wheels.	Inclination of Fore Wheels.	Ditto Hind Wheels.	Mean Draught per Ton Gross Load on Road.	Ditto on Field.
		Cwt.	Cwt.	Cwt.	"	′ "	′ "	°	°		
1306	W. Ball & Son	24·2·25	40·3·18	45	$2\frac{3}{4}$	3·5	4·$10\frac{1}{2}$	$4\frac{1}{4}$	$3\frac{3}{4}$	49·4	229·6
1307	,,	23·3·16	41·2·24	45	$2\frac{1}{2}$	3·3	4· $9\frac{1}{2}$	$3\frac{1}{4}$	$2\frac{1}{4}$	33·2	211·
1432	Hayes & Son	31·3·22	36·0· 4	45	$2\frac{3}{4}$	3·5	4·11	2	$2\frac{1}{4}$	46·2	214·

A larger proportion of the total weight rests on the hind wheels of the latter, which are, however, of less diameter; therefore these two points would nearly counterbalance themselves. The angle of inclination of the wheels is less in No. 1307, which will have some effect in reducing the draught; but we find, in looking at the respective mean draught per ton of gross load on the road, that there is a difference of 16·2 lbs. in favour of the waggon with springs; and if we assumed an allowance of 5 or 6 lbs. for difference of draught caused by the smaller inclination of the wheels of No. 1307, we should still have 10 lbs. of draught in favour of springs: this difference is also noticeable in the mean draught per ton of gross load on arable land, although in a much less degree. The reason of this is that, when a load is supported on springs, the continual shocks caused by resistances on the road are received by the springs instead of being communicated to the whole load, thus enabling the load to be moved along more steadily. This would lead to the inference that the more elastic the springs, the less will be the draught, and we shall see this very well illustrated in the comparison of Hayes and Son's waggon on springs No. 1432, with W. Ball and Son's No. 1307, in the preceding Table.

The deflections of the springs, when the waggons were each loaded with 45 cwts. roots, are given in the first Table on p. 687.

Thus we see that the deflection in the front springs is about equal, while on the hind springs there is a difference of $2\frac{7}{8}$ inches, Hayes's springs showing the least amount of deflection. The proportion of the total weight resting on the hind springs was however less in No. 1432 than in the other

	Ball & Son, 1307.		Hayes & Son, 1432.	
	Front Springs.	Back.	Front Springs.	Back.
Opening of springs without load	$3\frac{5}{8}''$	$5\frac{5}{8}''$	$2\frac{11}{16}''$	$4\frac{13}{16}''$
Ditto with load	$2\frac{3}{8}$	$2\frac{5}{16}$	$1\frac{3}{8}$	$4\frac{3}{8}$
Ditto limit	$1\frac{1}{4}$	$3\frac{5}{16}$	$1\frac{5}{16}$	$\frac{7}{16}$

waggon. Considering that on the front springs of No. 1307 there was 8 cwt. less weight, with an almost equal amount of deflection, and looking at the large amount of deflection in the hind springs of No. 1432, we come to the conclusion that the springs in No. 1307 were much more flexible than in the other waggon. In No. 1307 the hind wheels are of smaller diameter than in No. 1432, and this will to some extent reduce the counter advantage of a greater load on the hind wheels. The inclination of the front wheels is $1\frac{1}{4}°$ in favour of No. 1432. The mean draught per ton of gross load in No. 1307 is smaller by 13 lbs. on the road, and 3 lbs. on the arable land, than in No. 1432, which difference is apparently caused by the more flexible springs in Ball and Son's waggon.

It may now be possible to account for the many apparently conflicting results in the mean draughts, as these differences can only have been caused by better construction and workmanship in the case of one waggon or cart than of the other, so that the load is moved along more steadily and is less affected by the resistances on the road. We may, for instance, compare T. Milford and Son's waggon No. 4876 with W. Ball and Son's No. 1308, both in Class XXII.

Number.	Name of Exhibitor.	Load on Fore Wheels.	Ditto on Hind Wheels.	Width of Tyre.	Diameter of Fore Wheels.	Diameter of Hind Wheels.	Inclination of Fore Wheels.	Ditto Hind Wheels.	Mean Draught per Ton Gross Load on Road.	Ditto on Field.
		Cwt.	Cwt.							
4876	T. Milford & Son	46·3·16	52·3·16	4″	3′·4″	4′· 9″	2°	$2\frac{1}{4}$°	53·	206·
1308	W. Ball & Son ..	43·1·22	58·1· 8	$4\frac{1}{2}$	3·5	4·$10\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{2}$	26·8	188·

Milford's waggon has a smaller proportion of weight on the hind wheels, which are also smaller in diameter than in Ball and

Class.	Number.	Name of Exhibitor.	On Road. Mean Draught reduced to Level Road.	On Road. Ditto per Ton Gross Load.	On Road. Ditto per Ton Useful Load.	On Road. Rate in Miles per Hour.	On Road. Load on Back.	On the Field of Oats. Mean Draught reduced to Level Road.	On the Field of Oats. Ditto per Ton Gross Load.	On the Field of Oats. Ditto per Ton Useful Load.	On the Field of Oats. Rate in Miles per Hour.	On the Field of Oats. Loads on Horse's Back.
			WAGGONS.									
XX.	4875	T. Milford & Son	135·31	43·8	60·1	2·56	..	633·	205·	281·	2·29	
,,	1306	W. Ball & Son	162·2	49·4	72·1	2·58	..	753·	229·6	334·7	2·52	
,,	1567	W. Glover & Sons	162·	50·5	72·	2·81	..	607·	189·1	270·	2·19	
		Totals	459·51·	143·7	204·2	7·95	..	1993·	623·7	885·7	7·00	
		Averages	153·	47·9	68·1	2·65	..	664·3	207·9	295·2	2·33	
			CARTS.									
XXIII.	4877	T. Milford & Son	43·3	30·	43·3	2·62	40·	209·	144·	209·	2·68	50·
,,	1309	W. Ball and Son	48·7	30·7	48·7	2·62	85·	203·	128·	203·	2·86	60·
,,	1568	W. Glover & Sons	62·3	41·5	62·3	2·6	50·	191·	127·	191·	2·56	30·
		Totals	151·3	102·2	154·3	7·84	17·5	603·	395·	603·	8·10	140·
		Averages	51·4	34·1	51·4	2·61	58·3	201·	132·	201·	2·70	46·6

Son's waggon, but the inclination of the wheel is $1\frac{1}{4}°$ in favour of the former. Certainly, if we balance the points, Ball's waggon has an advantage in its favour, but the great differences in the mean draughts could not be ascribed to the above causes, for on the hard road the mean draught per ton of gross load in Milford's waggon was 53 lbs., while in Ball's it was only 26·8, or just about one-half. On the field the difference was not so striking, although it was also considerable, being 18 lbs. in favour of Ball and Son's waggon; this large difference can only be ascribed to better construction and workmanship in the one case than in the other.

Not the least point of interest in these trials is a comparison between the draughts of waggons and carts, for by the use of the horse dynamometer the whole conditions of draught in the case of an actual horse are obtained, and then not only is the draught at the shoulders registered, but also the weight on the horse's back. We shall compare pair-horse waggons in Class XX. with single-horse carts in Class XXIII.,—the former being loaded with 45 cwt. and the latter with 20 cwt. of roots.

In the foregoing Table (p. 688) the average mean draught per ton of useful load of the three waggons when travelling along the road is 68·1 lbs. as compared with 51·4 lbs. in the carts, the difference in favour of the carts being 16·7 lbs., or 24·5 per cent. On the arable land the waggons have a mean draught per ton of useful load of 295·2 lbs. as compared with 201 lbs. in the carts, thus showing a still larger difference of 94·2 lbs., or 31·9 per cent. If we take the average of these percentages, assuming that the travelling on road and on the fields are equal, we have an actual loss of horse-power in transport, amounting to 28·2 per cent., on a farm where waggons are used instead of carts.

Section IV.—Waggons.

Class XX. Pair-Horse Waggons.—In this class there were nine entries on the list, and six of these were presented for trial; but Hayes and Son's waggon was disqualified, because it should have been entered in Class XXII.

The waggons were weighed empty, and then loaded with 45 cwt. mangolds and drawn over the course as already described. On the whole this was a good class, with excellent workmanship, and the honours were somewhat closely contested.

No. 4875. *Thos. Milford and Son, of Thorverton, Cullompton, Devonshire.*—The bed framing of the body is of oak, the side bars being 4 in. × 4 in., and middle bars $2\frac{1}{2}$ in. × 4 in. The floor is made of 1-inch elm boards, and the sides are formed of $1\frac{1}{2}$-inch solid elm planks. The shelvings over the wheels are 11 in. wide × $1\frac{1}{4}$ in. thick. The tailboard is fastened up by a spring at each end. The fore and hind harvest ladders are slightly concave, and are hooked on to eye-bolts, which pass through the side planks. The dimensions of the body are 9 ft. 9 in. × 3 ft. $11\frac{1}{2}$ in. × 1 ft. $2\frac{3}{4}$ in., and its capacity is 47·04 cubic feet, while the area over ladders for harvest purposes is 95 square feet, being 15 ft. 10 in. long × 6 ft. broad; thus a large amount of sheaf corn may be packed on, forming a secure load.

The carriage bolsters are of ash, and are blocked up by four blocks of wood, instead of having continuous pieces of ash from side to side, as in Ball's waggon; the latter is certainly preferable, for it must render the whole load more steady, and is also stronger.

The iron axles, $2\frac{3}{8}$-in. × 2-in., are continuous from side to side, and bolted to the axle-bed by four clips and 2 bolts.

The diameter of the front wheels is 3 ft. 4 in., with $1\frac{1}{2}°$ of inclination to the vertical, and 10 spokes; that of the hind wheels 4 ft. 9 in., with 2° of inclination, and 12 spokes: thus these were more cylindrical than the wheels of any other waggon on trial. The oak spokes are mortised into the elm nave, with a round shoulder, and in two sets (see Fig. 21), the alternate spokes being 1 inch apart laterally. The spokes are square-shouldered into the felloes and fastened from the circumference by a wedge driven into the centre of the spoke (see Figs. 20 and 21). By having the alternate spoke insertions a little apart the

Figs. 20 and 21.—*Sections of Wheel of Messrs. T. Milford and Son's Waggon, No.* 4875.

Fig. 20.—Lateral Section.

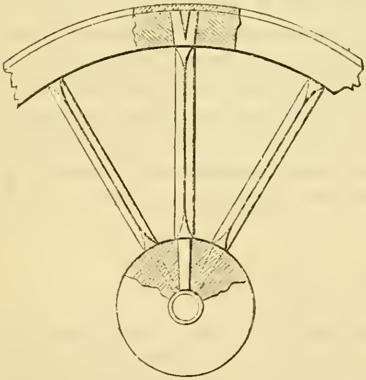
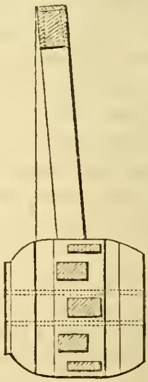


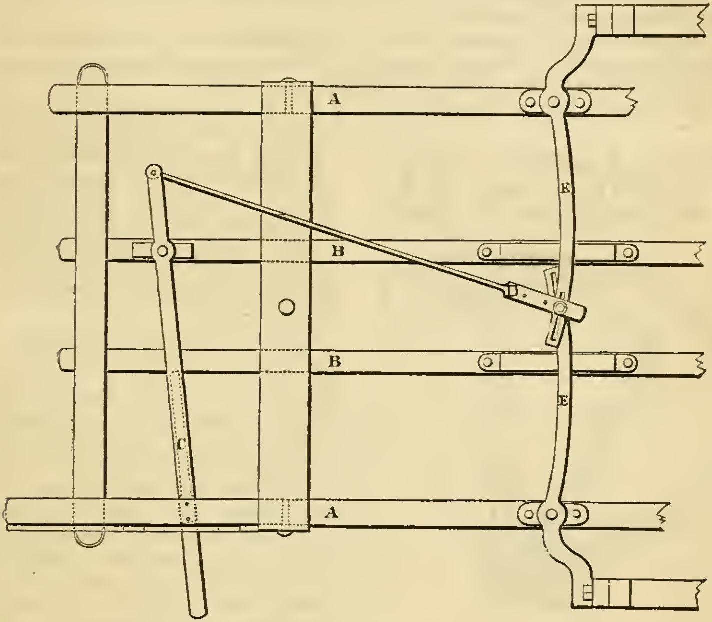
Fig. 21.—Cross Section.



nave is less weakened, because less is cut out in one direct circle round the nave, and the wheel is thus also well braced. Tyre, $2\frac{1}{2}$ in. broad and $\frac{5}{8}$ in. thick. The gauge width of the wheel centres on the ground is 4 ft. $11\frac{1}{2}$ in., and the wheel base, that is to say, the horizontal distance of the centre of the fore from that of hind wheel, is 5 ft. 4 in., which latter was less than in any other waggon on trial.

A simple but powerful break, under easy control of the driver, is placed in front on the near side of the waggon. It is a compound lever break (see Fig. 22). The lever-handle c has its fulcrum on the far middle bar of the frame, its near handle end working in a notched rack for fastening the break. A draught bar, D, is connected at its fore end with the end of the lever C, and at its hind end with the lever break-irons E. These have their fulcrum on the side bars A, and may be tightened as they become worn by moving forward the point of attachment on the draught bar D.

Fig. 22.—*Plan of Break attached to Messrs. T. Milford and Son's Waggon, No.* 4875.



The front wheels turn on two plates of iron with a pin passing through these as well as the bolsters. The wheels are checked by coming against an iron plate fastened to the side of the hind carriage-pole: this is not a good arrangement, as the wheels must eventually damage the pole by frequently coming against it.

There is only an attachment for one horse, so that a second horse would require to be attached by trace chains: this is a disadvantage, for the nearer a horse is attached to his load the easier it is drawn, because when attached to the inclined shafts he is not only pulling forward, but also lifting the small fore wheels of the waggon over the obstacles of resistance. Also when the trace horse is pulling at a more horizontal angle than the shaft horse, it is naturally throwing an extra weight upon the back of the shaft horse.

The waggon is light, weighing only 16 cwt. 3 qrs. 9 lbs., and the load is well placed, nearly two-thirds of it resting on the larger hind wheels. Its mean draught on the hard road was the lowest in its class, but on the field course it was excelled by Glover's waggon, owing to the wider tyre in the latter. Although this waggon was not so well finished as some others in its class, still it is low in price, 29*l*., and possesses other advantages.

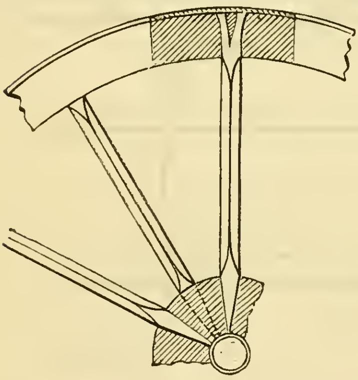
No. 1306. *W. Ball and Son, of Rothwell, Northampton.*—The body framing is of oak, and the sides are made of $1\frac{1}{2}$-inch pitch-pine, these being fastened to the side bars of the frame by three iron stay rods, and a middle and hind bracket stay, these latter also supporting the shelvings over wheels. The dimensions of the body are 11 ft. × 4 ft. 1 in. × 1 ft. $5\frac{1}{2}$ in., and its capacity is 63·1 cubic feet, while its area over the ladders for harvest purposes is 95 square feet.

The carriage bolsters are blocked up to the proper height by packing bolsters, which are continuous from side to side, instead of sets of blocks at each side, as in the waggon last described.

The axles are $2\frac{1}{2}$ inches square at the shoulders, and are flattened out towards the middle. They are fastened to a 6-inch square axle-bed by straps with bolts at the sides, which keep the timber together.

The diameter of the front wheels is 3 ft. 5 in., with $4\frac{1}{4}°$ inclination and 10 spokes; that of the hind wheels 4 ft. $10\frac{1}{2}$ in., with $3\frac{3}{4}°$ inclination, and 12 spokes. The tyres are $2\frac{3}{4}$ in. broad × $\frac{3}{4}$ in. thick. The spokes are mortised into the felloes, with a square tongue leaving a shoulder behind, and tightly wedged from the outer circumference of the felloes (see Fig. 23).

Fig. 23.—*Longitudinal Section of part of Wheel of Messrs. W. Ball and Son's Waggon, No.* 1306.



The fore wheels turn with a pin and two iron plates, being checked by a chain, one end of which is attached to the middle bar of the frame, the other end running loosely with a ring on an iron rod, which is fastened to the slide frame.

The break is applied from behind by a screw, thus differing from T. Milford and Son's, which latter has a simple hand lever instead. In Fig. 24, A is the screw, B the draught-bar, C the lever break irons, and D the wheels. It is effectual and rapidly applied; its only disadvantage being that the man requires to leave his horses when applying it, whereas in Milford's break the lever handle is close to the driver in front.

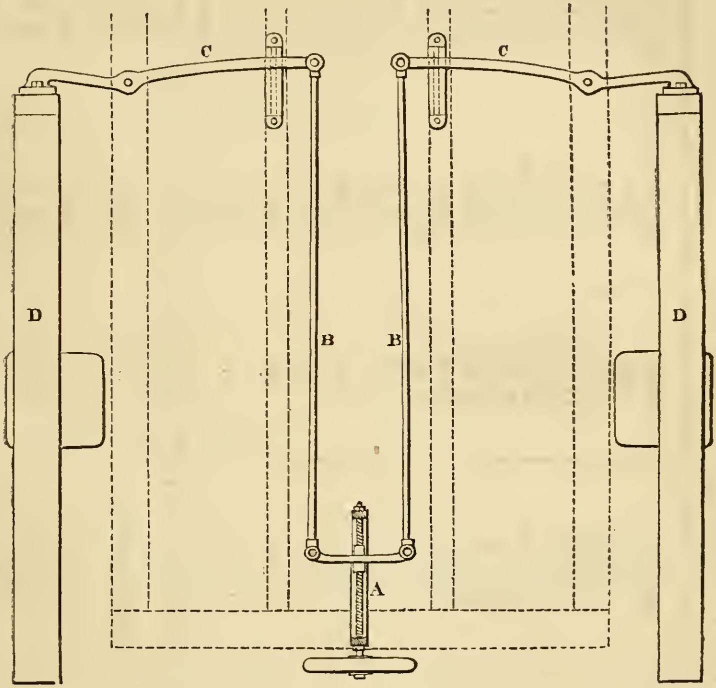
The weight of this waggon is 20 cwt. 3 qrs. 10 lbs., and the load is well placed, more than two-thirds of it resting on the hind wheels. Its mean draught in the field was the highest in this class, but the workmanship and materials of the waggon are very good, and it is well worth the money, the price being only 34*l.* complete.

No. 1567. *W. Glover and Sons, of Warwick.*—The body framing of this waggon is of oak. The sides are formed of $\frac{3}{4}$-inch pine deals, stayed with upright oak stays, and one longitudinal stay on each side. This was not considered so strong as solid elm plank or $1\frac{1}{2}$-inch pitch-pine planks. The floating boards over the wheels are supported on each side by two iron main stays and three smaller ones. The floor of the waggon is made of 1-inch red deals.

The hind carriage bolster is stayed forward on each side to the side bars of the frame by short chains.

The dimensions of the body are 11 ft. $3\frac{3}{4}$ in. × 4 ft. $2\frac{1}{2}$ in. × 1 ft. $7\frac{1}{2}$ in., its

Fig. 24.—*Plan of Break attached to Messrs. W. Ball and Son's Waggon, No.* 1306.



Back of Waggon here.

capacity is 74 cubic feet; and in this respect it is best in its class. Area over ladders for harvest purposes 92 square feet.

The fore carriage turns by a pin and two iron plates, and is checked by a chain fastened to the frame at one end, the other end running on a rod, which is fastened to the slide frame. The axles for each wheel are separate, being $2\frac{5}{8}$ inches square, and fastened to a $9\frac{1}{2}$-inch solid wood axle-bed by a $\frac{7}{8}$-inch bolt at the ends, and at the shoulders by a strong clip and two $\frac{3}{4}$-inch bolts.

The diameter of the fore wheels is 3 ft. 4 in., with 4° inclination, and 10 spokes; that of the hind wheels is 5 ft., with 4° inclination, and 12 spokes. The spokes are $1\frac{3}{4}$ in. × $3\frac{1}{4}$ in., and mortised with a round tongue and shouldered.

The tyre is 4 in. broad × $\frac{5}{8}$ in. thick, and thus broader than any other waggon in the class, which accounts for its low draught, as compared with the others; for when being drawn along the oat-field the wheel sank less. The mean draught per ton of gross load was 50·5 lbs. on the hard road, and 189·1 lbs. on the field; and thus on the road it showed the highest draught, and in the field the lowest draught in the class.

The weight of the waggon is 19 cwt. 1 qr. 15 lbs., and the load is well placed.

TABLE XX.—PAIR-HORSE WAGGONS. (CLASS XX.)

Name of Exhibitor	Milford, F. P.	Milford, T.	Hayes.	Ball, W.	Glover, W.
Catalogue number	5036	4875	1431	1306	1567
Price	32*l.* 10*s.*	31*l.* 10*s.*	53*l.*	34*l.*	44*l.*
Weight empty on fore wheels	10·2·25	8·2·24	14·1·13	10·0·23	9·3·18
" empty on hind wheels	9·0·18	8·0·13	11·2 6	10·2·15	9·1·25
" Total	19·3·15	16·3·9	25·3·19	20·3·10	19·1·15
" loaded on fore wheels	21·1·17	24·0·23	33·0·19	24·2·25	29·0·4
" loaded on hind wheels	43·1·22	37·2·5	37·2·17	40·3·18	35·1·1
" Total	64·3·1	61·3·0	70·3·8	65·2·15	64·1·5
" useful load	45·0·0	45·0·0	45·0·0	45·0·0	45·0·0
Nature of load	Roots.	Roots.	Roots.	Roots.	Roots.
Width and thickness of tyres	2½″ × ⅝″	2½″ × ⅝″	3″ × ⅝″	2¾″ × ¾″	4″ × ⅝″
Maximum load per inch, width of tyres in cwts.	8·68	7 5	6·2	7·4	4·4
Diameter of front wheels	..	3′·4″	3′·5″	3′·5″	3″·4″
" hind wheels	..	4′·9″	5′·0″	4′·10½″	5′·0″
Inclination to vertical of front wheels	2¼°	1½°	5¾°	4¼°	4°
Inclination to vertical of hind wheels	3°	2°	4¾°	3¾°	4°
Gauge width of wheel centres on ground	..	4′·11½″	..	5′·1″	4′·10″
Wheel base	6′·2¼″	5′·4″	..	6′·5″	6′·4″
Size of body	10′·11″ × 4′·2″ × 1′·3″	9′·9″ × 3′·11½″ × 1′·2¾″	10′ × 4′·1¾″ × 1′·8″	11′ × 4′·1″ × 1′·5½″	11′·3¾″ × 4′·2½″ × 1′·7¼″
Capacity of body in cubic feet	55·	47·04	33·32	63·1	74·
Area over ladders for harvest purposes	102· square feet.	90·5 square feet.	..	95·	92·
On Macadamised Road:—					
Mean draught in lbs. reduced to a level road	473	135·31	177·6	162 2	162·
Ditto per ton gross load	146	43 8	50·2	49·4	50·5
Ditto per ton useful load	210	60·1	78·9	72·1	72·
Rate in miles per hour	3·23	2·56	2·55	2·58	2·81

	Perfection being					
On Arable Land:—						
Mean draught in lbs. reduced to a level road		726	633	792	753	607
Ditto per ton gross load		224	205	224	229·6	189·1
Ditto per ton useful load ..		323	281	352	334·7	270·
Rate in miles per hour		2·98	2·29	2·42	2·52	2·19
Points of Merit:—						
1. Mechanical construction, strength, soundness and quality of materials and workmanship	200	75	150	Disqualified.	175	120
2. General design	100	50	90		100	50
3. Ease of turning, and arrangement of slipper or brake	100	50	75		80	40
4. Adaptability for harvest and general farm purposes	150	80	80		100	120
5. Arrangement for attaching horses ..	50	40	35		50	30
6. Weight	100	..	75		50	60
7. Draught	150	..	130		80	110
8. Price	150	10	140		130	50
Total	1000	305	775	..	765	580

The workmanship and materials are good, although the waggon is somewhat costly, the price being 44*l.*

No. 5036. *F. P. Milford.*—The peculiarities of this waggon are that the middle hind carriage-pole is done away with, which arrangement cannot add to its strength. The front wheels also have 12 spokes and the hind wheels 14 spokes each, as compared with 10 and 12 in the other waggons. The degrees of inclination are also small, being $2\frac{1}{4}°$ and 3°. The load is well placed, for more than three-quarters of it rests on the larger hind wheels. It was principally commended on account of its draught. The waggon is not so well finished as the others. Price 32*l.* 10*s.*

First Prize of 15*l.* to T. Milford and Son (4875), of Thorverton, Cullompton.
Second Prize of 10*l.* to W. Ball and Son (1306), of Rothwell, Kettering.
Highly Commended.—W. Glover and Sons (1567), of Warwick.
Commended.—F. P. Milford (5036), of Kenn, Exeter.

For TABLE XX., PAIR-HORSE WAGGONS, see pp. 694-695.

Class XXI. Light Waggons on Springs.—Four waggons were entered, but only two were tried. These were loaded with 45 cwt. mangolds, and tested in the same manner as those in the last class. In fact this class is similar to the last, differing only in the use of springs; therefore a good comparison of the mean draughts of these two classes of waggons is formed, and, as already explained, the mean draught was least in the spring waggons.

No. 1432. *H. Hayes and Son, of Stamford.*—The body framing is of oak, with sides of elm planks. Its dimensions are 10 ft. $5\frac{1}{4}$ in. × 4 ft. $1\frac{3}{4}$ in. × 1 ft. $7\frac{1}{2}$ in., its capacity is 69·5 cubic feet, and area over ladders for harvest purposes 100·9 square feet. The body rests in front on two longitudinal springs and behind on two longitudinal springs with a cross check-spring. The front springs are rather stronger than the hind springs, being made up of eleven $2\frac{1}{2}$-in. × $\frac{5}{16}$-inch plates, 3 ft. 5 in. long, and curled upwards and inwards at each end. The hind springs are made up of ten plates of like construction. The hind cross check-spring has seven plates of the same dimensions, and is 2 ft. 8 in. long. The springs are fixed to the axle-bed by two staples, which go through the axle-bed and are screwed up at the bottom. A hoop between these staples keeps the springs together.

When empty the opening of the front springs was $4\frac{13}{16}$ inches, and that of the hind springs $2\frac{11}{16}$ inches; under a load of 45 cwt. these openings were reduced to $1\frac{3}{8}$ inch in front and $4\frac{3}{8}$ inches in the hind springs, thus showing deflections of 1 $\frac{5}{16}$ inch and $\frac{7}{16}$ inch. The axles of the wheels are separate, $2\frac{3}{4}$ in. × $\frac{5}{8}$ in. × 19 in. long, and fastened to the axle-bed by bolts $2\frac{3}{4}$ in. × 5 in.

The diameter of the front wheels is 3 ft. 5 in., with 2° inclination to vertical, and 12 spokes; that of the hind wheels is 4 ft. 11 in., with $2\frac{1}{4}°$ inclination, and 14 spokes. The spokes are mortised into the felloes with a shoulder all round.

A screw lever break is attached to the hind wheels.

The fore carriage turns on two iron circular tables: this prevents undue oscillation of the load when travelling on a rough road; the waggon is also easily turned on them.

On the road the mean draught per ton of gross load was 46·2 lbs., and per ton of useful load 69·8 lbs.; on the field its mean draught per ton of gross load was

214 lbs., and per ton of useful load 324 lbs.: thus showing a higher mean draught on the road and field, of 28·57 per cent. and 1·4 per cent. respectively, than in Ball and Son's waggon, which must be owing to the less flexible springs upon which the load rests, for in respect to diameter of wheels and inclination of wheels, it possesses decided advantages over the latter. This is a well-constructed waggon, with good workmanship; but the price, 53*l.*, is somewhat high.

No. 1307. *W. Ball and Son, of Rothwell, Kettering.*—The construction and framing of the body are similar to those in waggon No. 1306, already described in Class XX. The dimensions of the body are 10 ft. 7½ in. × 4 ft. 0½ in. × 1 ft. 6 in., its capacity is 64 cubic feet, and area over ladders for harvest purposes 87

Figs. 25 and 26.—*Plan and Elevation of Break attached to Messrs. Ball and Son's Spring Waggon, No.* 1307.

Fig. 25.—Plan.

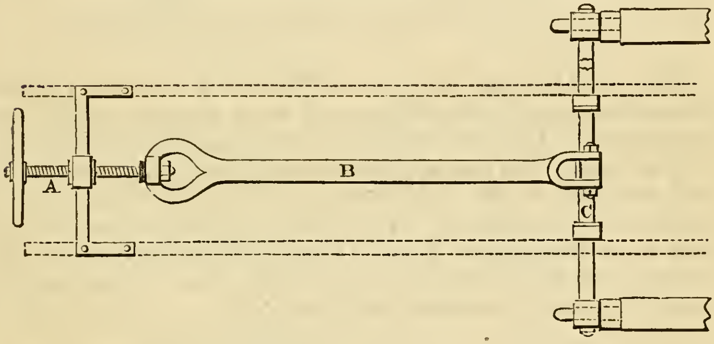
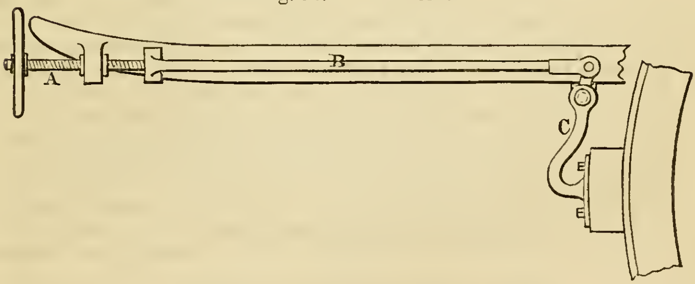


Fig. 26.—Elevation.



square feet. It rests upon two front and two hind longitudinal springs. The front springs are composed of nine plates $2\frac{1}{4}$ in. × $\frac{1}{4}$ in., and the hind springs of eleven plates of similar dimensions and 3 ft. 8 in. long. The ends of the springs are curled downwards and inwards; thus the weight is not distributed equally over all the plates. In the springs of the last-described waggon, where their ends are curled upwards and inwards, the weight is thrown into the centre of the springs, and must therefore press more equally on all the plates. The opening of the front springs without a load was $3\frac{5}{8}$ inches, and that of the hind springs $5\frac{5}{8}$ inches, while under a load of 35 cwt. their openings were reduced to $2\frac{3}{8}$ inches and $2\frac{5}{16}$ inches, thus showing deflections of $1\frac{1}{4}$ inch and $3\frac{5}{16}$ inches respectively. Although, as we have already shown, these more flexible springs reduced the mean draught considerably, still it would be better to have the springs a little stronger with a check-spring behind, where the deflection was as much as $3\frac{5}{16}$ inches. The axles are secured to the axle-bed by four clips. The fore carriage turns upon two circular turning-tables, and the shafts are well braced with iron.

The break is applied by a screw from before, and, as shown in Figs. 25 and 26, it consists of a screw, A, connected with a draught-bar, B, this in turn being connected with the smaller upper arm of the lever break-irons C.

The mean draught per ton of gross load was 33·2 lbs., and per ton of useful load 48·2 lbs., as compared with 46·2 lbs. and 69·8 lbs. in Hayes's waggon. This is a well constructed waggon, of good materials and workmanship, and well worth its price, namely, 44*l.*

First Prize of 10*l.* to H. Hayes and Son (1432), of Stamford.
Second Prize of 5*l.* to W. Ball and Son (1307), of Rothwell, Kettering.

For TABLE XXI., LIGHT WAGGONS on SPRINGS, see opposite page.

Class XXII. Other Waggons.—There were six entries on the list, and four were tried, Hayes and Son's waggon having been disqualified. The load used in the trial was 80 cwt. of Indian corn in bags. They were all tested with the dynamometer on the road and field, while T. Milford's and W. Ball's waggons were also tested on grass land. The weights of the waggons in this class are a little higher than in Class XX., their tyres are also broader, and their draught less, and altogether they seem more useful for general purposes than Class XX.

No. 1308. *W. Ball and Son, of Rothwell, Kettering.*—This waggon is similar in construction to No. 1306, already described in Class XX., the only difference being that its wheels are a little more cylindrical with broader tyres. We find that on the road its mean draught per ton of gross load is 26·8 lbs., and per ton of useful load 34 lbs., as compared with 49·4 lbs. and 72·1 lbs. in No. 1306. On the field the difference is also very striking, for the mean draughts are respectively 188 lbs. and 240 lbs., as compared with 229·6 lbs. and 334·7 lbs. in No. 1306. The price of this waggon is only 37*l.*, and the pair-horse waggon costs 34*l.*, therefore the difference in price is only 3*l.*; the former is decidedly the most useful and the cheapest for general farm purposes. It has been already explained how greatly the mean draught on the field was reduced by the use of convex tyres in this waggon, which advantage did not, however, show itself on the hard road or on the hard grass land. The workmanship and materials are good.

No. 4876. *T. Milford and Son, of Thorverton, Cullompton.*—The construction of this waggon is similar to No. 4875 in Class XX., already described. It is about 3 cwt. heavier, and its capacity is greater by 14 cubic feet. The area over ladders for harvest purposes is only 5 square feet larger. Its mean draught on the road was slightly higher, and on the field a little lower than in No. 4875, the latter advantage having no doubt been caused by the width of tyres, which are $1\frac{1}{2}$ inch broader in the present waggon. This is a strongly built waggon, and its price, 36*l.*, moderate.

No. 1240. *George Ball, of North Kilworth, Rugby.*—This is a well constructed waggon; plank sides; dimensions of body, 11 ft. $1\frac{1}{2}$ in. × 4 ft. 2 in. × 1 ft. 7 in.; capacity, 67 cubic feet; area over ladders for harvest purposes,

TABLE XXI.—LIGHT WAGGONS ON SPRINGS. (CLASS XXI.)

Name of Exhibitor	Hayes.	Ball, W.
Catalogue number	1432	1307
Price	53*l.*	44*l.*
Weight empty on fore wheels	13·2·16	11·1·9
„ empty on hind wheels	11·3·1	10·1·4
„ Total	25·1·17	21·2·13
„ loaded on fore wheels	31·3·22	23·3·16
„ loaded on hind wheels	36·0·4	41·2·24
„ Total	67·3·26	65·2·12
„ Useful load	45·0·0	45·0·0
Nature of load	Roots.	Roots.
Width and thickness of tyres	2¾″ × ¾″	2½″ × 5″
Maximum load per inch, width of tyres in cwts.	6·6	8·3
Diameter of front wheels	3′·5″	3′·3″
„ hind wheels	4′·11″	4′·9½″
Inclination to vertical of front wheels	2°	3¼°
„ „ hind wheels	2¼°	2¼°
Gauge width of wheel centres on ground	4′·10″	5′·1″
Wheel base	6′·1½″	6′·1¼″
Size of body	10′·5¼″ × 4′·1¾″ × 1′·7½″	4′·0½″ × 10′·7½″ × 1′·6″
Capacity of body in cubic feet	67·3	64·
Area over ladders for harvest purposes	100·9	87·
On Macadamised Road:—		
Mean draught in lbs. reduced to a level road	157·	108·9
„ per ton gross load	46·2	33·2
„ per ton useful load	69·8	48·4
Rate in miles per hour	2·45	2·5
On Arable Land:—		
Mean draught in lbs. reduced to a level road	729	692
„ per ton gross load	214	211
„ per ton useful load	324	307·5
Rate in miles per hour	2·22	2·47

POINTS OF MERIT:—	Perfection being	Hayes.	Ball, W.
1. Mechanical construction, strength, soundness and quality of materials, and workmanship	200	200	200
2. General design	100	90	90
3. Ease of turning, and arrangements of slipper or brake	100	100	100
4. Adaptability for harvest and general farm purposes	50	40	30
5. Strength and range of springs	300	250	40
6. Arrangement for attaching horses	50	40	50
7. Weight	100	25	50
8. Draught	150	50	100
9. Price	150	50	100
Total	1200	845	760

TABLE XXII.—OTHER WAGGONS. (CLASS XXII.)

Name of Exhibitor	Milford, T.	Ball, W.	Milford, F. P.	Ball, G.
Catalogue number	4876	1308	5038	1240
Price	36*l.*	37*l.*	40*l.*	42*l.*
Weight empty on fore wheels	9·2·23	10·1·25	11·3·0	11·0·10
" empty on hind wheels	9·2·8	11·2·9	11·1·11	10·2·14
" Total	19·2·3	22·0·6	23·0·11	21·2·24
" loaded on fore wheels	46·3·16	43·1·22	47·2·13	46·0·14
" loaded on hind wheels	52·3·16	58·1·8	55·2·9	55·3·5
" Total	99·3·4	101·3·2	103·0·22	101·3·19
" useful load	80·0·0	80·0·0	80·0·0	80·0·0
Nature of load	Corn in Sacks.	Corn in Sacks.	Corn in Sacks.	Corn in Sacks.
Width and thickness of tyres	$4'' \times \frac{5}{8}''$	$4\frac{1}{2}'' \times \frac{1}{2}''$ to $\frac{3}{4}''$	$4\frac{1}{2}'' \times \frac{3}{4}''$	$4'' \times \frac{3}{4}''$ to $\frac{1}{2}''$
Maximum load per inch, width of tyres in cwts.	6·6	6·5	6·2	7·0
Diameter of front wheels	3′·4″	3′·5″	3′·4″	3′·5″
" hind wheels	4′·9″	$4'\cdot10\frac{1}{2}''$	$5'\cdot1\frac{1}{2}''$	4′·10″
Inclination to vertical of front wheels.. ..	2°	$3\frac{1}{4}°$	3°	$4\frac{3}{4}°$
" " hind wheels	$2\frac{1}{4}°$	$3\frac{1}{2}°$	$3\frac{1}{2}°$	5°
Gauge width of wheel centres on ground ..	$5'\cdot0\frac{1}{2}''$	$4'\cdot11\frac{1}{2}''$	..	$4'\cdot10\frac{1}{4}''$
Wheel base	6′·1″	6′·5″	..	5′·10″
Size of body	$11'\cdot0\frac{1}{4}'' \times 1'\cdot4\frac{1}{2}'' \times 4'\cdot1''$	$11'\cdot3'' \times 4'\cdot1'' \times 1'\cdot5\frac{1}{2}''$	..	$9'\cdot10\frac{1}{2}'' \times 4'\cdot1'' \times 1'\cdot3\frac{3}{4}''$
Capacity of body in cubic feet	61·	66·8	..	67·
Area over ladders for harvest purposes ..	100·	94·5	..	98·6
On Macadamised Road:—				
Mean draught in lbs. reduced to a level road	266·	137·	102·5	261·
Ditto per ton gross load	53·	26·8	19·9	51·2
Ditto per ton useful load	66·5	34·	25·6	65·2
Rate in miles per hour	2·6	2·55	2·82	2·44
On Arable Land:—				
Mean draught in lbs. reduced to a level road	1029	958	968	1034

	Perfection being				
Ditto per ton gross load		206	188	187·6	203
Ditto per ton useful load		257	240	242	258
Rate in miles per hour		2·35	2·50	2·89	2·36
On Pasture:—					
Mean draught in lbs.		..	814	763	
Ditto per ton gross load		..	160	148	
Ditto per ton useful load		..	201	191	
POINTS OF MERIT:—					
1. Mechanical construction, strength, soundness and quality of materials, and workmanship	200	150	180	..	170
2. General design	100	85	80	..	75
3. Ease of turning and arrangements of slipper or brake ..	100	85	90	..	45
4. Adaptability for harvest and general farm purposes	150	100	110	..	120
5. Strength and range of springs	..	..	..	..	..
6. Arrangement for attaching horses	50	35	50	..	50
7. Weight	100	90	55	..	60
8. Draught	150	100	120	..	90
9. Price	150	125	120	..	90
Total	1000	770	805		700

98·6 square feet, being 16 ft. 1 in. long × 6 ft. $1\frac{1}{2}$ in. broad. The front wheels have a diameter of 3 ft. 5 in., with $4\frac{3}{4}°$ inclination to vertical, and 10 spokes; the hind wheels, 4 ft. 10 in., with 5° inclination, and 12 spokes. Tyres convex and 4 inches broad. The axles are double, $2\frac{3}{4}$ inches square, and 20 inches long, and are bolted to the axle-bed and lower bolster by a strong clip, and at the end by a bolt 1 inch square. The fore carriage turns upon a pin. A slipper is used instead of a lever-break.

The weight of the waggon is 21 cwt. 2 qrs. 24 lbs. The mean draught on the road per ton of gross load was 51·2 lbs., and per ton of useful load 65·2 lbs., while in the field these were respectively 203 lbs. and 258 lbs.; therefore the draught is somewhat high. Its price is also somewhat high, 42*l.*; but the construction, materials, and adaptability for general farm purposes are good.

No. 5038. *F. P. Milford, of Kenn, Exeter.*—The construction of this waggon is similar to No. 5036 in Class XX., only heavier, with broader tyres on the wheels. Its draught was low both on the road and in the field; but it is not so well finished as some of the other waggons, and its price is 40*l.*

Prize of 10*l.* to W. Ball and Son (1308), of Rothwell, Kettering.

Highly Commended.—T. Milford and Son (4876), of Cullompton; George Ball (1240), of North Kilworth, Rugby.

Commended.—F. P. Milford (5038), of Kenn, Exeter.

For Table XXII., Other Waggons, see pp. 700-701.

Section V.—Carts.

As previously shown, the mean draught of carts, either per ton of gross load or per ton of useful load, was much less than in waggons, and especially so in going through the oat-field; and this difference would certainly have been still greater had the soil been damp and soft; the reason of this is, that the whole load rests upon wheels of large diameter, whereas in the waggons one-third, and sometimes nearly one-half of the total load, rests upon the fore-wheels which are necessarily of smaller diameter than the hind-wheels. In a cart there is some weight thrown on to the horse's back; but this, as will be seen in the Tables, Class XXIII., was in most cases nearly reduced to one-half when the cart was drawn along the field; showing that, as the draught was increased, part of the weight on the back was thrown upon the shoulders. There are only two exceptions to this, namely, in T. Milford and Son's and Hayes and Son's carts, where the load on the horse's back was increased in the field, probably owing to the higher point-attachment of the shafts to the cart, and therefore more horizontal line of draught. In these carts the height of the floors was greatest in their class.

It would have been interesting to see the effect of the load on the horse's back in going over hilly ground, as this is frequently considered a disadvantage in carts; but the trial-course was very level, being only one gradient in 430 on the road, and one in 1000 in the field.

Class XXIII. Single-Horse Carts for General Agricultural Purposes.—The entries in this class were numerous, being twenty-one. Of these twelve were presented for trial, and seven of the latter number were tested with the dynamometer. They were loaded with 20 cwts. of mangolds.

No. 1309. *W. Ball and Son, of Rothwell, Kettering.*—The body framing is of oak, the two side pieces being 5 inches × 4 inches, and middle pieces 4 in. × $2\frac{3}{4}$ inches. The front cross piece is also of oak, and the hind cross piece of iron 2 in. × $\frac{3}{4}$ in., projecting 6 inches on each side. The sides and front are of $1\frac{3}{8}$-inch pitch-pine planks, with ash rails; these latter project beyond the sides to support the fixed shelvings over the wheels, which are also supported by an iron crutch, which is bolted through the top rail, and an iron cross piece; it is also supported by three small iron stays on each side. Three long bolts and two iron stays strengthen the front; and five bolts pass through the planks on each side. Four of these are provided with eyes at the top, to which the harvest rails are hooked. The shelving over the wheels is of $1\frac{1}{4}$-inch plank, bound with convex iron $1\frac{1}{4}$ in. × $\frac{1}{4}$-inch. The tailboard is made with hinges, and is not removable except by taking off the nuts; it is strengthened by an iron $1\frac{1}{2}$-in. × $\frac{3}{8}$-inch band, bolted to the two iron hooks inside, which arrangement gives great strength to the tailboard; it is fastened up by key and chain to two iron stays, which are bolted to the sides; in falling back it rests on the projecting side pieces of the frame.

The tipping apparatus consists of an iron upright sword fixed to the cross piece of the shafts, which passes through an iron staple bolted to the framework of the body, and is there checked by double lever-handle and spring. The body when down is secured to the shafts by two hooks. The dimensions of the body are 5 ft. 6 in. × 3 ft. 9 in. × 1 ft. 5 in.; its capacity 23·15 cubic feet, and its area over ladders for harvest purposes 57·1 square feet, being 10 ft. $8\frac{1}{2}$ in. × 5 ft. 5 in.

The shafts are of ash, fixed to the inside of side-pieces of the body-frame by a $\frac{7}{8}$-inch bolt passing through them and the frame-work. The shafts are plated with iron at the sides, and are well braced.

The axles are secured to a 6-inch square ash axle-bed, by a $\frac{7}{8}$-inch pin, and by double brackets, with pins at the shoulders.

The wheels are 4 ft. 9 inches in diameter, with $2\frac{1}{4}$° inclination to vertical, and 12 spokes; width of tyre 4 inches. The weight of the waggon was 11 cwt. 2 qrs. 20 lbs.; its mean draught on the road was 48·7 lbs., and thus 30·7 lbs. per ton of gross load, the weight on the horse's back being 85 lbs., which is too high; in the field the mean draught was 203 lbs., and per ton of gross load 128 lbs., with 60 lbs. on the horse's back. This clearly shows that, as the pull was increased, the weight on the horse's back was decreased. It is a well-designed cart, with good materials and workmanship, draught light, and price moderate, namely, 17*l.*

No. 5039. *F. P. Milford, of Kenn, Exeter.*—The framing is of oak, the side pieces being 4 in. × 3 in., and middle pieces $2\frac{1}{4}$ in. × $3\frac{1}{2}$ in. The sides are of $1\frac{1}{4}$-inch oak, and the floor is of elm. The side-boards are movable; this was considered objectionable. The tailboard is of 1-inch oak, bound with half-round iron, stayed with three upright braces, and fastened up by spring catches. The slightly concave fore and tail harvest ladders give a large area for harvest purposes; they are 14 ft. 8 in. long × 5 ft. 9 in. wide, thus giving an area of 84·07 square feet; in this respect it was best in its class. The dimensions of the body are 5 ft. 7 in. × 3 ft. 9 in. × 1 ft. 4 in., and its capacity 27·89 cubic feet.

The tipping apparatus consists of a sword, which is placed downwards, and is checked by a spring placed below the shaft-framing; this was not considered very secure, although the spring catch, by being well protected, is less liable to be broken.

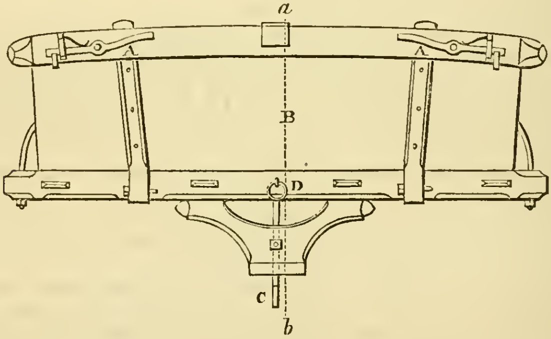
The iron axles are $1\frac{1}{2}$ in. × $2\frac{1}{2}$ in. at their middle, and $2\frac{1}{2}$ inches square at the shoulders, where it has wings welded to it; it is strongly fastened to the axle-bed by two clips and two screws. The diameter of the wheels is 5 ft. 2 in., with $2\frac{1}{2}°$ inclination and 14 spokes.

The weight of the cart is 11 cwt. 3 qrs. 2 lbs. The mean draught on the road per ton of gross load was 35·8 lbs., and in the field 66·5 lbs.

This is a very roomy cart, with high wheels, still low for loading; its price is 17*l.* 10*s.*

No. 4877. *Thomas Milford and Sons, of Thorverton, Cullompton.*—The framework of the body is of oak. The sides are formed with $1\frac{1}{2}$-inch solid elm planks similar to the waggon in Class XX., and stayed with four iron stays. The shelvings over the wheels are of $1\frac{1}{4}$-inch elm. The tailboard, B, is hinged, and is fastened up by a spring catch, A, on each side. When it falls down, the swing, with a little assistance, sends it back so as to be caught below the cart by the spring catch C; in fastening it up, the catch is taken off by pulling out the ring D, which by means of a thin iron rod is connected with it. This is a very ingenious invention, but would soon get out of order.

Fig. 27.—*Tailboard of Messrs. T. Milford and Son's Tipping Apparatus, No.* 4877.

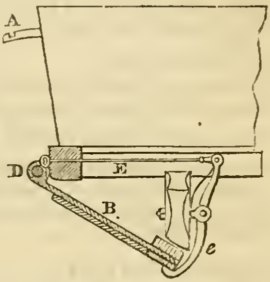


The cart is tipped by means of an upright sword, A (Fig. 29), hinged and fastened to the cross piece of the shafts, and working in a staple, B, fastened to the front cross-piece of the frame, where it is checked by a spring lever and pin, D. When the body of the cart is down upon the shafts, the lever fastens into two little catches on the shafts; thus the cart is kept steady, and there is less strain upon the tipping apparatus. The dimensions of the body are 5 ft. $7\frac{3}{4}$ in. × 3 ft. $8\frac{1}{4}$ in. × 1 ft. $3\frac{1}{4}$ in., and its capacity 29·14 cubic feet, while the area over ladders for harvest purposes was 60·34 square feet. The shafts are strengthened by strong stays. The iron $2\frac{1}{2}$-in. axles are fastened to a $5\frac{1}{2}$-in. square axle-bed. The diameter of wheels is 4 ft. 7 in., with $1\frac{3}{4}°$ inclination, and 12 spokes: of similar construction to those described in Class XX. The tyre is $3\frac{1}{2}$ in. wide × $\frac{5}{8}$ in. thick. The weight of the cart is light, being only 9 cwt. 11 lbs. The draught on the road was the lowest in its class; its mean draught on the road per ton of gross load being 30 lbs., and per ton of useful load 43·3 lbs., and weight upon horse's back 40 lbs.; while on the field these were respectively 144 lbs., 209 lbs., and 50 lbs. On the field it was excelled by most of the other carts, no doubt owing to its narrower tyre.

This is a strongly-made, useful cart, principally to be recommended on account of its low draught on the road. Its price is moderate, only 15*l*.

No. 1241. *George Ball, of North Kilworth, Rugby.*—In this cart there are three middle frame-pieces instead of two. The tailboard is removable. The cart is tipped by means of a sword placed downwards, and is checked by a reversible bar and pin. The dimensions of the body are 5 ft. 5 in. × 3 ft. 10 in. × 1 ft. 4 in., and its capacity 27·11 cubic feet. The dimensions over ladders for harvest purposes are large, being 11 ft. × 5 ft. 8 in., or 63·10 square feet; the diameter of the wheels is 4 ft. 9 in., with $2\frac{1}{4}°$ inclination, and 12 spokes. The weight of the cart is 10 cwt. 3 qrs. 6 lbs. Its mean draught on the road was somewhat high, being 36 lbs. per ton of gross, and 55·3 lbs. per ton of useful load. On the field the mean draughts per ton of gross and per ton of useful load were respectively 148 lbs. and 228 lbs.

Fig. 28.—*Tailboard Section of Messrs. T. Milford and Son's Tipping Apparatus, No.* 4877.



This is a well-constructed cart, the arrangement for tipping is simple and good, and its price is 18*l*.

No. 1437. *Hayes and Son, Stamford.*—This is a strongly-made cart, and all parts most subjected to strains are well braced with iron. The framing is of oak; the sides are of $1\frac{3}{4}$-inch elm; the dimensions of the body are 5 ft. 8 in. × 3 ft. 9 in. × 1 ft. $4\frac{1}{2}$ in., and its capacity 28·57 cubic feet. The dimensions over the harvest ladders were the largest in the class, being 11 ft. 4 in. × 5 ft. 10 in., area 66·2 square feet. The axles are $2\frac{1}{2}$ in. square, and have flaps welded on at each end (Fig. 30, p. 708); a bolt passing through these for fastening the axle to the axle-bed. The diameter of the wheels is 4 ft. 10 in., with $3\frac{1}{2}°$ inclination.

Fig. 29.—*Messrs. T. Milford and Son's Tipping Apparatus, No.* 4877.

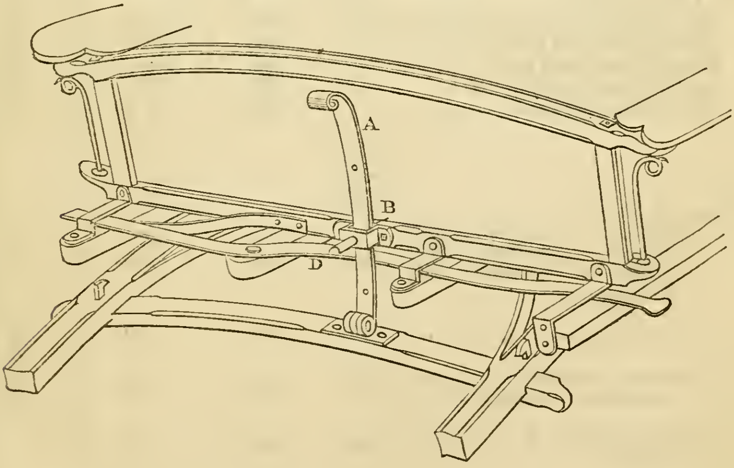


TABLE XXIII.—SINGLE-HORSE CARTS for

Name of Exhibitor		Ball, W.	Milford, F. P.	Glover, W.
Catalogue number		1309	5039	1568
Price		17*l.*	17*l.* 10*s.*	17*l.* 10*s.*
Weight empty		11·2·20	11·3·2	9·3·5
„ loaded		31·2·20	31·3·2	29·3·5
„ useful load		20·0·0	20·0·0	20·0·0
Nature of load		Roots.	Roots.	Roots.
Width and thickness of tyres		4″ × ⅝″	4″ × ⅝″	4″ × ⅝″
Maximum load per inch, width of tyres in cwts.		3·15	3·97	3·2
Diameter of wheels		4′·9″	5′·2″	4′·7″
Inclination of wheels to vertical		2¼°	2½°	3¾°
Gauge width of wheel centres on ground		4′·10¾″	4′·10″	4′·9¾″
Size of body—length, breadth, and depth		5′·6″ × 3′·9″ × 1′·5″	5′·7″ × 3′·9′ × 1′·4″	5′·7″ × 3′·8½″ × 1′·7½″
Capacity of body in cubic feet		23·15	27·15	32·71
Length and breadth over harvest ladders		10′·8½″ × 5′·5″	14′·8″ × 5′·9″	10′·8″ × 5′·6″
Area and breadth for harvest purposes		57·1	84·07	58·96
Height of floor		3′·3″	3′·0″	3′·2″
On Macadamised Road:—				
Mean draught in lbs. reduced to a level road		48·7	56·	62·3
Ditto per ton gross load		30·7	35·8	41·5
Ditto per ton useful load		48·7	56·	62·3
Load on horse's back in lbs.		85·	60·	50·
Rate in miles per hour		2·62	2·84	2·6
On Arable Land:—				
Mean draught in lbs. reduced to a level road		203	105·7	191
Ditto per ton gross load		128	66·5	127
Ditto per ton useful load		203	105·7	191
Load on horse's back in lbs.		60	35·	30
Rate in miles per hour		286	2·86	2·56
	Perfection being			
POINTS OF MERIT:—				
1. Mechanical, construction strength, soundness and quality of materials and workmanship	200	180	200	None given.
2. General design	100	90	80	
3. Balance, capacity, and arrangement for tipping	200	160	140	
4. Weight (width of tyre considered)	150	100	90	
5. Draught	150	120	100	
6. Price	200	150	150	
Total	1000	800	760	..

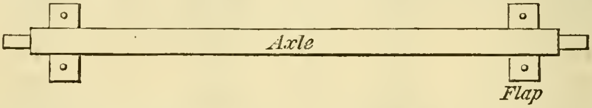
General Agricultural Purposes. (Class XXIII.)

Woods & Cocksedge.	Milford, T.	Ball, G.	Hayes & Son.
1512	4877	1241	1437
15*l.* 10*s.*	15*l.*	18*l.*	19*l.*
10·0·15	9·0·11	10·3·6	12·1·20
30·0·15	29·0·9	30·3·6	32·1·20
20·0·0	20·0·0	20·0·0	20·0·0
Roots.	Roots.	Roots.	Roots.
$3\frac{1}{2}'' \times \frac{5}{8}''$	$3\frac{1}{2}'' \times \frac{5}{8}''$	$4'' \times \frac{3}{4}''$	$4'' \times \frac{3}{4}''$
4·1	4·16	3·85	4·0
4′·6″	4′·7″	4′·9″	4′·10″
2°	$1\frac{3}{4}$°	$2\frac{1}{4}$°	$3\frac{1}{2}$°
5′·$1\frac{1}{2}$″	4′·$10\frac{3}{4}$″	..	4′·10″
5′·$0\frac{3}{4}$″×3′·$8\frac{1}{4}$″ ×1′·$4\frac{1}{2}$″	5′·$7\frac{3}{4}$″×3′·$8\frac{1}{4}$″ ×1′·$3\frac{1}{4}$″	5′·5″×3′·10″ ×1′·4″	5′·8″×3′·9″ ×1′·$4\frac{1}{2}$″
24·14	29·14	27·11	28·57
9′·9″ × 6′·$0\frac{1}{2}$″	11′·3″ × 5′·$4\frac{1}{2}$″	11′·0″ × 5′·8″	11′·4″ × 5′·10″
52·32	60·34	63·10	66·2
3′·0″	3′·4″	3′·2″	3′·6″
49·7	43·3	55·3	54·7
33·1	30·	36·	33·8
49·7	43·3	55·3	54·7
20·0	40·	..	60
2·67	2·62	2·68	..
	209	228	
227			197·
151	144	148	121·6
227	209	228	197·
15	50	60	75
2·66	2·68	2·54	3·20
	180	170	180
	70	80	90
None given.	100	160	150
	120	120	80
	120	100	105
	170	100	100
..	760	730	705

The mean draughts on the road were per ton of gross load 33·8 lbs., and per ton of useful load 54·7 lbs.; with a weight of 60 lbs. on the horse's back, which on the field was increased to 75 lbs.; this is somewhat high. The mean draughts on the field were 121·6 lbs. and 197 lbs., and thus lower than in any other cart in this class.

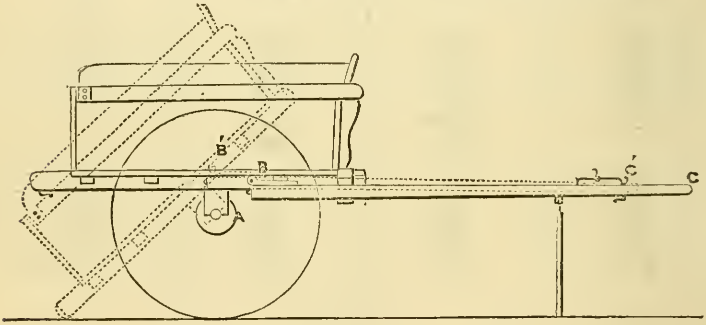
The construction and materials of this cart are good, but the price, 19*l.*, is somewhat high.

Fig. 30.—*Axle of Messrs. Hayes and Son's Cart, No.* 1437.



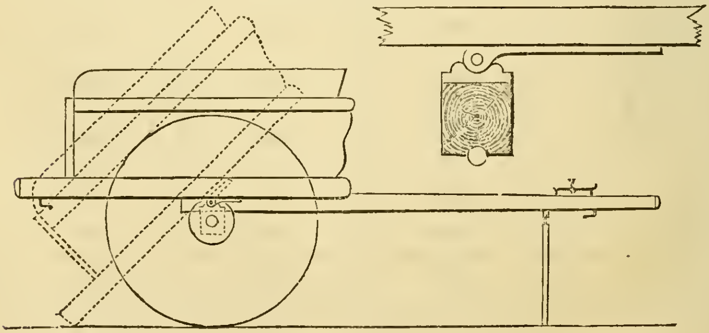
No. 1512. *Woods, Cocksedge, and Co., of Stowmarket.*—This cart may be considered as the novelty in its class, for it is the only one into which a really new invention has been introduced; this will be best seen by referring to the accompanying woodcuts (Figs. 31 and 32). The former represents the old

Fig. 31.—*Illustrating the old form of Tipping Apparatus.*



form of cart, the plain lines showing the cart when fastened down, and the dotted lines when tilted up. The shafts are jointed to the side pieces of the

Fig. 32.—*Illustrating Tipping Apparatus of Messrs. Woods, Cocksedge, and Co.'s Cart, No.* 1512.



body-frame at B, a little distance in front of the axle, so that really the draught is taken from the frame; it is found in practice that, even in the best-constructed carts, the shafts soon begin to fit loosely on the inside of the framing, and therefore the load is continually shaking the horse, which must considerably increase the draught. When the cart is tilted the points B and C must necessarily move back, thus giving a shock to the horse. Of course there is this advantage, that, in moving forward again, the horse brings back the body into its place without the assistance of the man, for a leverage is formed.

In the present cart shown in Fig. 32, the shafts are bolted to the axle-bed, so that the draught is taken from the point where nearly the whole load rests. The body is fastened to the axle-bed by a movable joint, the lower part of which is bolted to the axle-bed, and the upper part to the body-frame; thus in tilting the cart, it is sent over without giving the least jerk to the horse. There is certainly more difficulty in bringing back the body, as the attendant requires to pull the whole himself. Price 13*l.* 10*s.*

First Prize of 10*l.* to W. Ball and Son (1309), of Rothwell, Kettering.
Second Prize of 5*l.* to F. P. Milford (5039), of Kenn, Exeter.
Highly Commended.—T. Milford and Son (4877), of Cullompton, Devon; G. Ball (1241), of North Kilworth, Rugby; H. Hayes and Son (1437), of Stamford.

For Table XXIII., Single-Horse Carts for General Agricultural Purposes, see pp. 706-707.

Class XXIV. Harvest-Carts.—There were four entries on the list, but only two carts were presented for trial; these were loaded with 28½ cwts. of straw-bunches.

No. 1349. *Hayes and Son, of Stamford.*—This cart is provided with fore and tail harvest ladders. The tailboard is removable, and the wheels are cased with iron to protect them from the corn. The wheels have a diameter of 4 ft. 8. in., with 3° inclination. The dimensions of the body are 10 ft. 2 in. × 4 ft. 11 in. × 1 ft. 2 in., area 58·14 cubic feet, in this respect excelling Milford's cart. With harvest ladders attached, the dimensions are 14 ft. 5 in. × 6 ft. 11 in.; area 100 square feet.

The mean draughts on the road were, per ton of gross load 51·9 lbs., and per ton of useful load 74·1 lbs., with a weight of 60 lbs. on horse's back; but in the field these were respectively 156·6 lbs., 224 lbs., and 30 lbs.

This is a well-constructed, useful cart, but its price, 18*l.* 10*s.*, is high.

No. 5042. *F. P. Milford, of Kenn, Exeter.*—The body of this cart is boat-shaped, similar to the lorrie in Class XXIX.; it may be tilted, and is very useful for carrying roots. The dimensions of the body are 9 ft. 1 in. × 5 ft. 9 in. × 9 in., and its capacity is 39·29 cubic feet. Dimensions over ladders for harvest purposes are 15 ft. 2 in. × 5 ft. 11 in; area 89·10 square feet. Its mean draught on the road per ton of gross load was 40·7 lbs.; being less than that of Hayes's cart, but in the field its mean draught exceeded that of Hayes's by 26·4 lbs.

It is a strong, useful cart, and its price moderate, 15*l.* 10*s.*

First Prize of 10*l.* to H. Hayes and Son (1439), of Stamford.
Highly Commended.—F. P. Milford (5042), of Kenn, Exeter.

Table XXIV., Harvest-Carts, overleaf

TABLE XXIV.—HARVEST-CARTS. (CLASS XXIV.)

Name of Exhibitor	Hayes & Son.	Milford, F. P.
Catalogue number	1439	5042
Price	18*l.* 10*s.*	15*l.* 10*s.*
Weight empty	12·0·4	12·1·21
„ loaded	40·2·4	40·3·21
„ useful load	28·2·0	28·2·0
Nature of load	Straw.	Straw.
Width and thickness of tyres	4″ × $\frac{5}{8}$″	4″ × $\frac{5}{8}$″
Maximum load per inch, width of tyres in cwts.	5·06	5·97
Diameter of wheels	4′·8″	4′·3″
Inclination of wheels to vertical	3°	2$\frac{3}{4}$°
Gauge width of wheel centres on ground ..	4′·9″	5′·1″
Size of body—length, breadth, and depth ..	10′·2″ × 4′·11″ × 1′·2″	9′·1″ × 5′·9″ × 9″
Capacity of body in cubic feet	58·14	39·29
Length and breadth over harvest ladders ..	14′·5″ × 6′·11″	15′·2″ × 5′·11″
Area and breadth for harvest purposes	100·1	89·10
Height of floor	3′·0″	3′·6″
On Macadamised Road:—		
Mean draught in lbs. reduced to a level road	105·3	83·
Ditto per ton gross load	51·9	40·7
Ditto per ton useful load	74·1	58·4
Load on horse's back in lbs.	60·	
Rate in miles per hour	2·48	3·2
On Arable Land:—		
Mean draught in lbs. reduced to a level road	318·	373·
Ditto per ton gross load	156·6	183·
Ditto per ton useful load	224·	263·
Load on horse's back in lbs.	30·	
Rate in miles per hour	2·5	2·76

Class XXV. Market-Carts on Springs.—Ten carts were entered on the list, but only four were presented and tried; they were not tested with the dynamometer, but the Judges tested them by driving about the Show-yard in them.

No. 1440. *Hayes and Son, of Stamford.*—The dimensions of the body are 4 ft. 9 in. × 3 ft. 9½ in. × 1 ft. 10½ in., capacity 78·79 cubic feet. It is very roomy, with plenty of space for luggage. It rests on two springs with a cross check-spring. The longitudinal springs are composed of six plates, and their length is 4 ft. 3 in. The opening of these springs when empty was 9¼ in., and, when loaded, $7\frac{3}{8}$ in., showing a deflection of $1\frac{7}{8}$ inch. The cross check-spring is composed of five plates. The springs are fastened to the axle by two clips and a small bolt, which pass through the springs. The patent mail axle, $1\frac{3}{8}$ in. square, is provided with solid flaps turned downwards for holding the clips and thus preventing any movement of the springs. The diameter of the wheels is 5 feet, and they contain 16 spokes. The tyre is convex, $1\frac{3}{4}$ in. × $\frac{5}{8}$ in. All parts are well stayed, and the construction and workmanship are good. The price is 25*l.*

No. 1392. *Corbett and Peele, of Shrewsbury.*—This is a roomy cart; its weight empty is 5 cwt. 2 qrs. 22 lbs. The body is supported on two springs with a cross check-spring. The longitudinal springs are composed of seven plates, 2 in. × $\frac{1}{4}$ in., and their length is 4 ft. 6 in. Their opening empty was $7\frac{5}{8}$ in., and when loaded, $5\frac{1}{4}$ inches; showing a deflection of $2\frac{3}{8}$ inches. The cross check-spring is composed of four plates. The axle is patent mail, $1\frac{1}{2}$ in. square. The wheels have a diameter of 4 ft. 10 in. with 14 spokes. It is well-constructed. Its price is 19*l.* 10*s.*; cushions 1*l.* 10*s.* extra.]

Prize of 10*l.* to Hayes and Son (1440), of Stamford.
Commended.—Corbett and Peele (1392), of Shrewsbury.

TABLE XXV.—MARKET-CARTS ON SPRINGS. (CLASS XXV.)

Name of Exhibitor	Hayes & Son.	Corbett & Peele.
Catalogue number	1440	1392
Order of trial	3	4
Price	25*l.*	19*l.* 10*s.*
Mean diameter of wheels	5′ 0″	4′ 10″
Width and thickness of tyres	$1\frac{3}{4}$″ × $\frac{5}{8}$	$1\frac{1}{4}$″ × $\frac{5}{8}$
Gauge width of wheel centres on ground	4′ 10″	4′ 7″
Size of body	4′ 9″ × 3′ $9\frac{1}{2}$″ × 1′ $10\frac{1}{2}$″	5′ $1\frac{1}{2}$″ × 3′ $4\frac{1}{2}$″ × 1′ 10″
Capacity in cubic feet	78·79	
Height of floor	..	3′ 8″
Opening of springs (empty)	$9\frac{1}{4}$″	7′ $\frac{5}{8}$″
,, ,, (loaded)	$7\frac{3}{8}$″	$5\frac{1}{4}$″

Class XXVI. Carts for the Conveyance of Water with Pumps attached.—There were ten entries, and five carts were tried. These were first weighed when empty and again when filled. The carts were then driven about, in order to test steadiness of load, as well as to observe any splashing; after which the water was run off, notice being taken of the time occupied, in emptying, as well as in filling the barrel.

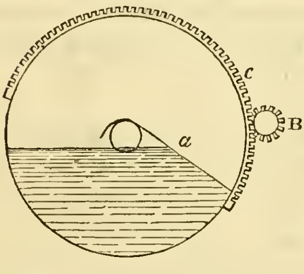
Reeves and Son gained the first prize with a new invention (at least new since the last trial of watercarts by the Royal Agricultural Society), in which the water is emptied from behind at the centre of the barrel; thus not only obtaining a sufficient height of delivery, but also a better position for the load, it being thrown well down between the wheels and thus steadying it. The other carts all emptied themselves at the bottom of the barrel, and some of them possessed many superior points, and might be used as liquid-manure distributors as well as water-barrels.

Some good pumps were attached to the barrels, especially that of Messrs. Fowler and Co., which is hereafter described.

No. 1594. *R. and J. Reeves and Son, of Westbury, Wilts.*—The barrel is cylindrical, and is mounted longitudinally on the iron front and back cross-pieces of the shaft-frame; the shafts being mounted on strong cast-iron brackets.

The barrel is of wrought iron, and empties itself in the centre, by means of a partition, *a*, inside, which extends from the outer circumference of the barrel to its centre, where it is curved round; it also extends from end to end. The first half of the water runs out as in an ordinary water-barrel, but the second half is delivered by turning the barrel by means of a lever-handle and pinion, B, gearing with toothed segments, *c*, attached to the outside of the barrel. The lever-handle is fitted with a catch, so that the barrel may be held in any position.

Fig. 33.—*Section of Messrs. R. and J. Reeves and Son's Water-barrel, No.* 1594.

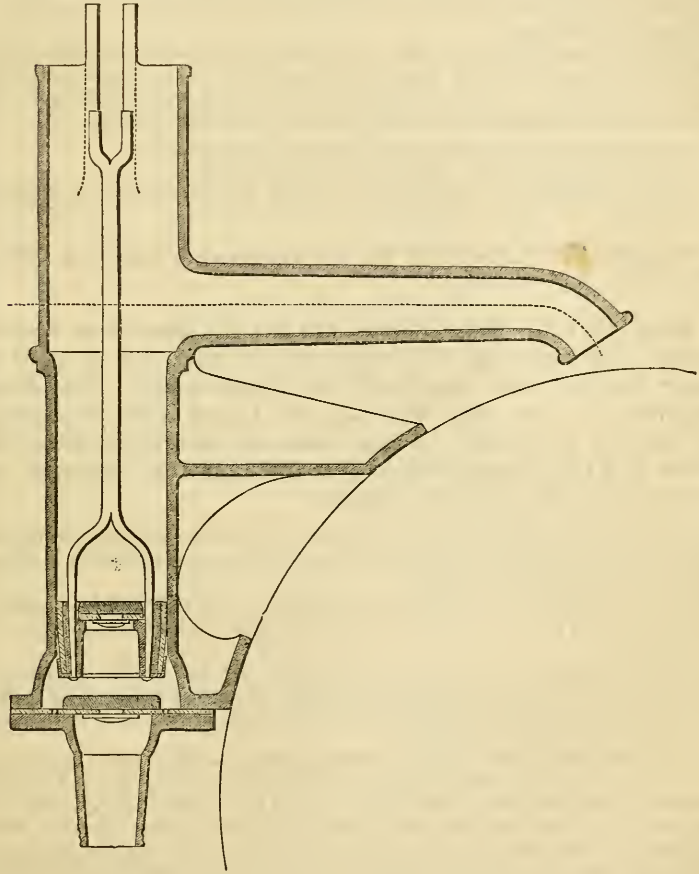


The pump is 4 inches in diameter, and is made of galvanized sheet-iron. The bucket is a leathered cast-iron cup, with leather valve. The suction-hose is $1\frac{3}{4}$ inch in diameter, and is made of vulcanized india-rubber, while the joint is made of gutta-percha, and held by a brass clip. The advantages of this barrel are, that the weight is thrown more between the wheels, which must steady the load; this would therefore be a very useful water-barrel for hilly districts. It is easily filled, the height being less than in ordinary water-carts. The time occupied in filling was 8′ 35″, and in delivering 2′ 30″. The price is 24*l.*, and therefore lower than any other cart in its class.

No. 1360. *William Affleck, of Swindon, Wilts.*—This barrel is cylindrical, of wrought iron, with one seam of rivets on the top and round each end. It is supported on two cast-iron cross-bearers, and bolted to the shaft-frame with four iron stays. The shafts are of ash, and provided with two props before and one placed behind. The wheels are 4 ft. 6 in. diameter, and are composed of iron nave, ash spokes, and elm felloes with 4-inch tire. Capacity 145 gallons. The delivery cock, 3 inches in diameter, is placed at the bottom of the barrel; emptying itself at the back, the height of delivery being 3 ft. $8\frac{3}{4}$ in. On the top of the barrel is a manhole with funnel top, which prevents splashing, and was very effective during trial. The pump is $4\frac{1}{2}$ inches diameter with $9\frac{3}{4}$-inch stroke; it has an india-rubber sucker, and a 3-winged valve, so that thick runnings of the farmyard may be pumped up. The barrel may be fitted with a distributor, and cleaned out by the manhole. The time occupied in filling was 8′ 28″, and in delivering 1′ 45″. The construction, materials, and workmanship are good, and the price, 24*l.* 10*s.*, is moderate.

No. 994. *J. Fowler and Co., of Leeds.*—The barrel is cylindrical and of wrought iron; it is divided in the centre by two sheets of iron plates, which allow the water to pass freely, but prevent splashing, and thus render the load steadier and easier for the horse. It is filled by a pump in front, which is placed there in order to balance the cart; but a larger suction-pipe is necessary, which is expensive.

Fig. 34.—*Section of Messrs. J. Fowler and Co.'s Pump for Water-Cart, No.* 994.



The pump is $4\frac{3}{4}$ inches in diameter, with $9\frac{1}{2}$-inch stroke, and is provided with leather valves. The suction-pipe is made of leather, with a double coil of copper-wire inside. The water is discharged from behind, at the bottom of the barrel, by a $1\frac{7}{8}$-inch delivery-cock which is 4 ft. 2 in. from the ground. The barrel is supported on an ash-frame. The axles are round, and $2\frac{1}{4}$ inches in diameter. The nave of the wheel is of cast iron, with wrought-iron spokes and rim.

The weight empty, is 17 cwt. 1 qr. 13 lbs., which is somewhat heavy. Its capacity is 212·5 gallons.

The time occupied in filling was 9′, and in delivering 4′ 50″. It is highly commended for steam-cultivation purposes. Its price is 30*l.*

No. 1361. *William Affleck.*—The barrel is cylindrical, and is placed across the frame, to which it is bolted by four stays. The frame rests on, and is well bolted to, a cast-metal cross-bracket fastened on the fore-axle and on two longitudinal brackets on the hind-axle. The four wheels are of cast metal.

There is a 3-inch delivery-cock at the bottom of the barrel on each side; the water may thus be delivered from either side as required; the height of delivery is 3 ft. $2\frac{1}{2}$ in.

There is a manhole at the top. The pump is $5\frac{3}{4}$ inches diameter, with $9\frac{3}{4}$-inch stroke, and is well stayed by $1\frac{1}{4}$-in. × $\frac{5}{8}$-in. iron rods, these being bolted to the frame. This is a spacious barrel, its capacity being 220 gallons. It is strong, well made, and admirably adapted for watering stock.

First Prize of 10*l.* to Reeves and Son (1594), of Westbury.
Second Prize of 5*l.* to W. Affleck, (1360), of Swindon.
Highly Commended.—Fowler and Co. (994), Leeds; W. Affleck, (1361), Swindon.

For Table XXVI., Carts for the Conveyance of Water with Pumps attached, see opposite page.

Class XXVII. Other Carts.—On the list there were fifteen entries, eight of which were presented for trial, and six of this latter number were tested with the dynamometer. The load employed in the trial was bags of Indian corn, weighing 31 cwts. 1 qr. 8 lbs. These carts are similar to those in Class XXIII., simply differing in being a little stronger in construction and of greater capacity.

No. 5042. *F. P. Milford, of Kenn, Exeter.*—The construction of this cart is similar to the one already described in Class XXIII., simply differing in being stronger and of greater capacity.

The dimensions of the body are 6 ft. $1\frac{1}{2}$ in. × 4 ft. × 1 ft. 6 in., capacity 36·9 cubic feet, and area over ladders for harvest purposes large, being 88·9 square feet.

The mean draught on the road per ton of gross load was 46 lbs., and per ton of useful load 64 lbs., with a load of 30 lbs. on the horse's back; while in the field these were respectively 139·3 lbs., 194 lbs., and 20 lbs. It is a strongly-built cart, and its price is 19*l.* 10*s.*

No. 1242. *George Ball, of North Kilworth, Rugby.*—The construction of this cart is also similar to that described in Class XXIII., only having a greater capacity. The dimensions of the body are 3 ft. 11 in. × 5 ft. $7\frac{3}{4}$ in. × 1 ft. $6\frac{1}{2}$ in., capacity 34 cubic feet, and area over ladders for harvest purposes 60·4 square feet. The tyres are convex and 4 inches wide. On the road, the mean draught per ton of gross load was 48·7 lbs., and per ton of useful load 67·1 lbs., with 50 lbs. weight on the horse's back. In the field these were respectively 179 lbs., 234 lbs. and 60 lbs.

This is a strong, well-built cart, and its price is 19*l.* 10*s.*

No. 1445. *Hayes and Son, of Stamford, Lincolnshire*—This cart is also of similiar construction to that described in Class XXIII., only stronger and of greater capacity.

The dimensions of body are 5 ft. 8 in. × 3 ft. $9\frac{3}{4}$ × 1 ft. $5\frac{3}{4}$ in., capacity 33·3 cubic feet, and area over ladders for harvest purposes 71·6 square feet.

TABLE XXVI.—CARTS for the CONVEYANCE of WATER with PUMPS attached. (CLASS XXVI.)

Name of Exhibitor		Reeves & Son.	Affleck, W.	Fowler, J.	Affleck, W.
Catalogue number		1594	1360	994	1361
Order of trial		6	7	10	8
Price		24*l.*	24*l.* 10*s.*	30*l.*	27*l.* 10*s.*
Mean diameter of wheels ..		4′ 6″	4′ 9″	..	3′ 4″ hind, 2′ 6″ fore.
Width and thickness of tyres		$3\frac{1}{2} \times \frac{1}{2}$	..	..	4″
Dimensions of tank		4′ × 2′ 11″	4′ × 2′ 9″	5′ $0\frac{3}{4}$″ × 3′ 11″	4′ 4″ × 3′ $2\frac{1}{2}$″
Size of pump		$4\frac{1}{2}$″ dia. 10″ st.	$4\frac{1}{4}$″ dia. $9\frac{3}{4}$″ st.	$4\frac{1}{2}$″ dia. $9\frac{1}{2}$″ st.	$5\frac{3}{4}$″ dia. $9\frac{3}{4}$″
Capacity in gallons		160	145	212	220
Weight empty		10 3 9	10 2 5	17 1 13	
„ filled		25 0 13	23 2 5	36 1 10	
Delivery cock		$3\frac{1}{2}$″	3″	$1\frac{5}{8}$″	3″
POINTS OF MERIT:—	Perfection being				
1. Mechanical construction, soundness and quality of materials, workmanship, and durability ..	250	200	200	None given.	None given.
2. General design and balance of carriage	150	150	100		
3. Capacity	150	130	120		
4. Efficiency and simplicity of pump	150	100	100		
5. Facilities for delivering water ..	150	150	150		
6. Price	150	130	130		
Total	1000	860	800	..	..

On the road the mean draughts were,—per ton of gross load 38 lbs., and per ton of useful load 55·1 lbs., with a load of 30 lbs. on the horse's back. On the field these were respectively 142 lbs., 206 lbs., and 25 lbs.

It is a well-constructed cart, and its price is 21*l.* 10*s.*

Prize of 10*l.* to F. P. Milford (5042), of Exeter.
Highly Commended.—G. Ball (1242), of Rugby.
Commended.—Hayes and Son (1445), of Stamford.

TABLE XXVII., OTHER CARTS, overleaf.

TABLE XXVII.—OTHER

Name of Exhibitor		Milford, T.	Ball, G.
Catalogue number		4878	1242
Price		17*l.*	19*l.* 10*s.*
Weight empty		10·0·25	11·2·20
„ loaded		41·2·5	43·0·7
„ useful load		31·1·8	31·1·17
Nature of load		Corn in Sacks.	Corn in Sacks.
Width and thickness of tyres		4″ × ⅝″	4″ × 3″ to ½″
Maximum load per inch of tyres in cwts.		5·2	5·4
Diameter of wheels		4′·9″	4′·10″
Inclination of wheels		2¼°	3½°
Gauge width of wheel centres on ground		5′·0½″	5′·1″
Size of body		5′·9″ × 1′·4½″ × 3′·9½″	3′·11″ × 5′·7¾″ × 1′·6½″
Capacity in cubic feet		29·8	34
Area for harvest purposes		64·8	69
Height of floor		3′·1¼″	3′·3″
Mean draught in lbs. on level road		96·7	104·7
Ditto per ton gross load		46·5	48·7
Ditto per ton useful load		61·8	67·1
Rate in miles per hour		2·67	2·89
Load on horse's back in lbs.		35	50
Mean draught in lbs. on level road		333	365·7
Ditto per ton gross load		165	170
Ditto per ton useful load		212	234
Rate in miles per hour		2·66	..
Load on horse's back in lbs.		25	35
	Perfection being		
POINTS OF MERIT:—			
1. Mechanical construction, strength, soundness, and quality of materials	200	..	170
2. General design	100	..	80
3. Balance, capacity, and arrangement for tipping	200	..	180
4. Weight (width of tyre considered)	150	..	120
5. Draught	150	..	100
6. Price	200	..	150
Total	1000	..	800

CARTS. (CLASS XXVII.)

Ball, W.	Hayes & Son.	Vipan & Headley.	Milford, F. P.
1319	1445	782	5042
25*l.*	21*l.* 10*s.*	17*l.* 10*s.*	19*l.* 10*s.*
12·1·15	13·3·6	9·3·17	12·0·18
43·2·23	45·0·14	41·0·25	43·1·26
31·1·8	31·1·8	31·1·8	31·1·8
Corn in Sacks.	Corn in Sacks.	Corn in Sacks.	Corn in Sacks.
$4\frac{1}{2}'' \times \frac{5}{8}''$	$4\frac{1}{2}'' \times \frac{3}{4}''$	$4'' \times \frac{5}{8}''$	$4\frac{1}{2}'' \times \frac{5}{8}''$
4·8	5·0	5·1	4·8
5′·1″	5′·0″	4′·11″	4′·11″
$2\frac{1}{4}°$	$3\frac{1}{2}°$	3°	$2\frac{3}{4}°$
$5'·1\frac{1}{2}''$	4′·10″	$4'·9\frac{1}{2}''$	5′·0″
$6'·3\frac{1}{2}'' \times 4'·1'' \times 2'·0\frac{1}{2}''$	$5'·8'' \times 3'·9\frac{3}{4}'' \times 1'·5\frac{3}{4}''$	$5'·1\frac{1}{2}'' \times 3'·9\frac{1}{4}'' \times 1'·5''$	$6'·1\frac{1}{2}'' \times 4'·0'' \times 1'·6''$
51·06	33·3	27·26	36·9
60·4	71·6	75·8	88·2
3′·8″	$3'·3\frac{1}{2}''$	3′·6″	$2'·10\frac{1}{2}''$
99·	86·	84·7	99·9
45·4	38·	41·1	46·
63·5	55·1	54·3	64·
2·69	2·72	2·7	2·97
50	30	50	30
325	321	297	302·3
149	142	144	139·3
208	206	190	194·
2·97	2·97	2·7	3·0
25	25	38	20
..	170	..	190
..	86	..	75
..	150	..	150
..	90	..	120
..	140	..	120
..	100	..	160
..	730	..	815

Class XXVIII. Low-bodied Carts on Springs for Conveyance of Stock.—The cart entered was Corbett and Peele's, which obtained the first prize at Manchester.

No. 1393. *Corbett and Peele, of Shrewsbury.*—This is a crank-axle cart. The dimensions of the body are 8 ft. 7 in. × 4 ft. 2 in. × 5 ft. 11 in., and its capacity 196 cubic feet; provided with a movable top cover. The body is supported on each side by a spring 4 ft. 6 in. long, and composed of ten $2\frac{1}{4}$-in. × $\frac{1}{4}$-in. plates. The height of the floor from the ground is 1 ft. 3 in. Stock may be put in either from the back or from the front. In going up or down hill, the body is levelled by altering the pitch of the shafts, by means of a leverage at the side in front. A roller is placed across the shafts, by means of which, with a rope, refractory or dead animals may be pulled into the cart. The axle is $2\frac{1}{2}$ inches square and cranked.

The wheels are 4 ft. 8 in. diameter, having 14 spokes. Price 38*l*. 10*s*. It is a useful general purpose farm-cart, and well constructed.

Prize of 10*l*. to Corbett and Peele (1393), of Shrewsbury.

TABLE XXVIII.—LOW-BODIED CARTS ON SPRINGS for the CONVEYANCE of CATTLE. (CLASS XXVIII.)

Name of Exhibitor	Corbett & Peele.
Catalogue number	1393
Order of trial	1
Price	38*l*. 10*s*.
Mean diameter of wheels	4′ 8″
Width of thickness of tyres	$2\frac{1}{2} \times \frac{3}{4}$
Size of body	8′ 7″ × 4′ 2″ × 5′ 11″
Capacity in cubic feet	196
Height of floor	1′ 3″
Opening of springs	3″
Size of springs	4′ $6\frac{1}{2}$″ × $2\frac{1}{4}$′ × $\frac{1}{4}$″
Number of plates (spring)	10

Class XXIX. Lorries or other Vehicles for the Conveyance of Implements.—In this class there were six entries on the list, while only two lorries were presented for trial,—F. P. Milford's and Hayes and Son's.

As before mentioned, two prizes were offered at the Manchester meeting for "carriages with low body adapted for moving stock and implements," while at the present meeting a separate prize was offered for "lorries or other vehicles for the conveyance of implements." These cannot be considered as an important class of implements to the farmer, for it does not seem at all likely that 20*l*. will be expended on a lorry for transporting implements on the farm.

As for harrows and such like tillage implements they are more conveniently loaded and carried on a low frame, supported on four cast-iron wheels of about 12 inches diameter, which could be made by the home blacksmith and carpenter at a cost of about *3l.* In a lorry there is a dead lift of 4 feet when loading it. The prize lorry has harvest ladders attached, so as to make it useful for carting-in corn; but of course for this purpose it is not only less convenient, but also has a heavier draught than an ordinary farm-waggon, owing to the smaller diameter of the wheels. Lorries may be useful for transporting grain to market, and also might be made excellent for the transport of calves, sheep, and lambs, if side rails were attached to the body.

No. 5043. *F. P. Milford, of Haldon Works, Kenn, Exeter.*—The body is similar to that of Milford's highly-commended harvest-cart in Class XXIV. Its dimensions are 9 ft. × 5 ft. 7 in. × $7\frac{1}{2}$ in.; and its area is 50·4 square feet; it is boat-shaped, thus always tending to concentrate its load towards the centre of the body, which is an advantage in travelling on rough roads or over uneven ground. The spaces between the boards composing the floor are covered with hoop iron. The tailboard is removable. The height of the sides from the ground is 4 feet. Movable fore and tail harvest ladders are attached, inclining upwards and outwards, thus giving a large area for harvest purposes, as well as a secure load. In this respect it is superior to Hayes and Son's, where there is only a front vertical harvest ladder. There are no springs below the body. The diameter of fore wheels is 2 ft. 9 in., that of hind wheels 3 ft. 10 in., with $2\frac{1}{2}$-in. × $\frac{5}{8}$-in. tyres. The gauge width of wheel centres on the ground is 5 ft. 2 in., and the wheel base from the centre of the fore wheel to that of the hind wheel, is 4 ft. 10 in. The front wheels lock through under the body, so that the lorry may turn upon its own ground. The hind wheels are dragged by a slipper.

There is only one attachment for shafts, and it would certainly be an improvement for heavy loads to be able to attach both horses abreast. Its price is *20l.*

No. 1447. *Hayes and Son, of Stamford.*—The size of body is 9 ft. × 5 ft. 7 in. × $7\frac{1}{2}$ in., thus a longer, narrower, and shallower lorry than the last-described one, while its area is 54·12 square feet, and therefore only 3·72 square feet larger. The tailboard is fixed. Only one vertical harvest ladder is attached in front. The body is supported on strong springs with a check-spring. The diameter of the fore wheels is 3 feet, and that of the hind wheels 3 ft. 3 in. The gauge width of the wheels on the ground is 4 ft. $9\frac{1}{2}$ in., and the wheel base is 6 ft. $7\frac{1}{2}$ in., exceeding Milford's by 1 ft. $9\frac{1}{2}$ in.

This is a well-constructed lorry, with excellent workmanship, although there is a good deal of useless ornament about it. Its price, *33l.*, is also rather high.

In comparing the two lorries the Judges considered Milford's lorry cheaper, more compact, with superior harvest attachments, quite as convenient for transporting implements, and altogether better suited for farm purposes.

Prize of *10l.* to F. P. Milford (5043), of Kenn, Exeter.

Table XXIX., Lorries, &c., for Conveyance of Implements, overleaf.

TABLE XXIX.—LORRIES or other VEHICLES for the CONVEYANCE of IMPLEMENTS. (CLASS XXIX.)

Name of Exhibitor	Milford, F. P.	Hayes & Son.
Catalogue number	5043	1447
Order of trial	4	1
Price	20*l.*	33*l.*
Mean diameter of wheels	3′ 10″ hind × 2′ 9″ fore	3′ 3″ hind, 3′ fore
Width and thickness of tyres ..	$2\frac{1}{2}'' \times \frac{5}{8}$	$2\frac{1}{4}'' \times \frac{3}{4}''$
Size of body	$9'\ 0'' \times 5'\ 7'' \times 7\frac{1}{2}'$	$11' \times 4''\ 11' \times 3\frac{1}{2}''$
Area of body	50·4	54·12
Height of floor	3′ 6″	3′ 6″
Opening of springs	..	..
Size of springs	..	$3 \times 2\frac{1}{2} \times \frac{5}{16}$
Number of plates (spring)	..	10
Gauge width of wheel centres on ground	5′ 2″	$4'\ 9\frac{1}{2}''$
Wheel base	4′ 10″	$6'\ 7\frac{1}{2}''$

Class XXX. Carts with Crank Axle and Low Body.—There were seven entries on the list, and four carts were presented for trial: of these two were tested with the dynamometer.

Only two of the carts were considered suitable for farm purposes, the others having neither close sides nor ends. The prize was awarded to W. Ball and Son; for Milford's cart was far too complicated, and most of its parts were removable, and would be apt to get lost. They were loaded with 21 cwts. of Indian corn in bags.

No. 1322. *W. Ball and Son, of Rothwell, Kettering.*—The construction of the body is similar to that of cart No. 1309 in Class XXIII., already described, excepting that the sides are of $1\frac{1}{2}$-inch elm. The side-boards are movable. The tipping apparatus consists in an upright sword, checked by a lever-spring handle and pin, the same as in cart No. 1309.

The axle is $2\frac{1}{2}$ inches square, and solid through and through. The crank is 1 ft. 2 in. deep, and the length of the axle between the cranks is 4 ft. $1\frac{1}{2}$ in. In tipping, the axle turns, being connected to the body. The diameter of the wheels is 4 ft. 8 in., with $2\frac{1}{2}°$ inclination to vertical, and the tyre is 4 inches wide and $\frac{5}{8}$ inch thick.

On the road its mean draught per ton of gross load was 35·6 lbs., and per ton of useful load 54·6 lbs., with a load on the horse's back of 45 lbs.; these in the field were respectively 132·3 lbs., 203 lbs., and 35 lbs.

It is a well-constructed cart, useful for carrying sheep or pigs, and may be turned to many uses on a farm. Its price is 20*l.*

Prize of 10*l.* to W. Ball and Son (1322), of Rothwell, Kettering.

TABLE XXX.—CARTS with CRANK AXLE and LOW BODY. (CLASS XXX.)

Name of Exhibitor	Ball, W.	Milford, F.
Catalogue number	1322	5044
Price	20*l.*	25*l.*
Weight empty	11·1·5	11·3·17
,, loaded	32·1·5	32·3·17
Useful load	21·0·0	21·0·0
Nature of load	Corn in Sacks.	Corn in Sacks.
Width and thickness of tyres	4″ × ⅝″	3½′ × ⅝″
Maximum load per inch of tyres in cwts.	4·	4·7
Diameter of wheels	4′·8″	5′·9″
Inclination of wheels	2½°	1¼°
Gauge width of wheel centres on ground	5′·8″	5′·6″
Size of body	5′·5″ × 3′·8½″ × 1′·5″	5′·9″ × 3′·9″ × 1′·7½″
Capacity in cubic feet	26·36	34·7
Area for harvest purposes	..	..
Height of floor	2′·6″	2′·0″
Mean draught in lbs. on level road ..	57·3	53·8
Ditto per ton gross load	35·6	32·8
Ditto per ton useful load	54·6	51·2
Rate in miles per hour	2·76	2·88
Load on horse's back in lbs.	45	45
Mean draught in lbs. on level road ..	213	188
Ditto per ton gross load	132·3	144·6
Ditto useful load	203	176
Rate in miles per hour	2·58	2·61
Load on horse's back in lbs.	35	35

SECTION VII.—MOVABLE HUTS.

Class XXXI. Shepherds' Huts on Wheels.—There were four entries, and three of these were presented for trial. The prize hut was not ventilated, and it was considered that a ventilating shutter in the roof would effect a great improvement in this respect.

No. 357. *J. P. Fison, of Teversham Works, Cambridge.*—The framing is of oak. The sides are formed with double ⅝-inch boards. The roof is arched and covered with zinc. The inside dimensions are 9 ft. 6 in. × 6 ft. 1 in. × 7 ft. 1 in. The internal arrangements are as follows:—The door is in front, and, on entering, a cupboard is seen on the left, 2 ft. × 18 in., with two shelves; also a sliding washstand with a 13-inch galvanized bowl.

The window is 2 ft. 4 in. square, and below it is fitted a hinged table, which may be let down. At the end is a movable bed, 6 ft. 1 in. × 3 ft., which is drawn up or pulled down by sash-weights. Under the bedstead are two lockers with hinged sparred doors for lambs, and a third locker for corn. The stove is 6¾ inches square and 14 inches high, with a 3½-inch pipe; guarded by sheet iron.

The van rests upon four cast-iron wheels of 2 feet diameter, the front ones locking under for turning.

This is a very useful hut, and might be employed for various purposes. It would be greatly improved by being provided with some means of ventilation. Its price is 18*l.*

No. 5815. *Henry Inman, of Rose Bank, Stretford, Manchester.*—The dimensions of this hut are 8 ft. 2 in. × 5 ft. 4 in. × 6 ft. 6 in., and it rests upon four wheels of 1 ft. 8 in. diameter. The sides are formed of $\frac{3}{4}$-inch red deal boards, which lap. There are two windows, one of which is made to open. The bed is made so as to close down, the legs take out, and the bed forms a locker with lid. The stove may be used either open or closed, takes two pots, and is also provided with a steamer. Its dimensions are 16½ in. × 14 in. × 7 in., with a 4½-inch pipe. Its price is 15*l.*

There are no turning arrangements, which is a disadvantage.

First Prize of 10*l.* to J. P. Fison (357), of Cambridge.
Second Prize of 5*l.* to H. Inman (5815), of Manchester.

Table XXXI.—Shepherds' Huts on Wheels. (Class XXXI.)

Name of Exhibitor	Fison, J. P.	Inman, H.
Catalogue number	357	5815
Order of trial	4	2
Price	18*l.*	12*l.*
Size of wheels, fore	2′ 0″	1′ 8″
„ hind	2′ 0″	1″ 8′
Width and thickness of tyres ..	4½′ × ¾″	2½″
Height of floor	2′ 7″	..
Inside dimensions	9′ 6″ × 6′ 1″ × 7′ 1″	8′ 2″ × 5′ 4″ × 6′ 6″
Capacity in cubic feet	409·3	283·9
Fire arrangements (stove)	14″ × 6¾″ × 6¾″ (6¾″ pipe)	14″ × 7″ × 16½″ (4½″ pipe)
Sleeping accommodation	6′ 1″ × 3′ 0″	5′ 0″ × 3′ 3″
Lighting arrangements	·None	None.

Class XXXII. Vans for Men engaged in Steam Cultivation.—Three vans were entered and tried. These were first of all tested as regards their ventilation. After closing ventilators, doors, and windows, a given weight of waste and tallow was burnt on the fireplace in each van, and when the fires had gone out, each van was examined. Faulkes's van contained a stronger stench than the other two,—Fowler's and Aveling and Porter's, which latter were about equal. This result was owing to the fact that there are no shutters in the roof of Faulkes's van, and it was therefore perfectly closed up; the other two have slides which do not fit closely together when shut. It was considered a great advantage to have some means of ventilation uncontrollable by the men, as they are so addicted to closing up every means of ventilation, to the injury of their health. When all the ventilators were opened the stench cleared away from Faulkes's van quite as soon as from the others, which shows that its ventilation could be made very perfect.

The object of the second test was to try the ventilation with all the ventilators open and with the cooking apparatus at work; this also forming a test as to the efficiency of the latter. The following Table shows the time occupied in boiling water, also the temperature of the van at the beginning of the experiment, and the temperature at the close of the same, also the increase in temperature during the experiment:—

	Aveling & Porter.	J. Fowler & Co.	Faulkes, M.
Time occupied in boiling water in minutes	37	46	45
Temperature of van at beginning of experiment	90½	82	85
Ditto close of ditto ..	109¾	110	101
Increase in temperature	19¼	28	16

It will therefore be seen from the above Table that Aveling and Porter were most successful as to the time occupied in boiling the water, which speaks well for the efficiency of the cooking apparatus. Fowler and Co. and M. Faulkes were about equal in this respect.

The increase in temperature was least in Faulkes's van, although it was closed eight minutes longer than Aveling's van, which proves that Faulkes's van possesses decidedly the best controllable ventilation of the three, and would be altogether superior in this respect, were it provided with some means of ventilation uncontrollable by the men.

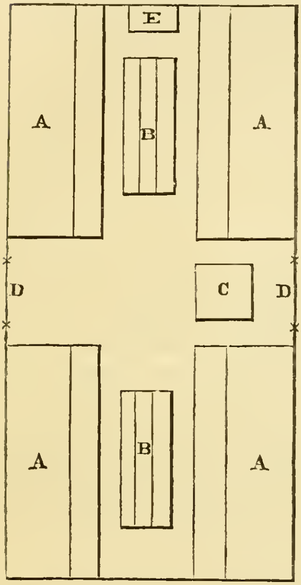
The vans were now weighed—first the fore wheels and then the hind wheels being placed on the scales—and we shall see from the annexed Table that Faulkes's van weighs only 50 cwts. 2 qrs. 8 lbs., while Fowler's weighs 60 cwts. 2 qrs. 18 lbs., and Aveling's weighs 61 cwts. We also notice that in Fowler's van a greater proportion of the weight is thrown upon the hind wheels.

Each van was then loaded with 6 cwt. and their draught tested on the hard road by the dynamometer, and we shall see from the Table that Fowler's had the lowest number of pounds of mean draught per gross load,—103·6 lbs., while Aveling's had 115·5 lbs., and Faulkes's 115·7 lbs.

The other points taken into consideration were the sleeping accommodation, the convenience for cooking and storing victuals, ground space of the van, strength of frame and general construction, all of which will be noticed in the following descriptions:—

No. 992. *John Fowler and Co. of Leeds.*—This van contains five beds, A, one of these being placed against the side in each corner, and the fifth above, at one end. The beds are simply boarded benches, which may be used either as bench or bed. A table, B, is fixed in each end of the van between the beds, these being composed of a fixed 6-inch leaf, with two 9-inch hinged flaps. A stove, C, is fixed between the two doors, D; these being placed in the centre of the van, one on each side, thus the heat of the cooking is readily carried off.

Fig. 35.—*Ground Plan of Messrs. J. Fowler and Co.'s Sleeping Van, No. 992, showing the Internal Arrangements.*



A. Beds. B. Tables. C. Stove. D. Doors. E. Foreman's Desk.

Each man has a food cupboard, with lock and key. A desk, E, and cupboard, with two shelves for the foreman's accounts, is fitted up at one end of the van, where there is also a window with a socket-sash. No bedding nor fixed tools are supplied.

There are two ventilators in the roof, two on the sides and two on the ends.

The dimensions of the van are 15 feet × 6 feet 7 inches × 7 feet; its capacity is 714 cubic feet.

A large box for carrying tools and spare gear is fitted underneath the van; this was considered good.

The van is mounted on strong springs, which render it efficient on hard roads. The wheels are of cast iron, the hind ones being 5 feet diameter, and the fore wheels 3 feet 7 inches. The van was pretty steady in locomotion, and showed the lowest mean draught per ton of gross load in the class.

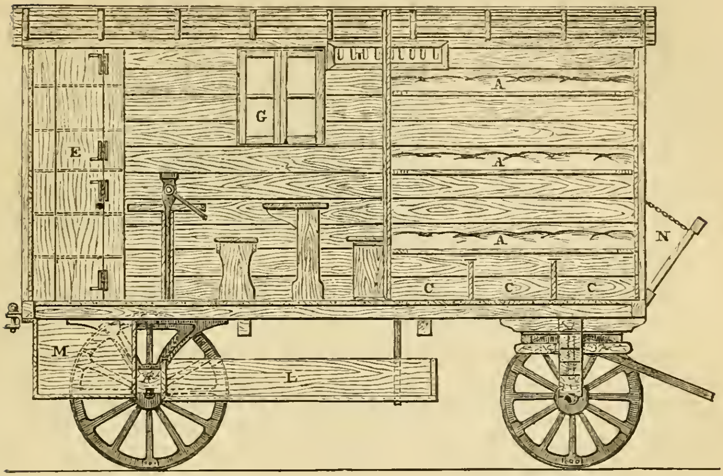
The construction is good, the framing being of oak and very strong. The price is 95*l*.

No. 5047. *Aveling and Porter, of Rochester.*—The fore part of the van contains six sleeping berths, A, placed back to back in three tiers, with a central partition between them, thus leaving a passage, B, between the walls and the beds on each side of the van. This is a good arrangement, inasmuch as the men are not liable to be lying against wet boards, as is sometimes the case when beds are placed against the outside walls. The beds are supported on slips of hoop-iron stretched on wood frames. Below the lower bed on each side are three clothes-lockers, C, one for each man.

In one corner of the hind part of the van is a stove, D, the woodwork behind it being protected by a sheet of wrought iron. As already stated, the stove is a good one. A food cupboard, E, is fitted in the opposite corner, and has six shelves, in order that each man may provide his own food and keep it separate from the rest. The hind part of the van also has in it a table, half of which may be let down when not required, a fixed seat, a movable form, and two stools, also a well-fitted vice.

The van is lighted by two windows, F, in front at the ends of the berth passages, and by two windows, G, on the sides of the van. Two ventilators, H, are at the fore end over the ends of the top berths, two, J, on the sides of the van, and one, K, over the door which is behind; this arrangement must render the top berths, especially those at the fore end, very cold.

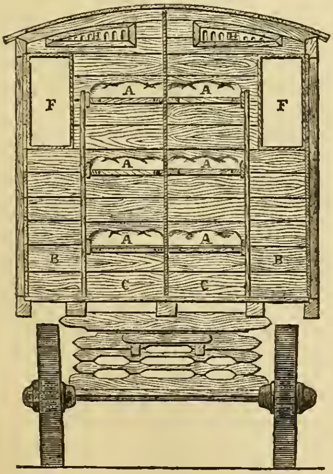
Fig. 36.—*Longitudinal Section of Messrs. Aveling and Porter's Travelling Waggon, No.* 5047.



A. Sleeping Berths.
C. Clothes Lockers.
E. Food Cupboard.
G. Side Window.

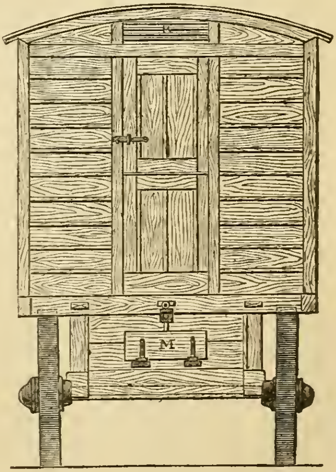
I. Side Ventilators.
L. Box for Spare Gear.
M. Box for Tools.
N. Rack for Waterproof Clothes.

Fig. 37.—*Transverse Section of Messrs. Aveling and Porter's Travelling Waggon, No.* 5047.



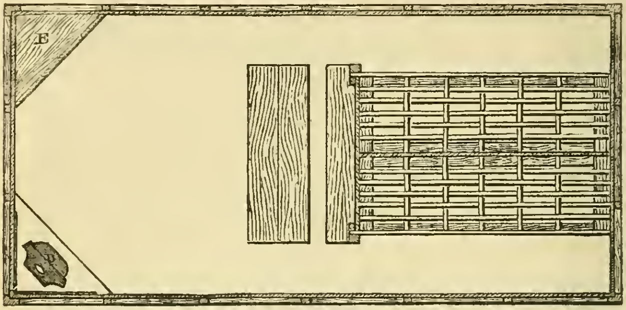
A. Sleeping Berths. B. Passage. C. Clothes Locker. F. Front Windows. H. Fore-end Ventilators.

Fig. 38.—*End View of Messrs. Aveling and Porter's Travelling Waggon, No.* 5047.



K. Back Ventilators.
M. Box for Tools.

Fig. 39.—*Plan of Messrs. Aveling and Porter's Travelling Waggon, No.* 5047.



D. Stove. E. Food Cupboard.

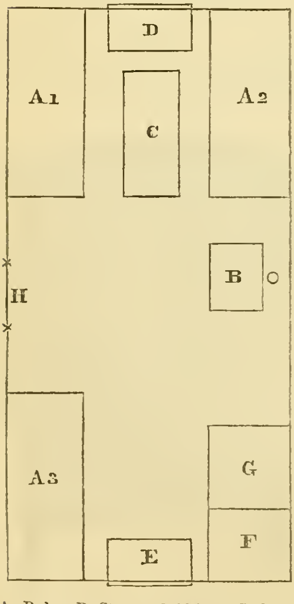
Air holes are made in the floor at the back of the stove to supply air to the fire.

The capacity of the van is 15 feet long, 7 feet wide by 6 feet 9 inches in height, inside measurement; cubic content 708 cubic feet.

A large open box, L, is fitted underneath the floor, in which shares and points are carried; also a box for tools, M, behind the axle, is fitted with lock and key. A rack, N, for holding waterproof cloths, is fitted to the front of the van. The storage for tools and spare gear was considered good.

The van is mounted on four wheels without springs, which renders it less perfect on a hard road. The diameter of the fore wheels is 3 feet 8 inches, and that of hind wheels 4 feet. It is well constructed, its framing being of oak, with deal sides, well adapted for drawing heavy implements behind it. Price 85*l*.

Fig. 40.—*Sketch of Mr. M. Faulkes's Travelling Van, No.* 5861, *showing the relative position of Contents.*



A. Beds. B. Stove. C. Table. D. Desk and Cupboard. E. Box and Cupboard F. Ventilated Cupboard. G. Open Boxes.

No. 5861. *Michael Faulkes, of Colston Bassett, Bingham, Notts.*—This van has six beds, A, in it—an upper and lower bed being fitted in each of three corners of the van. The lower bed is used as a seat in the day-time, while the upper one is folded up; this latter being fastened by hinges to the side walls, and supported at night by ledges. The upper bed is 2 ft. $7\frac{1}{2}$ in. clear of the roof. Six mattresses and six bolsters are supplied.

A stove, B, 1 ft. 1 in. × 2 ft. 4 in. × 1 ft. 9 in., and provided with two separate holes for cooking, is placed in the centre of the van, against the side, and opposite the door H—the pipe clearing the wall by 8 inches.

A table, C, with hinged flaps, is placed at one end between the beds A^1 and A^2.

TABLE XXXII.—VANS for STEAM CULTIVATION. (CLASS XXXII.)

Name of Exhibitor	Perfection being	Aveling.	Fowler.	Faulkes.
Catalogue number		5047	992	5861
Price		85*l.*	95*l.*	110*l.*
Weight empty		29·0·0, 32·0·0 } 61·0·0	24·0·14, 36·2·4 } 60·2·18	22·3·6, 27·3·2 } 50·2·8
„ loaded		67·0·0	66·2·18	56·28
Useful load		6·0·0	6·0·0	6·0·0
Nature of load		4 Men.	4 Men.	4 Men.
Width and thickness of tyres		6″ iron × ⅝″	6″ iron ⅝″	6″ × ⅝″
Maximum load per inch of tyres in cwts.		..	..	..
Diameter of wheels		4′ hind, 3′·8″ fore.	5′ hind, 3′·7″ fore.	3′·6″
Inclination of wheels		Vertical.	Vertical.	Vertical.
Gauge width of wheel centres on ground		..	..	..
Inside dimensions		15×7′ × 6′·9″	15′×6′·7″×7′·0″	16′×7′·4″×7′
Capacity in cubic feet		708	714	821·56
Area for harvest purposes		..	..	..
Height of floor		4′·1¾″	4′·3″	3′ 10″
Mean draught in lbs. on level road		387	345	327
Ditto per ton gross road		115·5	103·6	115·7
Ditto per ton useful load		..	..	..
Rate in miles per hour		2·34	2·35	2·29
Load on horse's back in lbs.		..	..	..
POINTS OF MERIT:—				
1. General construction, soundness and quality of materials and workmanship, strength, and durability	300	250	280	200
2. Internal arrangements and facilities for storing duplicate gear and tools	300	230	300	200
3. Capacity and ventilation	200	150	140	200
4. Portability and draught	50	45	50	40
5. Price	150	150	150	100
Total	1000	825	920	740

A writing-desk, D, with cupboard 3 ft. 10 in. × 2 ft. 6 in. × 1 ft. 2 in. underneath, is fitted up at one end of the van, while at the other end there is a deep box, E, with two clothes-lockers, 4 ft. × 2 ft. 6 in. × 1 ft. 3 in., underneath.

A cupboard, F, ventilated from outside, is in one corner opposite the bed D^3; under this cupboard is an open box, 4 ft. 2 in. × 3 ft. 2 in., with three 14-inch shelves; at the side of this are eight open spaces, G, 1 ft. 2 in. × 12 in. × 12 in., with two cupboards of same size above.

The van is well lighted by two windows at the ends, at D and E, each 2 ft. 6 in. × 1 ft. 10 in.; these swinging on a central pivot. Ventilators are fixed in the roof, sides and ends, and are very perfect in their action.

The dimensions of the van are 16 ft. × 7 ft. 4 in. × 7 ft., and its capacity is 821·56 cubic feet.

The van rests on strong springs, which are rather rough. It turns freely. The carriage is of oak, with ash framing and deal sides. In construction it was considered not sufficiently strong for drawing heavy implements behind it. Two boxes are fitted underneath for carrying tools and spare gear. Its price is high—110*l.*

First Prize of 15*l.* to J. Fowler and Co. (992), of Leeds.
Second Prize of 10*l.* to Aveling and Porter (5047), of Rochester.
Highly Commended.—M. Faulkes (586), of Bingham, Notts.

For TABLE XXXII., VANS for STEAM CULTIVATION, see p. 727.

Class XXXIII. For the best Guard or Appliance to the Drum of a Threshing-Machine, for preventing Accidents to the People employed.—At the Cardiff trials of threshing-machines a Medal was awarded to Wilder's patent self-feeding apparatus attached to a threshing-machine, and at the subsequent General Meeting of Members of the Society, held in December last, a suggestion was made by Mr. H. Corbet, on behalf of Mr. C. S. Read, M.P., that the Council should offer a special prize for the most efficient guard to the drum of a threshing-machine at work. The Council therefore resolved to offer the large Gold Medal of the Society, "for the best guard or appliance to the drum of a threshing-machine for preventing accidents to people employed."

The number of entries on the list was fifteen; of these, eleven were presented for trial, which, together with three not entered for trial, made in all fourteen.

None of the guards were sufficiently simple and effective; some of them being somewhat obstructive to the feeding, and thereby increasing the danger. Clayton and Shuttleworth's Wilder's self-feeding apparatus was the most effective as a guard; but could not be said to come within the instructions of the Society for awarding the prize. The Judges, therefore, withheld the prize, recommending that two prizes should be offered next year, one for a combined guard and feeder, and the other for a guard.

It is of the utmost importance that the feeding is not obstructed by the drum-guard.

The appliances entered to compete were constructed on various principles. There were drum-covers, which simply covered up the drum when the man feeding leaves the machine, as it is considered that most accidents occur when the feeding is not going on. There were also covers held up by springs, so that in the event of anybody falling off a stack, or the feeder falling forward, the mouth of the drum would be at once closed. Those drum-guards and self-feeders which fed the machine, either by double rollers or revolving tines, all broke the straw very much, and impeded the feeding.

The machines were drawn up in line at the end of the Implement-yard, and were there each in turn driven by a portable steam-engine for about ten minutes.

The wheat-sheaves used in the trial were in bad condition, and well adapted for testing the efficiency of the feeding-apparatus.

No. 338. *J. P. Fison, of Cambridge.*—This is a guard of very ingenious construction, and is capable of improvement. A revolving cylinder is supported over the mouth of the drum on the ends of two levers, to the other ends of which are attached weights; the least weight being thrown on the cylinder, it is at once moved down and closes the drum-mouth, at the same time slackening the driving-belt, and thus stopping its movement. The straw was not much broken, but the feeding was somewhat impeded. Its price is 6*l.*

No. 4048. *Wandley and Robb, of Outwell, Wisbeach, Cambridgeshire.*—This is a semicircular folding-guard in three parts, which, in opening the drum-mouth, are folded back into each other.

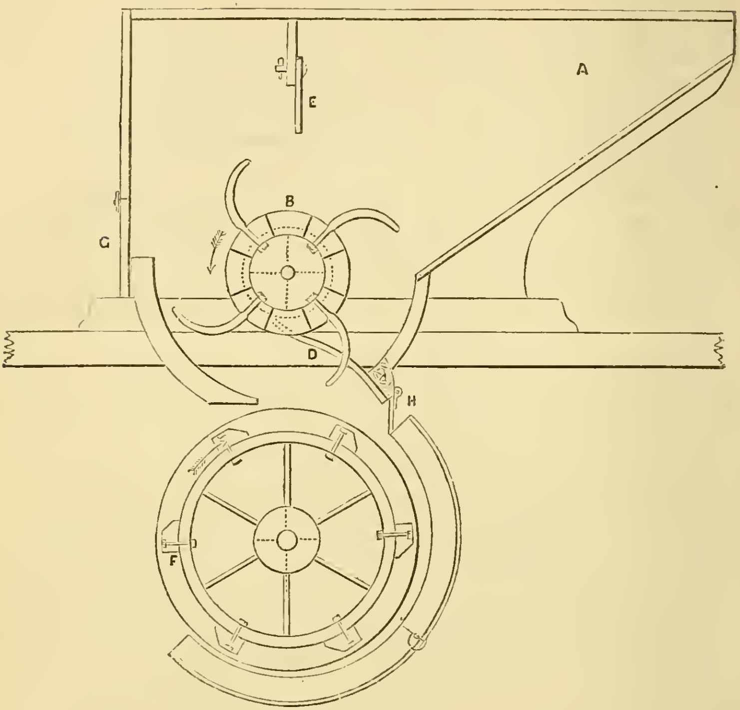
No. 1522. *Woods, Cocksedge, and Co., of Stowmarket.*—This drum-feeder (Fig. 41, p. 730) consists of a hopper, A; the front of which is formed by a sloping platform, upon which the sheaf-corn is placed; thence passing down to a revolving cylinder, B, which moves in the opposite direction to the drum. Curved arms are fitted on the circumference of the cylinder, which open out the sheaf and pass it down to the drum F. The fingers, D, work between the arms of the cylinder, and prevent any straws from being twisted round it. The cylinder is driven by a strap off the shaker-spindle, and the feed is regulated by a slide, E.

When the sheaves were put in sideways, the feeding was fair; but when put in head first, the cylinder would not draw them in. A firmly-tied sheaf was thrown in; this at once threw off the strap, thus constituting it a guard. The straw was somewhat broken.

No. 2653. *Barford and Perkins, of Peterborough.*—This drum-guard, consisting of a concave cover, is held up by springs pressing against projecting pieces of iron at each side, so that if any weight is thrown on to it, it at once closes the mouth of the drum. The guard may be fixed half up, when shovelling in loose corn; it is very simple, and may be fitted to any threshing-machine for 1*l.* 5*s.* The idea is an ingenious one, but not yet perfectly worked out.

No. 3518. *Ransomes, Sims, and Head, of Ipswich.*—This drum-feeder, which consists of a fluted cylinder, is placed a little in front and above the drum, and is driven at a speed of about 250 revolutions per minute. Above the cylinder are a number of wooden rollers covered with leather, and strung upon a spindle working in slide-guides; these are set in motion by the lower cylinder, and have a hole in the centre of larger diameter than that of the spindle, so that they are free to lift about 2 inches, without moving the spindle. When fed, the weight of the upper rollers pressing upon the lower cylinder draws in the sheaf-corn.

Fig. 41.—*Section of Messrs. Woods, Cocksedge, and Co.'s Drum-feeder, No.* 1522.



A tied bunch of straw, of the thickness of a man's arm, was introduced, but the rollers did not stop it; but one, of the thickness of a man's leg, was stopped, and could be pulled out again. When an entire tied sheaf was thrown in, the rollers stopped, and the driving-strap was thrown off. A good deal of straw lodged above the drum, because the opening above it was too large.

This feeder may be fitted to any threshing-machine, at a cost of 5*l.*, and is so constructed that the drum may be fed either with or without it, from opposite sides.

No. 5079. *Ruston, Proctor, and Co., Lincoln.*—The woodcut, Fig. 42, represents a plan, and Fig. 43 an elevation, in section, of the drum-feeder.

A is a hopper or box, containing the spindles b, b^1, b^2, which carry a number of curved tines, C. These spindles, with the tines, are made to revolve, in the direction shown by arrows, by means of the toothed pinions d; motion being given from the shaker crank-shaft S, to a pulley, P, upon the end of the spindle B. E is a board carrying a number of tines, which are so placed that the tines upon the spindle B^2 pass between them, thus preventing any corn being returned over the spindle. F is the drum, and G the concave; H H^1 are the shakers. The feed-board rests upon a spring, so that it yields to the sheaves and may be set lower or higher as required. The spindles are put in and out of gear by a clutch-gearing at the side of the feed-board. A tied sheaf was thrown in; this at once stopped the spindles by throwing off the strap, and in this

Figs. 42 and 43.—*Plan and Section of Messrs. Ruston, Proctor, and Co.'s Patent Self-feeding Gear for Threshing-Machine, No.* 5079.

Fig. 42.—Plan.

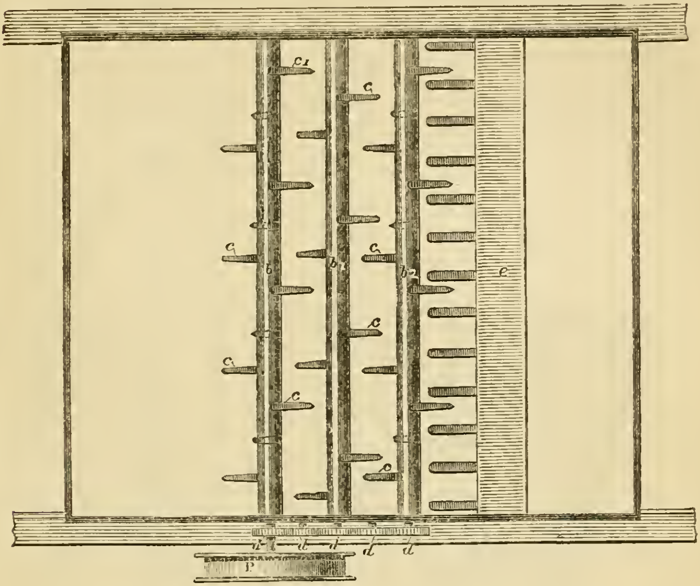
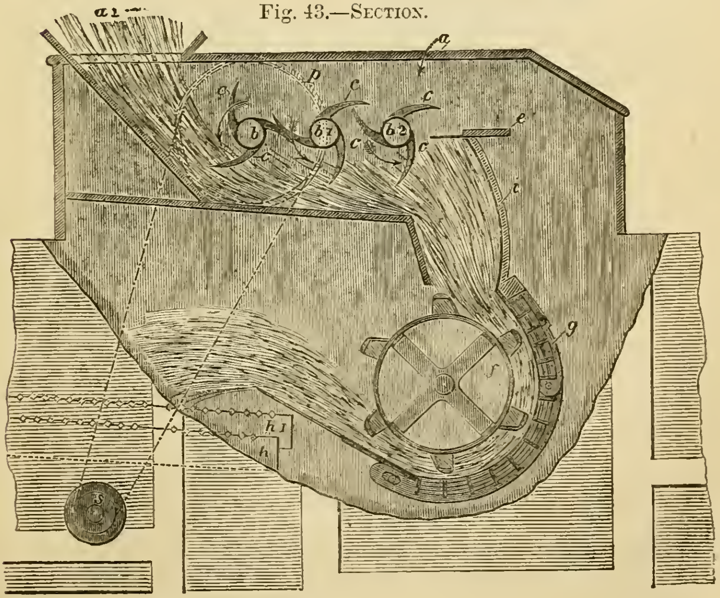


Fig. 43.—Section.

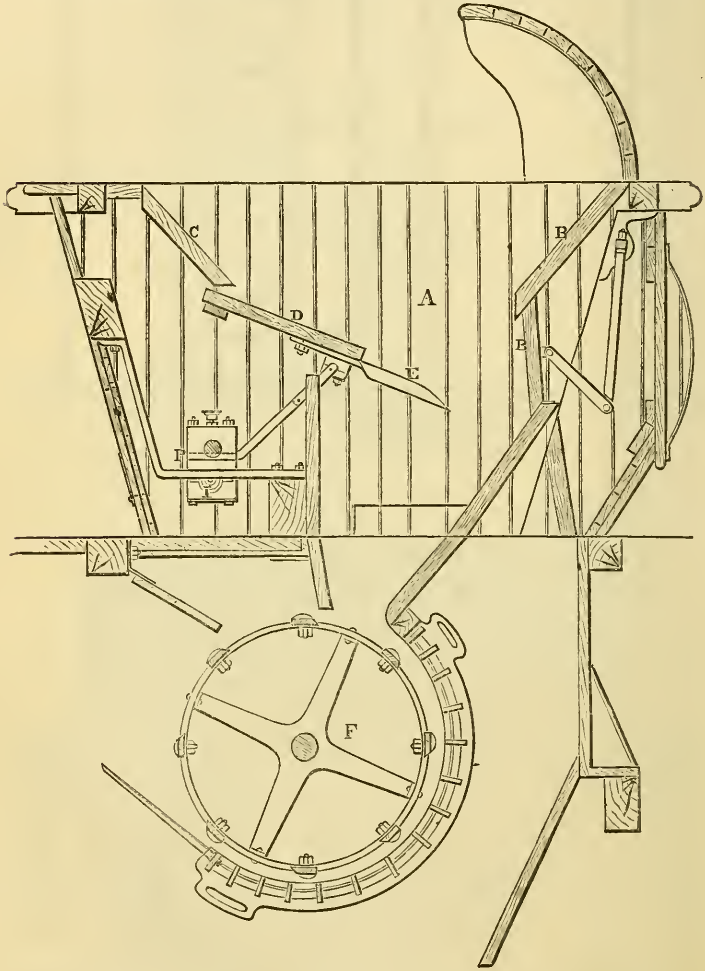


a. Hopper. *b*, b^1, b^2. Spindles. *c.* Curved Tines. *d.* Toothed Pinions. *f.* The Drum. *g.* The Concave. *h*, h^1. Shakers. *e.* Board.

respect was more effective than any of the other revolving feeders. The feeding was fair, but the straw was somewhat broken.

No. 5332. *Marshall, Sons, and Co., of Gainsborough, Lincolnshire.*—This is a Drum-feeder, and consists of a hopper, A, above the drum (Fig. 44). The fore

Fig. 44.—*Section of Messrs. Marshall, Sons, and Co.'s Patent Self-feeding Apparatus for Threshing-Machine, No.* 5332.



A. Hopper. B. Front Flaps. C. Inclined Feed-board. E. Spikes. F. Drum.

part of the hopper has two hinged flaps, B, which may be moved either in or out by a lever acted on by a screw at the side of the feed-board under the control of the attendant, to suit the feed. The back part has an inclined feed-board, C, and below it a hinged flap, D, with spikes, E, this being made to oscillate by a crank-shaft, F. The flap shakes up the corn very well, and must be useful where a man is careless in feeding; but as the opening of the hopper is so large, it cannot be said to be any protection to life.

No. 5333. *Marshall, Sons, and Co.*—An upright box is fitted over the mouth of the drum; this has movable flaps, which are fixed; they are altered to suit the feed by a pin at the side.

This is a simple and effective guard, but impedes the feeding considerably. During the trial the attendant was obliged to push the sheaves down; this defect was thought to be attributable to a piece of leather, which had been nailed to one of the flaps in order to prevent grain flying out of the drum; but after it was removed the feeding was still inefficient.

No. 5418. *W. Tasker and Sons, of Andover, Hants.*—This is a drum-feeder, and consists of three revolving triangular spindles, which are placed on an inclined plane, and are driven by three pinion-wheels with intermediate pinions. It is a fair feeder, but no protection to life.

No. 5067. *Clayton and Shuttleworth, of Lincoln.—Wilder's Patent Self-feeding Apparatus.*—This, as has already been mentioned, was particularly described in the report on the Cardiff trials. The feeding is performed by horizontally-placed shakers, which are driven from the shaker-spindle at 180 revolutions per minute. Oscillating rakes, which may be raised or lowered, are placed near the mouth of the drum, and tease out the sheaves. A tied sheaf was thrown on the shakers, and this was kept from going into the drum by the oscillating rakes. This appliance costs 20*l.* It is a good feeder, and would also be effective as a guard.

Miscellaneous Awards.

Miscellaneous Awards to Agricultural Articles not included in the ordinary rotation. Ten Silver Medals.

Silver Medals.

119. Reading Iron Works Company (Limited), Reading; for their 4-Horse-Power Patent "Nozzle" Vertical Boiler.

1000. John Fowler and Co., of Leeds, for their Patent 4-Wheel Windlass for Steam Cultivation (Round-about System).

1742. W. N. Nicholson and Son, of Newark-on-Trent, for their adaptation of Self-acting Delivery to Horse-Rake.

2665. Barford and Perkins, of Peterborough, for their 10-Horse-Power Agricultural Locomotive Engine, the Driving-wheels being utilized as Winding-drums.

2969. G. Lewis and Son, of Kettering, for their new Patent Machine for Elevating, Shooting, Loading, and Unloading Sacks of Corn, and other Articles.

3115. Fairbanks and Co., of King William Street, London, for their 3-Ton Weighbridge for Carts and Waggons.

3174. W. R. Dell and Son, of Mark Lane, London, for their Duplex Grain Sorter, for separating round seeds from wheat.

3515. Ransomes, Sims, and Head, of Ipswich, for their Patent Straw-burning Apparatus attached to a 10-Horse-Power Portable Steam Engine.

5066. Clayton and Shuttleworth, of Lincoln, for their Variable Expansion Motion, acted on by the Governor attached to a 7-Horse-Power Portable Steam Engine.

5127. Davey, Paxman, and Co., of Colchester, for their Patent Paxman Water Heater, B. No. 1.

No. 119. *Reading Iron Works Company (Limited), Reading.—Four-H.P. Patent Nozzle Vertical Boiler.*—This boiler consists of two parts, namely, a circular fire-box, A, and a square tube chamber, B, which is traversed by rows of tubes, C, set at right angles to each other. At the ends of the tubes are fixed cast nozzles or circulators, D, the action being, that as soon as the steam is generated, it readily and necessarily passes off at the turned-up nozzles, D^1, the water rushing in at the turned-down nozzles, D, to supply its place; thus a circulation of the water is obtained (see Figs. 45 and 46).

The heating surface is,

Of Tubes	31·6	square	feet.
„ Fire-box	9·7	„	„
„ Tube chambers ..	17·7	„	„
Total heating surface ..	59·0	„	„

From the fact of the sets of tubes crossing each other, sieves are formed, through which the heated gases must pass, and thus the heat is well utilised, rendering this a very economical boiler as regards fuel.

1000. *J. Fowler and Co., of Leeds.—Patent Windlass for Steam-cultivation on a Triangular Round-about System.*—The windlass consists of two horizontal winding-drums, each provided with a coiling-gear. These are worked by pinions and a pair of bevel wheels, which are connected with the crank-shaft of the engine by means of a short shaft and universal joint. A lever is employed for throwing the two drum-pinions in and out of gear, and the drums are set in motion without reversing the engine; hence engines unprovided with reversing gear may be employed. The windlass is placed on four wrought-iron wheels. In beginning work in a field, the engine and windlass are placed on the headland, while the anchors are placed on the side headlands in a line with the windlass. The claw-anchors, attached by a rope to a winding apparatus on the anchors, are taken to the far corners of the field and fastened there. Thus the anchors travel away from the engine as the work proceeds, and require the employment of only a small quantity of rope at the start, which is an advantage for making a quick beginning; they also dispense with the labour of taking the anchors to the far corners of the field. The anchors are kept fixed between the plough-ropes and the winding-forward rope; this, therefore, as well as the regular decrease of rope on the drums as the work goes forward, insures the rope being properly coiled.

The work is therefore done on a triangular system; but if it is desired to avoid the rope passing over the land, snatch-blocks are placed at the corners in a line with the windlass, thus keeping the rope in a fixed line along the headland.

When the field is finished, no horses are required to move the anchors and implements, for they are pulled back by the plough rope.

1742. *W. N. Nicholson and Son, of Newark-on-Trent.—Self-acting Delivery to Horse-rake.*—By pressing the foot-step B (Fig. 47, p. 736), or elevating the hand-lever C, the rule-joint A is depressed and unlocked; thus the catch D is slipped over the stop E. The catch D pivots on the rod F, which is attached to the rocking-frame G of the rake. The pawl H is fixed on the opposite end of the

Figs. 45 and 46.—*Plan and Section of the Reading Iron Works Company's Four-H.P. Patent Nozzle Vertical Boiler, No.* 119.

Fig. 45.—Plan.

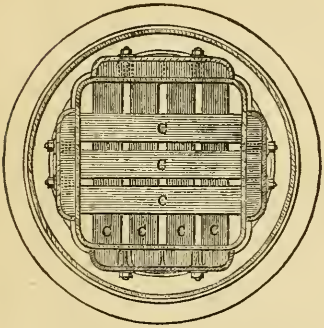
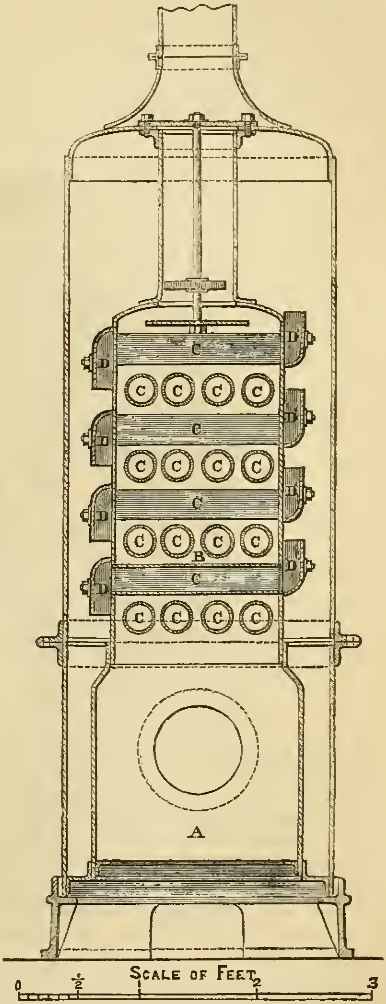


Fig. 46.—Section.



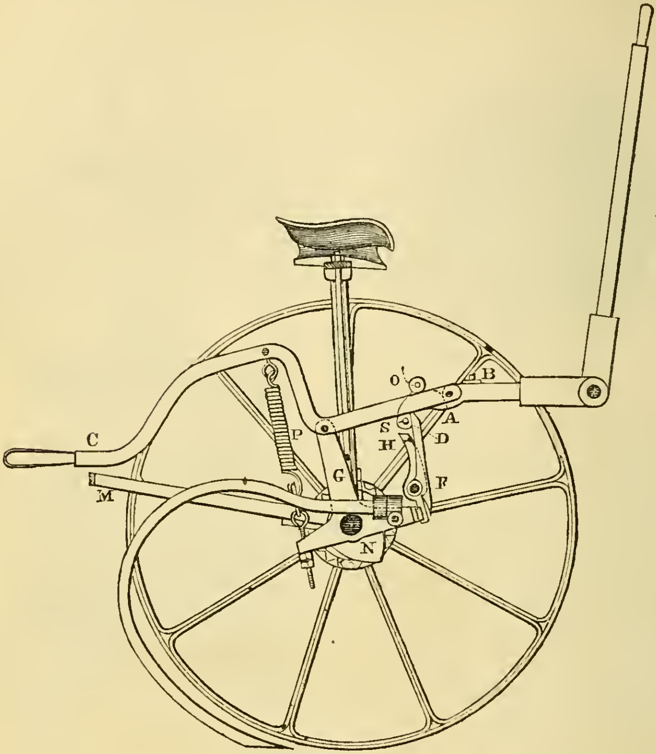
A. Circular Fire-box. B. Square Tube Chamber. C. Tubes. D. Turned-down Nozzles. D. Turned-up Nozzles.

rod. The catch drops, and with it also the pawl, which latter drops into the ratchet-teeth, K, on the travelling wheel, and is thus at once carried downwards by the revolution of the wheel; at the same time the rocking-frame G, having the bulk-ends of the tines attached to it, also moves downwards, and raises the points of the tines. In the course of the revolution the tines are raised to a level with the stripper bar M; the pawl H is brought into contact with, and thrown out of gear by the cam N, which is fixed to the main axle of the rake; thus the tines are released, and fall by their own gravity. The catch D is arrested by a stop, O, and delivered into the original stop F without any jerk. The rule joint is retained in lock by the spiral spring P (see Fig. 47).

Each travelling-wheel actuates a distinct set of pawls and catches; thus the rake may be delivered when turning a corner,—one pawl then only being in gear, while the other is over-ridden. The sudden check is avoided, because the same movement which unlocks the joints also starts the lift of the tines. Price 13*l.*

2665. *Barford and Perkins, of Peterborough.—Ten-H.P. Locomotive Engine; the Driving-wheels being utilised as Winding-drums.*—By means of the patent

Fig. 47.—*Messrs. W. N. Nicholson and Son's Adaptation of Self-acting Delivery to Horse-Rake, No.* 1742.



hand-lifting gear, for which they obtained a silver medal at the Hull Meeting, the hind wheels of the engine are raised off the ground and blocked up, the tyres are taken off, and they are then utilised as winding-drums; thus the separate windlass is dispensed with. The break for regulating the slack rope is a simple band with wood blocks, and is applied to the surface of the wheels and regulated by a lever. Only two men are required; one for the engine, and the second for the plough, with a few boys for the rope porters.

This is a very ingenious invention, and exceedingly simple. The tackle was at work in a field about a mile from the Show-yard, and was making good work. Price 600*l.*

2969. *G. Lewis and Son, Kettering.—Patent Machine for elevating, shooting, loading, and unloading Sacks of Corn and other Articles.*—In unloading sacks of corn an iron clip catches up the sack at the middle, and thus, by chains attached to it and to a rack and pinion, it is wound up. The sack is raised and turned over on to the platform, and then lowered by the rack and pinion. This is a very ingenious machine, and must be very useful for outlying homesteads where the carter might not be able to get any assistance in unloading his cart. Price 6*l.*

3115. *Fairbanks and Co., of King William Street, London.—Three-Ton*

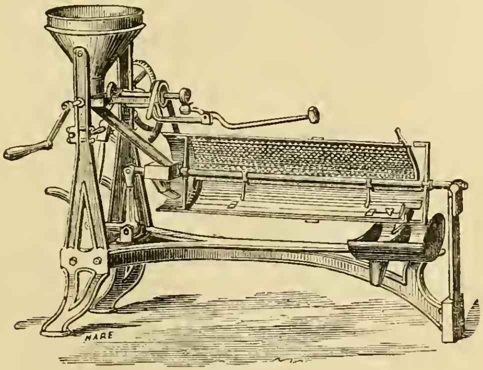
Weighbridge for Carts and Waggons.—In this weighbridge, by reducing the number of working centres and connections, friction is reduced, and thus the machine is rendered more sensitive and unvarying in its indications. No relieving apparatus is used; thus an invariable uniform bearing is secured for the working parts, more accurate operations obtained, and chafing as well as wear, to a great extent obviated. All the working parts are suspended from the corners of the coping, and float freely with every movement of the platform; thus there is no risk of sticking or binding. By other improvements, lateral friction and consequent wear of the edge centres, which take place when loads are driven on to the platform, are reduced.

The platform is constructed of timber; the advantages of which over an iron one are, saving in prime cost, as well as facility of repair.

As an experiment, the three Judges and the Consulting Engineer were weighed on one of the 12-cwt. machines of similar make, first collectively, and then singly, the difference between the former weight and the sum of the latter being only ½ lb. Price 38*l.*

3174. *W. R. Dell and Son, of Mark Lane, London.*—*Duplex Grain Sorter, for separating Round Seeds from Wheat.*—The corn is placed in a hopper provided with a shutter for regulating the feed; it is delivered on to the lower part of an inclined revolving cylinder, which is made of sheet iron, with in-

Fig. 48.—*Messrs. W. R. Dell and Son's Duplex Grain Sorter, for separating Round Seeds from Wheat, No.* 3174.



Section of indented Zinc Plate.

dented zinc plates fixed to its inner circumference. Suspended in the cylinder is a semicircular wrought-iron trough, with a winged edge pressing upon the zinc plates. The round seeds find their way into the small round indentations of the plates, as shown in section, and are thus carried round, in order to drop into the suspended trough. A hammer strikes the cylinder on the top, about its middle at short intervals, in order to shake out the round seeds. The machine is worked by a crank-handle at the side, motion being given to the cylinder by a cog and bevel gearing, and a strap passing round the outer circumference of the cylinder and over a pulley fixed to the driving spindle. An additional rocking motion is imparted to the cylinder, in order to make the grain travel. The round seeds are very effectually separated from the grain; but one drawback is that different zinc-plates are required, with indentations to suit different sizes of round seeds. The zinc plates are the most expensive part of the machine, and fixtures; a separate machine would therefore be required for each size of round seed. Its price is 13*l.* 10*s.*

3515. *Ransomes, Sims, and Head, of Ipswich.—Patent Straw-burning Apparatus, attached to* 10-*horse-power Portable Steam-engine.*—Straw, reeds, cotton-stalks, and other vegetable substances, may be used as fuel in place of coal. This invention will specially meet the requirements of agriculturists in the vast corn-growing districts of the East, where great difficulty is found in getting rid of the straw. In our own country it seems unlikely that this apparatus will be much used; because on few farms is the straw or other vegetable refuse so plentiful, that it requires to be burnt in order to get rid of it. It must also be considered what an enormous loss of nitrogen would take place; which, of course, is the manurial element most to be economised by farmers.

In Russia, Hungary, and on the banks of the Danube, where thousands of acres of wheat are annually planted, the soil is in many places so rich, that it requires little manure; and owing to the vast acreage, the land is usually cropped with wheat for two years in succession, and then allowed to lie in fallow for three or four years. As there is little or no stock to utilize the straw, it follows that an enormous surplus must every year accumulate. The agriculturist then either stacks it and allows it to rot, or endeavours to utilize it as fuel for threshing his crops. Coal in most of these Eastern countries is out of the reach of the agriculturist, owing to the long, difficult, and expensive transport; he therefore endeavours to use his straw instead of it. In Hungary and South Russia, a pit is dug about 8 or 9 feet square and of the same depth, and in one end of it is built an oven, similar to a baker's oven, with an inclined brick or clay flue passing upwards. A portable engine, with its fire-bars removed, is placed about 5 or 6 feet from the hole, its fire-box being connected with the flue. A fire of straw is made in the oven, and kept continually fed with small quantities of straw; the heated gases passing through the flue into the fire-box of the engine, and thence through the tubes to the chimney. The disadvantages of this system are: 1st. that the joint between the flue and fire-box of the engine soon shakes loose; the flame then attacking the rivets and angle-iron ring at the bottom of the fire-box, soon causing them to leak. 2nd. The construction of a pit involves some expense; the engine is therefore a comparative fixture, and all the grain requires to be transported to the threshing-machine in carts, instead of moving the engine and threshing-machines alongside of each stack to be threshed.

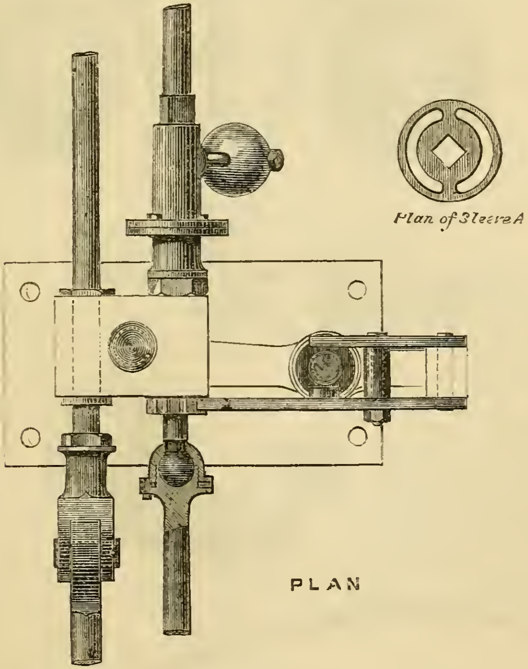
Many difficulties are found attendant upon burning straw in the fire-box of an ordinary portable engine, without the employment of the pit above described, chiefly on account of the larger amount of fuel space and heating surface required, over and above that necessary for coal and wood; and also the difficulty of obtaining the admission of sufficient atmospheric air to produce proper combustion, when straw or similar substances are treated in a boiler in the same way as coal or wood.

The theory of the present invention is, that the straw is forced into the fire-box at a low level, by means of rollers, in a thin stream, and held there in suspension, so that the flame can completely surround each piece. A sufficient quantity of atmospheric air is admitted into the furnace, so that a proper combustion is kept up. The bars are kept free from silica by means of knives, which are completely under the control of the stoker. A steam jet is attached to the feed-pump, so that the heat of the ashes is extinguished immediately they fall, thus obviating the danger of fire. No kindling of wood is required to get up steam; but the rollers are first turned by hand to feed the straw into the fire-box, and as soon as there is sufficient pressure of steam to start the engine, the rollers are driven by a strap direct from the crank-shaft. Only one man is required to feed the straw to the rollers.*

The dimensions of the engine were:—

Diameter of cylinder	10 inches.
Length of stroke	13 inches.
Revolutions per minute	140.
Pressure of steam	80 lbs. per square inch.
Area of grate	9·7 square feet.
Total heating surface	266 square feet.
Number of tubes	54.
Outside diameter of ditto	$2\frac{1}{4}$ inches.

Fig. 49.—*Plan of Messrs. Clayton and Shuttleworth's Governors for Variable Expansion Gear, No.* 5066.

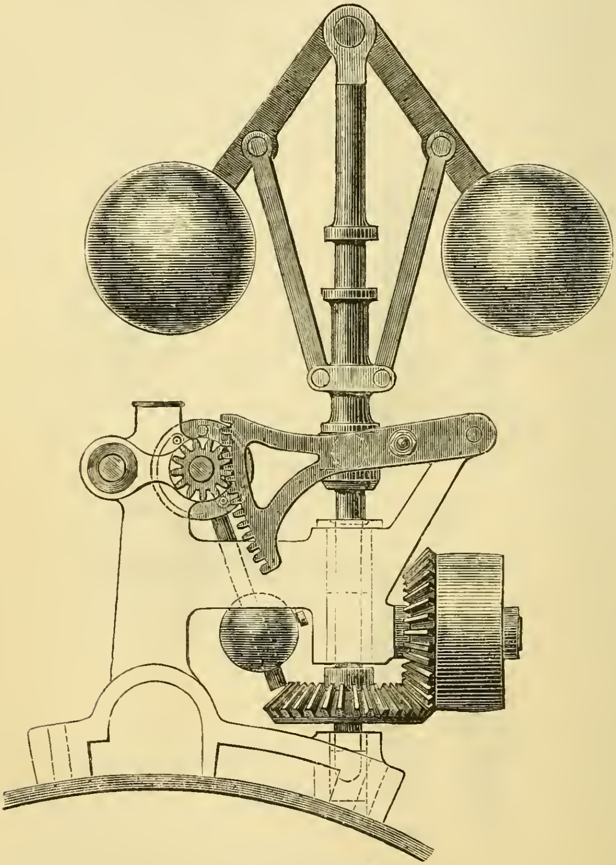


Coal or wood may be used as fuel, by altering the position of the bars and substituting an ordinary fire-door for the mechanical apparatus for feeding the straw into the fire-box.

* Further description and illustrations of these engines will be found in Prof. Wrightson's 'Report on the Agricultural Features of the Vienna Exhibition,' pp. 72 and 73 of this volume of the 'Journal.'

Experiments were made with a 10-horse-power portable engine, working on the dynamometer brake at 20-horse-power, and the steam was kept up to 70 lbs. per square inch. One hundredweight (112 lbs.) of straw was weighed out and consumed in 14 minutes, giving a result of 23 lbs. per horse-power per hour, and as these engines would consume about $5\frac{1}{2}$ to 6 lbs. of coal per horse-power per hour, it follows that it requires from $3\frac{3}{4}$ to 4 lbs. of straw to produce the same result as 1 lb. of coal.

Fig. 50.—*Elevation of Messrs. Clayton and Shuttleworth's Governors for Variable Expansion Gear, No.* 5066.



ELEVATION

The actual amount of straw consumed varies considerably according to quality, but it may be taken as an average that it requires from 8 to 9 sheaves of straw to thresh 100 sheaves of wheat of the same size.

In Egypt, where wood does not exist and all the coal has to be imported, these engines are coming into use for burning cotton-stalks, which may be obtained in all parts of the Delta in great abundance. In India, indigo-stalks, and other indigenous vegetable substances, have been used in this way with great success. Price 445*l.*

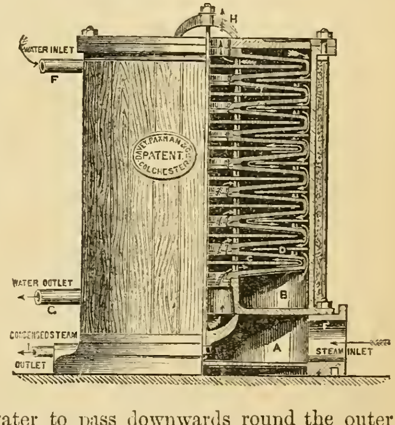
5066. *Clayton and Shuttleworth, of Lincoln.—Variable Expansion Motion, acted on by the Governor, attached to a 7-horse-power Portable Steam-engine.*—This is an adaptation of Meyer's valve motion, in which the variable cut-off is accomplished by altering the length of a cut-off plate on the back of the ordinary valve. The cut-off valve is moved by a second eccentric, and the length of the valve is altered by moving two plates, of which it is composed, by quick threaded right and left-handed screws cut on the valve of the spindle; this is capable of being turned by the rise and fall of the governor-balls, through the agency of a toothed quadrant and pinion. The absolute speed of the engine is determined by a circular weight keyed on the valve spindle, which affects the rise of the governor, and can be slid along its lever for small adjustments, the larger changes being made by balls of different weights, which can be readily applied (see Figs. 49 and 50, pp. 739 and 740).

The spindle is not turned immediately by the governor quadrant, but through a slotted pair of discs, which permit the governor-balls to lift some part of the distance without affecting the spindle.

The engine runs very regularly with the steam-valve full open, and with loads varying from nothing to the full power of the engine, or when lightly loaded with steam full on, or only partially.

5127. *Davey, Paxman, and Co., of Colchester.—Patent Paxman Water-heater No.* 1.—This is an upright cylinder placed at the side of a vertical-boiler-engine. In the cylinder are placed eight hollow discs, having a circular hole in the centre at top and bottom, and a central horizontal partition which does not quite extend to the outer circumference of the discs; so that steam coming in at the lower opening would require to pass along below the partition and round its outer circumference, and again over the top of the partition, in order to reach the upper opening. The circular openings are closely connected by india-rubber joints. It will also be seen from the accompanying woodcut (Fig. 51), that the discs are shallower at their circumference than at their centre, and that they do not extend quite to the inner circumference of the cylinder. Circular plates, D, are fixed to the inner circumference of the cylinder, and placed in the interspaces formed by the discs, leaving space to allow the water to pass downwards round the outer surface of the discs. Thus it will be seen that the water enters at the top, circulating downwards over the outside of the discs, and passing out at G; while the steam enters at E, passing upwards through the discs, and out at H; there is therefore a complete circulation of both water and steam in opposite directions, and thus a large and effective heating surface is obtained.

Fig. 51.—*Messrs. Davey, Paxman, and Co.'s Patent Paxman Water-heater B. No.* 1, *No.* 5127.



Royal Agricultural Society of England.

1874.

President.

EDWARD HOLLAND.

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1852	RICHMOND, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1859	VERNON, Lord, *Sudbury Hall, Derby.*
1855	WYNN, Sir WATKIN WILLIAMS, Bart., M.P., *Wynnstay, Ruabon, Denbighshire.*

Other Members of Council.

1855	ACLAND, Sir THOMAS DYKE, Bart., M.P., *Sprydoncote, Exeter, Devonshire.*
*1858	AMOS, CHARLES EDWARDS, 5, *Cedars Road, Clapham Common, Surrey.*
1848	BARNETT, CHARLES, *Stratton Park, Biggleswade, Bedfordshire.*
*1853	BARTHROPP, NATHANIEL GEORGE, *Hacheston, Wickham Market, Suffolk.*
*1873	BEDFORD, Duke of, *Woburn Abbey, Bedfordshire.*
*1868	BOOTH, THOMAS CHRISTOPHER, *Warlaby, Northallerton, Yorkshire.*
*1863	BOWLY, EDWARD, *Siddington House, Cirencester, Gloucestershire.*
1861	CANTRELL, CHARLES S., *Riding Court, Datchet, Bucks.*
*1872	CHAPLIN, HENRY, M.P., *Blankney Hall, Lincoln.*
*1866	DAVIES, DAVID REYNOLDS, *Agden Hall, Lymm, Cheshire.*
1861	DENT, J. D., *Ribston Hall, Wetherby, Yorkshire.*
*1860	DRUCE, JOSEPH, *Eynsham, Oxford.*

* Those Members of Council whose names are prefixed by an asterisk retire by rotation in July, but are eligible for re-election in May.

Year when Elected.	
*1868	EDMONDS, WILLIAM JOHN, *Southrope, Lechlade, Gloucestershire.*
*1871	EGERTON, Hon. WILBRAHAM, M.P., *Rostherne Manor, Knutsford, Cheshire.*
1873	EVANS, JOHN, *Uffington, Shrewsbury, Salop.*
*1872	EXETER, Marquis of, K.G., *Burghley House, Stamford, Lincolnshire.*
*1873	HORLEY, THOMAS, Jun., *The Fosse, Leamington, Warwickshire.*
*1866	HORNSBY, RICHARD, *Spittle Gate, Grantham, Lincolnshire.*
*1854	HOSKYNS, CHANDOS WREN, *Harewood, Ross, Herefordshire.*
1871	JONES, J. BOWEN, *Ensdon House, Shrewsbury, Salop.*
1863	KINGSCOTE, Colonel, M.P., *Kingscote, Wootton-under-Edge, Gloucestershire.*
*1848	LAWES, JOHN BENNET, *Rothamsted, St. Albans, Herts.*
1869	LEEDS, ROBERT, *Wicken Farm, Castleacre, Brandon, Norfolk.*
*1872	LEICESTER, Earl of, K.G., *Holkham Hall, Wells, Norfolk.*
*1868	LICHFIELD, Earl of, *Shugborough, Staffordshire.*
1867	LIDDELL, Hon. HENRY GEORGE, M.P., *Ravensworth Castle, Durham.*
1865	LOPES, Sir MASSEY, Bart., M.P., *Maristow, Roborough, Devon.*
1871	McINTOSH, DAVID, *Havering Park, Romford, Essex.*
*1871	MASFEN, R. HANBURY, *Pendeford, Wolverhampton, Staffordshire.*
1857	PAIN, THOMAS, *The Grove, Basingstoke, Hants.*
*1861	RANDELL, CHARLES, *Chadbury, Evesham, Worcestershire.*
1868	RANSOME, ROBERT CHARLES, *Ipswich, Suffolk.*
*1871	RAWLENCE, JAMES, *Bulbridge, Wilton, Salisbury, Wilts.*
1869	RIDLEY, M. WHITE, M.P., *Blagdon, Cramlington, Northumberland.*
1861	RIGDEN, WILLIAM, *Hove, Brighton, Sussex.*
*1856	SHUTTLEWORTH, JOSEPH, *Hartsholme Hall, Lincoln.*
1872	SKELMERSDALE, Lord, *Lathom Hall, Ormskirk, Lancashire.*
*1869	STATTER, THOMAS, *Stand Hill, Whitefield, Manchester, Lancashire.*
1873	TORR, JOHN, M.P., *Carlett Park, Eastham, Chester.*
1857	TORR, WILLIAM, *Aylesby Manor, Great Grimsby, Lincolnshire.*
1845	TURNER, GEORGE, *Brampford Speke, Exeter, Devonshire.*
1871	TURNER, JABEZ, *Haddon, Huntingdonshire.*
1871	WAKEFIELD, WILLIAM H., *Kendal, Westmorland.*
1867	WEBB, JAMES, *Spring Hill, Fladbury, Pershore, Worcestershire.*
*1870	WELBY, WILLIAM EARLE, M.P., *Newton House, Folkingham, Lincolnshire.*
1871	WELLS, JOHN, *Booth Ferry, Howden, Yorkshire.*
*1861	WELLS, WILLIAM, *Holmewood, Peterborough, Northamptonshire.*
*1870	WHITEHEAD, CHARLES, *Barming House, Maidstone, Kent.*
1866	WILSON, Lieut.-Colonel FULLER MAITLAND, *Stowlangtoft Hall, Bury St. Edmund's, Suffolk.*
1865	WILSON, JACOB, *Woodhorn Manor, Morpeth, Northumberland.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London*, W.

Consulting Chemist—Dr. AUGUSTUS VOELCKER, F.R.S., 11, *Salisbury Square*, E.C.
Consulting Botanist—W. CARRUTHERS, F.R.S., F.L.S., *British Museum*, W.C.
Consulting Veterinary Surgeon — JAMES BEART SIMONDS, *Royal Veterinary College*, N.W.
Consulting Engineers—EASTONS & ANDERSON, *The Grove, Southwark Street*, S.E.
Seedsmen—THOMAS GIBBS and Co., *Corner of Halfmoon Street, Piccadilly*, W.
Publisher—JOHN MURRAY, 50, *Albemarle Street*, W.
Bankers—THE LONDON AND WESTMINSTER BANK, *St. James's Square Branch*, S.W.

* Those Members of Council whose names are prefixed by an asterisk retire by rotation in July, but are eligible for re-election in May.

STANDING COMMITTEES FOR 1874.

Finance Committee.

Bridport, Viscount (Chairman).
Davies, D. R.
Kingscote, Colonel.
Randell, Charles.
Torr, William.

House Committee.

The President.
Chairman of Finance Committee.
Davies, D. R.
Kingscote, Colonel.
Gibbs, B. T. Brandreth.
Torr, William.

Journal Committee.

Dent, J. D. (Chairman).
Cathcart, Earl.
Vernon, Lord.
Acland, Sir T. Dyke, Bart.
Holland, Edward.
Hoskyns, C. Wren.
Jones, J. Bowen.
Kingscote, Colonel.
Milward, Richard.
Rawlence, J.
Ridley, M. White.
Welby, W. E.
Wells, W.
Whitehead, Charles.
Wilson, Jacob.

Chemical Committee.

Wells, William (Chairman).
Bedford, Duke of.
Lichfield, Earl.
Vernon, Lord.
Davies, D. R.
Dent, J. D.
Egerton, Hon. W.
Evans, John.
Hoskyns, C. Wren.
Lawes, J. B.
Voelcker, Dr. A.
Wakefield, W. H.
Welby, W. E.
Whitehead, Charles.
Wilson, Colonel.
Wilson, Jacob.

Botanical Committee.

Vernon, Lord.
Dent, J. D.
Edmonds, W. J.
Gibbs, B. T. Brandreth.
Jones, J. Bowen.
Torr, John.
Turner, Jabez.
Voelcker, Dr.
Welby, W. E.
Wells, W.
Whitehead, Charles.

Veterinary Committee.

Bridport, Viscount (Chairman).
Cathcart, Earl.
Booth, T. C.
Brown, Professor.
Dent, J. D.
Egerton, Hon. Wilbraham.
Gibbs, B. T. Brandreth.
Kingscote, Colonel.
Leeds, Robert.
Masfen, R. H.
Ridley, M. White.
Simonds, Professor.
Statter, Thomas.
Wells, William.
Wilson, Jacob.

Stock-Prizes Committee.

Bridport, Viscount.
Barthropp, Nathaniel G.
Booth, T. C.
Bowly, Edward.
Davies, D. R.
Dent, J. D.
Druce, Joseph.
Evans, John.
Gibbs, B. T. Brandreth.
Horley, Thomas.
Leeds, Robert.
Masfen, R. H.
Milward, Richard.
Randell, Charles.
Ridley, M. White
Rigden, William.
Torr, William.
Turner, George.
Wakefield, W. H.
Wilson, Jacob.
The Stewards of Live Stock.

Implement Committee.

BOOTH, T. C. (Chairman).
BRIDPORT, Viscount.
VERNON, Lord.
AMOS, C. E.
CANTRELL, CHAS. S.
EDMONDS, W. J.
EVANS, JOHN.
GIBBS, B. T. BRANDRETH.
HORLEY, T.
HORNSBY, RICHARD.
HOSKYNS, C. WREN.
JONES, J. BOWEN.
LEEDS, ROBERT.
MILWARD, R.
MASFEN, R. H.
RANDELL, CHARLES.
RANSOME, R. C.
SHUTTLEWORTH, JOSEPH.
TORR, WILLIAM.
TURNER, JABEZ.
WELBY, W. EARLE.
WELLS, JOHN.
WHITEHEAD, CHARLES.
WILSON, JACOB.
The Stewards of Implements.

General Bedford Committee.

CATHCART, Earl (Chairman).
BEDFORD, Duke of.
POWIS, Earl.
BRIDPORT, Viscount.
CHESHAM, Lord.
KESTEVEN, Lord.
VERNON, Lord
WYNN, SIR WATKIN W., Bart.
BARNETT, CHARLES.
BEDFORD, Mayor of.
BOOTH, T. C.
BOWLY, EDWARD.
CANTRELL, CHARLES S.
DAVIES, D. R.
DRUCE, JOSEPH.
EDMONDS, W. J.
GIBBS, B. T. BRANDRETH.
HORNSBY, RICHARD.
HOWARD, CHARLES.
HOWARD, JAMES.
LEEDS, ROBERT.
MASFEN, R. H.
MILWARD, RICHARD.
RANDELL, CHARLES.
RANSOME, R. C.
RIDLEY, M. W.
SHARMAN, MARK.
SHUTTLEWORTH, JOSEPH.
STEPHENSON, C.
TORR, WILLIAM.
TRETHEWY, H.
TURNER, JABEZ.
WAKEFIELD, W. H.
WEBB, JAMES.
WELLS, WILLIAM.
WHITEHEAD, CHARLES.
WILSON, JACOB.

Show-Yard Contracts Committee.

BRIDPORT, Viscount.
VERNON, Lord.
AMOS, C. E.
BOOTH, T. C.
GIBBS, B. T. BRANDRETH.
HORNSBY, RICHARD.
MILWARD, RICHARD.
RANDELL, CHARLES.
SHUTTLEWORTH, JOSEPH.
TORR, WILLIAM.
WELLS, JOHN.
WILSON, JACOB.

Committee of Selection.

CATHCART, Earl.
BRIDPORT, Viscount.
DAVIES, D. R.
DENT, J. D.
GIBBS, B. T. BRANDRETH.
HOLLAND, E.
KINGSCOTE, Colonel.
MILWARD, R.
RANDELL, CHARLES.
THOMPSON, H. S.
TORR, WILLIAM.
WELLS, WILLIAM.

And the Chairmen of the Standing Committees.

Education Committee.

BEDFORD, Duke of (Chairman).
ACLAND, Sir T. DYKE, Bart.
LOPES, Sir MASSEY, Bart.
DENT, J. D.
HOLLAND, E.
JONES, J. BOWEN.
KINGSCOTE, Colonel.
McINTOSH, DAVID.
VOELCKER, Dr.
WELLS, WILLIAM.
WHITEHEAD, CHARLES.

Cattle Plague Committee.

THE WHOLE COUNCIL.

*** The PRESIDENT, TRUSTEES, and VICE-PRESIDENTS are Members *ex officio* of all Committees.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Thursday, December 11th, 1873.

REPORT OF THE COUNCIL.

During the year 1873 the list of Governors and Members of the Society has been increased by the election of 1 Governor and 351 Members, and diminished by the death of 5 Governors and 128 Members, the resignation of 168 Members, and the removal of 15 Members by order of the Council. In addition to these changes, the Council have to record their sense of the loss which not only this Society, but the whole world of science, has suffered by the death of one of its Honorary Members, Baron Liebig, whose chemical discoveries, especially in relation to the production and utilization of food, have been of the utmost importance to agriculture.

The Society now consists of

77 Life Governors,
59 Annual Governors,
1894 Life Members,
3949 Annual Members,
12 Honorary Members,

making a total of 5991, and showing an increase of 46 Members during the year 1873.

The Duke of Bedford has been elected a Member of Council in the room of Lord Kesteven, whose election as a Trustee was reported to the Annual Meeting last May; and Mr. T. Horley, junior, of the Fosse, Leamington, has been elected to fill the vacancy caused by the resignation of Mr. Sanday, the state of whose health no longer allows him to give the Council the advantage of his services.

The half-yearly statement of accounts to the 30th of June, 1873, has been examined and approved by the Society's auditors and accountants, and has been published for the information of the Members in the last number of the 'Journal.' The funded capital of the Society remains the same as at the last half-yearly meeting, namely, 24,112*l.* 7*s.* 8*d.* New Three per Cents., and the balance in the hands of the bankers on the 1st instant was 1111*l.* 2*s.* 1*d.*

The distinguishing feature of the Hull Country Meeting was to be found in the Trial-fields rather than in the Show-yard. More than three hundred implements were entered for trial, in thirty-four classes. Of these implements 86 were Ploughs entered in 16 classes, 75 were Harrows divided into 6 classes, 58 were Rollers and Clodcrushers, 42 Cultivators and Scarifiers, 12 Diggers, Potato-ploughs, &c., and 31 Stacking-machines. The number of classes, no less than the number of implements, would have rendered a comparison of the relative merits of the prize implements a matter of very considerable labour and difficulty to intending purchasers, unless some special facilities had been afforded them by the Society. The experiment of a parade of the prize implements on the first two days of the Show was therefore made; and as it appeared to give wide-spread satisfaction, it is proposed next year to erect a special exhibition shed for this purpose in a prominent part of the Show-yard.

Illustrated reports of the trials, by Mr. J. Coleman and Mr. C. G. Roberts, have been published in the last number of the 'Journal,' as well as tables, showing the dynamometrical and other results, compiled with great care by the Consulting Engineers, Messrs. Eastons and Anderson.

The competition for the prize of 100*l.* for the best farm in Holderness, in connection with the Hull Country Meeting, was very close, although only four competitors entered for it. The prize was awarded to Mr. W. G. Walgate, of West Hill, Aldborough, near Hull, and the three other farms were highly commended by the Judges. The Council regret that the illness of the Judge who had undertaken to act as reporter has necessitated the postponement of the publication of the report of this interesting competition.

The show of Live Stock at Hull will be remembered on account of the high quality of many of the animals exhibited; but the small entry of Horses was disappointing. An exhaustive account of the whole exhibition has been contributed to the last number of the 'Journal' by Mr. Milward, the Senior Steward of Live Stock, with the assistance of his colleagues.

The smallness of the Horse Show at Hull, as compared with the anticipations which had been formed of the number of entries which the Society would be justified in expecting, coupled with the admitted scarcity of the supply of horses in proportion to the demand throughout the country, has induced the Council to take into consideration the whole question of its list of prizes for Horses, as offered at the Annual Country Meetings. Hitherto the Society's prize-list has been limited to classes for breeding animals, and conditions having reference to their productiveness have been attached to all prizes offered by the Society. These prizes have up to the present time been supplemented by others, offered by Local Committees, County Agricultural Societies, or individual donors, generally for Mares and Geldings in various Hunting and Hackney classes. Notwithstanding the great liberality, and sometimes profuseness, with which these prizes have been offered year by year, the system has not been favourable to the Society's Horse Show, the scheme of these supplementary prizes having varied very much from one year to another, and occasionally the conditions attached to their offer have varied essentially from those generally recognized by the Society. Under these circumstances the Council have determined in future to offer prizes for all classes of Horses which a farmer may be supposed to have in his possession, either for breeding purposes or as the product of his stud.

At the Bedford Meeting next year the amount offered by the Society as prizes for Horses will be increased to the extent of about 600*l.*; and prizes will be offered for Norfolk and Suffolk Polled and for Sussex Cattle in place of those offered at Hull for Ayrshires and Galloways. The Council have decided to continue the prizes for Border Leicester Sheep for another year; but the prizes for Cheviot, Blackfaced, and Mountain Sheep have been omitted from the Bedford Prize-sheet.

The Council have decided to add the following rules to those previously published with the Stock Prize-sheet:

"The Council reserves to itself the right of determining all disputed cases as to qualification, &c., and the decision of the Council shall be final in all respects.

> "The Exhibitor of any animal at the Society's Country Meetings shall be required to prove the correctness of his certificate to the satisfaction of the Stewards, if called upon by them to do so. Until the required proof has been furnished, the prize may be withheld, and the Exhibitor may, on the recommendation of the Stewards, be prohibited by the Council from exhibiting at the Society's Country Meetings."

The Bedford Local Committee have added to the Society's Prize-sheet offers of prizes for Cart Horses for agricultural purposes, Dairy Cows, and for long-wooled and short-wooled Ewes, Lambs, and Wethers.

Lord Charles Russell has also offered a cup, value 50*l.*, together with a purse of 50*l.* as a Prize for the best managed farm in Bedfordshire. The Council have decided to offer a Second Prize of 50*l.*, to appoint the Judges and pay the expenses of the adjudication, and to fix the conditions of competition.

The Implements to be tried at Bedford next year comprise twelve classes of Drills, and several classes of Horse-hoes, Manure-distributors, Waggons, and Carts. Prizes are also offered for vehicles for the road-conveyance of Implements and Live-Stock, as well as for Shepherds'-huts on Wheels, and Sleeping-vans for men engaged in steam-cultivation. The points of merit which are to be taken into consideration by the Judges in awarding these prizes have been already arranged by the Implement Committee, with the assistance of the Consulting Engineers and experienced Judges.

The question of providing in the Show-yard adequate sleeping-accommodation for the men in attendance on the Stock exhibited at the Country Meetings has been under the consideration of the Council; and the Society's Surveyor has been instructed to prepare plans and estimates with a view to the experiment being made at Bedford. It is proposed to charge a fee sufficient to cover the expense of building the sleeping-room, leaving it optional with the Exhibitors to take beds for their men, or not, at the time when they send in their Certificates of Entry to the Secretary.

The Education Grant has been renewed for the year 1874 on the scheme which has now been continued for several years past. The Secretary has been in communication with the Head-masters of some of the County and Middle-class Schools, but up to the present time it does not appear that the study of the science and practice of agriculture has been combined with a superior education in any English place of education, except in the Royal Agricultural College, Cirencester.

Professor Wrightson has prepared an elaborate Report on the Agricultural Departments of the Vienna Exhibition, which will be published in the next number of the 'Journal;' and it is proposed to publish his Report on the Agriculture of Austro-Hungary in the succeeding number.

The Council are glad that they are able to congratulate the Members on the very general and decided decrease of Foot and Mouth disease since the last General Meeting; but the prevalence of Pleuro-pneumonia, notwithstanding the recent Order of the Privy Council, compelling local authorities to slaughter animals known to be affected with that disease, and to compensate the owners, is still a matter of serious importance.

Ninety-four Essays were sent in to compete for the Prize of 100*l.* offered by Lord Cathcart for the best Essay on the Potato-disease and its prevention. The Committee appointed by the Council to adjudicate this Prize, have reported that they cannot recommend its being awarded to any one of the competitors. They have, however, recommended that a sum of money be granted for the purpose of inducing a competent mycologist to undertake the investigation of the life-history of the potato-fungus (*Peronospora infestans*) in the interval between the injury to the potato-plant and the reappearance of the fungus in the following year; and that the Society should offer prizes for kinds of potatoes that would resist disease during a series of experiments to be continued for three successive years. The Council have taken these recommendations into consideration, and have appointed a special Committee to make further inquiry, and, if necessary, to draw up a detailed scheme of the manner in which these recommendations might be usefully carried out.

By order of the Council,

H. M. Jenkins,

Secretary.

Royal Agricultural Society of England.

1874.

DISTRIBUTION OF MEMBERS OF THE SOCIETY AND OF MEMBERS OF COUNCIL.

Districts.	Counties.	Number of Members.	Number in Council.	Members of Council.
A.	Durham	91 ..	1	Hon. H. G. Liddell.
	Northumberland ..	130 ..	2	M. White Ridley; Jacob Wilson.
	Yorkshire — North and East Ridings	170 ..	3	Earl Cathcart, v.p.; T. C. Booth; John Wells.
		—— 391	— 6	
B.	Bedfordshire ..	50 ..	2	Duke of Bedford; C. Barnett.
	Cambridgeshire ..	74		
	Essex	113 ..	1	D. McIntosh.
	Hertfordshire ..	103 ..	1	J. B. Lawes.
	Huntingdonshire ..	34 ..	2	Jabez Turner; W. Wells.
	Norfolk	164 ..	2	Earl of Leicester; Robert Leeds.
	Suffolk	152 ..	3	Sir E. C. Kerrison, v.p.; N. G. Barthropp; Lieutenant-Colonel Wilson.
		—— 690	— 11	
C.	Cornwall	45		
	Devonshire	98 ..	3	Sir T. D. Acland; Sir M. Lopes; G. Turner.
	Dorsetshire	62 ..	1	Lord Portman, t.
	Somersetshire ..	108 ..	2	Viscount Bridport, t.; Sir W. Miles, v.p.
	Wiltshire	99 ..	1	J. Rawlence.
		—— 412	— 7	
D.	Derbyshire	74 ..	1	Lord Vernon, v.p.
	Leicestershire ..	125 ..	1	Duke of Rutland, t.
	Lincolnshire	210 ..	5	Marquis of Exeter; Henry Chaplin; Lord Kesteven, t.; W. Torr; W. Earle Welby.
	Northamptonshire	95		
	Nottinghamshire ..	132 ..	1	R. Milward, t.
	Rutlandshire ..	14		
	Warwickshire ..	154 ..	1	T. Horley, jun.
		—— 804	— 9	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts.	Counties.	Number of Members.		Number in Council.		Members of Council.
E.	Cumberland	95				
	Lancashire	232		3		Duke of Devonshire, V.P.; Lord Skelmersdale; T. Statter.
	Westmoreland	56		1		W. H. Wakefield
	Yorkshire — West Riding	131		2		Sir H. S. Meysey Thompson, T.; J. D. Dent.
			514		6	
F.	Gloucestershire	185		4		E. Bowly; W. J. Edmonds, E. Holland, T.; Col. Kingscote.
	Herefordshire	99		1		C. Wren Hoskyns.
	Monmouthshire	53		1		Lord Tredegar, T.
	Worcestershire	136		2		C. Randell; James Webb.
	South Wales	150				
			623		8	
G.	Berkshire	122				
	Buckinghamshire	63		2		Lord Chesham, T.; C. S. Cantrell.
	Hampshire	149		3		Viscount Eversley, V.P.; Sir A. K. Macdonald, T.; T. Pain.
	Kent	243		1		C. Whitehead.
	Middlesex	291		1		B. T. Brandreth Gibbs, V.P.
	Oxfordshire	145		2		Duke of Marlborough, T.; J. Druce.
	Surrey	121		1		C. E. Amos.
	Sussex	134		4		Earl of Chichester, V.P.; Earl of Egmont, V.P.; Duke of Richmond, V.P.; W. Rigden.
			1268		14	
H.	Cheshire	149		3		D. R. Davies; Hon. W. Egerton; John Torr.
	Shropshire	299		3		John Evans; Viscount Hill, V.P.; J. B. Jones.
	Staffordshire	246		2		Earl of Lichfield; R. H. Masfen.
	North Wales	121		2		Earl of Powis, T.; Sir W. Wynn, V.P.
			815		10	
Scotland		70				
Ireland		82				
Channel Islands		10				
Isle of Man		2				
Foreign Countries		78				
Members without addresses		67				
			309			

Implement Makers.

R. Hornsby.
R. C. Ransome.
J. Shuttleworth.

ROYAL AGRICULTURAL

DR. HALF-YEARLY CASH ACCOUNT

	£ s. d.	£ s. d.	£ s. d.
To Balance in hand, 1st July, 1873:—			
Bankers		1,414 9 5	
Secretary		32 2 9	
At Deposit with London and Westminster Bank		2,000 0 0	
			3,446 12 2
To Income:—			
Dividends on Stock		357 3 3	
Interest on Deposit		52 10 10	
Subscriptions:—	£ s. d.		
Governors' Life-Composition	70 0 0		
Governors' Annual	5 0 0		
Members' Life-Compositions	382 0 0		
Members' Annual	680 0 0		
		1,137 0 0	
Journal:—			
Sales	64 4 10		
Sales of Pamphlets	5 9 9		
		69 14 7	
Earl Cathcart's Essay Prize		100 0 0	
Total Income		.. .. ..	1,716 8 8
To Capital Account:—			
Sale of Old Metal		.. .. ..	16 2 0
To Country Meetings:—			
Hull		.. .. ..	10,385 17 7
			£15,565 0 5

BALANCE-SHEET,

LIABILITIES.	£ s. d.	£ s. d.	£ s. d.
To Capital:—			
Surplus, 30th June, 1873		29,065 2 4	
Less Surplus of Expenditure over Income during the Half-year, viz.:—	£ s. d.		
Expenditure	2,874 11 7		
Income	1,716 8 8		
		1,158 2 11	
		27,906 19 5	
Less half-year's interest and depreciation on Country Meeting Plant	209 17 0		
To Hull Meeting:—			
Excess of Expenditure over Receipts	110 19 5		
		320 16 5	
			£27,586 3 0

BRIDPORT, *Finance Committee.*

QUILTER, BALL, & CO., *Accountants.*

SOCIETY OF ENGLAND.

FROM 1ST JULY TO 31ST DECEMBER, 1873. CR.

	£ s. d.	£ s. d.	£ s. d.
By Expenditure:—			
Establishment:—			
Salaries, Wages, &c.	532 6 0		
House:—Rent, Taxes, Repairs, &c.	416 3 5		
Office:—Printing, Postage, Stationery, &c.	117 13 7		
		1,066 3 0	
Journal:—			
Printing and Stitching	526 11 1		
Postage and Delivery	149 0 0		
Literary Contributions	137 0 0		
Woodcuts	64 16 0		
Advertising	4 19 6		
Reprinting Vol. VIII., Part I.	90 0 0		
		972 6 7	
Professor Wrightson, Balance for Journey to Vienna		150 0 0	
Chemical:—			
Consulting Chemist's Salary		150 0 0	
Botanical:—			
Consulting Botanist's Salary		50 0 0	
Education		4 6 0	
Farm Inspection		148 5 4	
Sundries:—			
Law Charges	309 19 8		
Surveyor preparing various Plans	15 0 0		
		324 19 8	
Cardiff Meeting		8 11 0	
Total Expenditure		.. .. ..	2,874 11 7
By Capital Account:—			
Country Meeting Plant		.. .. ..	396 17 4
By Country Meetings:—			
Hull		11,668 8 1	
Bedford		136 4 10	
			11,804 12 11
			15,076 1 10
By Balance in hand, 31st Dec.:—			
Bankers		433 18 9	
Secretary		54 19 10	
			488 18 7
			£15,565 0 5

31ST DECEMBER, 1873.

ASSETS.	£ s. d.	£ s. d.
By Cash in hand	488 18 7	
By New 3 per Cent. Stock 24,112*l.* 7*s.* 8*d.* cost*	22,920 7 1	
By Books and Furniture in Society's House	1,451 17 6	
By Country Meeting Plant	2,588 15 0	
		27,449 18 2
By Bedford Meeting (Balance)	.. .. ..	136 4 10
		£27,586 3 0

* *Value at* 91¾ = £22,176 6*s.* 8*d.*

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 31st December, 1873, which at that date amounted to 1051*l.*

Examined, audited, and found correct, this 16th day of February, 1874.

A. H. JOHNSON,
HENRY CANTRELL,
FRANCIS SHERBORN,
} *Auditors on behalf of the Society.*

ROYAL AGRICULTURAL

Dr. YEARLY CASH ACCOUNT,

	£. s. d.	£. s. d.	£. s. d.
To Balance in hand, 1st Jan. 1873:—			
Bankers	. .	411 10 10	
Secretary	. .	80 5 8	
			491 16 6
To Income:—			
Dividends on Stock	. .	712 16 5	
Interest on Deposit Account	. .	52 10 10	
Subscriptions:—			
Governors' Life-Compositions	110 0 0		
Governors' Annual	270 0 0		
Members' Life-Compositions	1,093 0 0		
Members' Annual	3,612 0 0		
		5,085 0 0	
Journal:—			
Sales (half-year)	64 4 10		
Sales of Pamphlets	28 19 9		
		93 4 7	
Lord Cathcart's Essay Prize	. .	100 0 0	
Farm-Inspection:—Entry Fees	. .	11 0 0	
Sundries:—			
Donations on Account of Law Costs in the case of Kidd *v.* the Society	. .	110 0 0	
			6,164 11 10
To Capital Account:—			
Sale of Old Metal	. .	. .	16 2 0
To Country Meetings:—			
Cardiff	. .	15 1 6	
Hull	. .	15,403 15 4	
			15,418 16 10
			£22,091 7 2

SOCIETY OF ENGLAND.

FROM 1ST JANUARY TO 31ST DECEMBER, 1873. Cr.

	£. s. d.	£. s. d.	£. s. d.
By Expenditure:—			
Establishment:—			
Salaries, Wages, &c.	1,064 12 0		
House: Rent, Taxes, Repairs, &c.	695 17 1		
Office: Printing, Postage, Stationery	319 0 4		
		2,079 9 5	
Journal:—			
Printing and Stitching	1,012 13 7		
Postage and Delivery	278 10 0		
Literary Contributions	157 10 0		
Woodcuts and Lithographs	101 9 6		
Advertising	4 19 6		
Printing Pamphlets	7 16 6		
Reprinting Vol. VIII. Part I.	90 0 0		
Wrappers for four deliveries.	33 10 0		
Miscellaneous	7 0 0		
		1,693 9 1	
Professor Wrightson's Journey to Vienna . . .	. .	300 0 0	
Chemical:—			
Consulting Chemist's Salary	300 0 0		
Grant for Investigations	200 0 0		
		500 0 0	
Veterinary:—			
Grant to Royal Veterinary College (half-year to Christmas, 1872)	. .	75 0 0	
Botanical:—			
Consulting Botanist's Salary	. .	100 0 0	
Education	. .	94 12 6	
Subscriptions (paid in error) returned.	. .	13 1 0	
Farm Inspection:—			
Advertising, &c.	33 12 6		
Prize	100 0 0		
Expenses of Judging	48 5 4		
		181 17 10	
Sundries:—			
Law Charges	618 13 5		
Expenses of Inspection Committee	34 14 1		
Surveyor preparing Plans	15 0 0		
		668 7 6	
			5,705 17 4
By Capital Account:—			
Country Meeting Plant	. . .	. .	396 17 4
By Country Meetings:—			
Cardiff	. .	90 11 0	
Hull	. .	15,272 18 1	
Bedford	. .	136 4 10	
			15,499 13 11
By Balance in hand, 31st Dec.:—			
Bankers	. .	433 18 9	
Secretary	. .	54 19 10	
			488 18 7
			£22,091 7 2

RECEIPTS.

	£.	s.	d.
Subscription from Hull	2,000	0	0
Admissions to Show Yard by Payment	7,449	7	9
Admissions by Season Tickets	619	15	0
Admissions to Grand Stand by Payment	477	10	0
Admissions by Season Tickets	107	13	0
Sale of Catalogues	573	19	5
Entries in Implement Catalogue	450	0	0
Implement Exhibitors' Payments for Shedding	2,061	18	9
Non-Members' Fees for entry of Implements	183	0	0
Fees for entry of Live Stock	526	5	0
Fees for Horse Boxes and Stalls	205	0	0
Premium for Supply of Refreshments	437	16	0
Premium for Collecting Manure	10	0	0
Premium for Cloak Rooms and Lavatory	60	0	0
Fines for Non-Exhibition of Live-Stock	30	5	0
Fines for Non-Exhibition of Implements	30	12	6
	15,223	2	5
Balance of Expenditure over Receipts	413	14	1
	£15,636	16	6

March, 1874.

ACCOUNT, HULL, 1873.

EXPENDITURE.

	£. s. d.	£. s. d.
Show Yard Works:—viz. Carriage, Storage, erecting and Painting, taking to pieces, Packing and Insurance of Permanent Buildings, and other Plant	590 7 6	
Implement Sheds, 1268*l.* 10*s.*; Seed and Model Sheds, 275*l.* 10*s.*	1544 0 0	
Stock Sheds, 639*l.* 7*s.* 2*d.*; Fodder Shed, 120*l.*; Horse Boxes, 1004*l.*	1763 7 2	
Hurdles, 210*l.*; Fences, Gates, &c., 446*l.* 13*s.*	656 13 0	
Tents and Fittings, 71*l.* 10*s.* 3*d.*; Awnings, 70*l.* 14*s.*	142 4 3	
Lavatories, &c., 187*l.* 18*s.*; other Offices, &c., 72*l.* 9*s.* 3*d.*	260 7 3	
Platform inside Entrances, 83*l.* 10*s.* 8*d.*; Signs, &c., 45*l.* 8*s.* 7*d.*	128 19 3	
Other Works, 238*l.* 18*s.* 6*d.*; Trial Field, 76*l.* 4*s.* 5*d.*	315 2 11	
Surveyor	219 10 9	
Grand Stand	538 4 8	
Depreciation of Plant	405 16 9	
		6,564 13 6
Trial Fields, 400*l.*; Extra in levelling Showyard, 100*l.*		500 0 0
Judges: Implements, 236*l.* 7*s.*; Stock, 327*l.* 15*s.* 3*d.*		564 2 3
Consulting Engineers and Assistants		226 4 8
Inspectors: Veterinary, 54*l.* 17*s.* 10*d.*; Shearing, 36*l.* 4*s.* 8*d.*		91 2 6
Police: Metropolitan		297 2 0
Clerks and Assistants: Secretary and official Staff, 83*l.* 3*s.* 2*d.*; Hon. Director, 42*l.* 4*s.* 7*d.*; Bankers, 31*l.* 10*s.*		156 17 9
Assistant Steward of Implements		34 13 0
Foremen: Implements, 12*l.* 16*s.* 10*d.*; Trials, 32*l.* 7*s.*; Stock Yard, 17*l.* 10*s.* Horses, 10*l.* 5*s.* 2*d.*; Cattle, 9*l.* 2*s.*; Fodder, 10*l.*		92 1 0
Yardmen, Fieldmen, Labourers, Foddermen, Grooms		233 13 8
Index-Clerk and Money Takers, 88*l.* 15*s.*; Doorkeepers and Money-changer, 44*l.* 2*s.*		132 17 0
Stewards' Lodgings and Expenses		170 0 3
Lodgings for Judges and other Officials		143 6 6
Refreshments		200 11 0
Catalogues: Implements, 321*l.* 10*s.*; Awards, 5*l.* 7*s.*; Stock, 152*l.* 16*s.* 6*d.*; Awards, 24*l.* 18*s.*; Plan of Yard, 22*l.* 10*s.*; Sellers, 40*l.* 4*s.*; Carriage and Packing, 28*l.* 10*d.*		595 6 4
Printing		545 6 10
Advertising and Bill Posting		580 16 0
Hay, 114*l.* 17*s.* 11*d.*; Straw, 188*l.* 3*s.* 3*d.*; Green Food, 303*l.* 18*s.* 10*d.*; Expenses in Purchasing, 29*l.* 17*s.* 1*d.*		636 17 1
Postage, Telegrams, Carriage, Stationery, Badges, &c.		107 10 10
Repairs, Insurance, and Carriage of Testing Machinery		56 8 9
Horse Hire, 350*l.* 3*s.* 4*d.*; Hire of Engines, 14*l.* 6*d.*; Carriages and Cabs, 24*l.* 11*s.* 6*d.*		388 15 4
Fire Engine Men, 15*l.* 14*s.* 6*d*; Waterworks Men, 20*l.* 10*s.*		36 4 6
Coals, 5*l.* 5*s.*; Surveyor at Trials, 3*l.* 3*s.*		8 8 0
Journeys to Hull previous to Show		23 2 0
Gratuities to Post-Office and Telegraph Department, 5*l.* 5*s.*; Refreshment for Police at Trials, 2*l.* 12*s.*		7 17 0
Hire of Weighing Machines, Sacks, &c., 8*l.* 5*s.*; Hire of Scythes, 2*l.* 16*s.*		11 1 0
Expenses at Trial of Potato Diggers		4 6 0
Royal Standard, 2*l.* 10*s.*; Twine, 1*l.* 4*s.*		3 14 0
Chloride of Lime, Cotton Waste, and Sundries		7 14 3
Rosettes, 15*l.* 7*s.* 6*d.*; Medals, 10*l.* 16*s*		26 3 6
Prizes: Stock, 2830*l.**; Implements, 355*l.*		3,185 0 0
		£15,636 16 6

* Exclusive of Local Prizes, 325*l.*, and 90*l.* given by E. Pease, Esq.

Bedford Meeting, 1874:

ON MONDAY THE 13TH OF JULY, AND FOUR FOLLOWING DAYS.

SCHEDULE OF PRIZES.

I.—LIVE-STOCK PRIZES.

*Prizes offered by the Bedford Local Committee and the Bedfordshire Agricultural Society are marked thus * ; those offered by Edward Pease, Esq., of Darlington, are marked thus †.*

Reference Number in Certificates.	HORSES.	First Prize.	Second Prize.	Third Prize.
	STALLIONS.			
Class		£.	£.	£.
1	Agricultural Stallion, foaled in the year 1872, *not qualified to compete as Clydesdale or Suffolk* ..	20	10	5
2	Agricultural Stallion, foaled before 1st Jan. 1872, *not qualified to compete as Clydesdale or Suffolk*	25	15	5
3	Clydesdale Stallion, foaled in the year 1872 ..	20	10	5
4	Clydesdale Stallion, foaled before the 1st Jan. 1872	25	15	5
5	Suffolk Stallion, foaled in the year 1872	20	10	5
6	Suffolk Stallion, foaled before the 1st of Jan. 1872	25	15	5
7	Stallion, suitable for getting Hackneys	20	10	5
8	Thorough-bred Stallion, suitable for getting Hunters	50	25	10
	BROOD MARES.			
9	Agricultural Mare, in foal, or with foal at foot, *not qualified to compete as Clydesdale or Suffolk* ..	20	10	5
10	Clydesdale Mare, in foal, or with foal at foot ..	20	10	5
11	Suffolk Mare, in foal, or with foal at foot	20	10	5
12	Mare and foal, of any breed, for Agricultural purposes	*15	*10	..
13	Mare, in foal, or with foal at foot, suitable for breeding Coach Horses	20	10	5
14	Mare, in foal, or with foal at foot, suitable for breeding Hackneys	20	10	5
15	Mare, in foal, or with foal at foot, suitable for breeding Hunters	25	15	5
	DRAUGHT GELDINGS AND FILLIES.			
16	Yearling Gelding, of any breed, for Agricultural purposes	*10	*5	..
17	Yearling Cart Filly, of any breed, for Agricultural purposes	*10	*5	..

Reference Number in Certificates.	HORSES—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
18	Agricultural Gelding (*including Clydesdale and Suffolk*), two years old	15	10	5
19	Agricultural Filly (*including Clydesdale and Suffolk*), two years old	15	10	5
20	Suffolk Filly, two years old (*County of Suffolk Prize, offered by Breeders of Suffolk Horses*) ..	25	10	..
21	Agricultural Gelding (*including Clydesdale and Suffolk*), three years old	15	10	5
22	Agricultural Filly (*including Clydesdale and Suffolk*), three years old	15	10	5
23	Pair of Agricultural Horses (Mares or Geldings), not under four years old, used solely for Agricultural purposes	*20	10	*5
	HUNTERS.			
24	Hunter Filly, two years old	15	10	..
25	Hunter Gelding, two years old	15	10	..
26	Hunter Mare, three years old	20	15	10
27	Hunter Gelding, three years old	20	15	10
28	Hunter Mare, four years old	30	20	10
29	Hunter Gelding, four years old	30	10	10
30	Hunter Mare or Gelding, five years old and upwards, up to not less than 12 stone	30	20	10
31	Hunter Mare or Gelding, five years old and upwards, up to not less than 14 stone	30	20	10
	HACKNEYS.			
32	Hackney Mare or Gelding, up to not less than 12 stone	20	10	5
33	Hackney Mare or Gelding, up to not less than 14 stone	20	10	5
	PONIES.			
34	Pony Mare or Gelding, above 13 hands 2 inches, and not exceeding 14 hands 2 inches	15	10	5
35	Pony Mare or Gelding, not exceeding 13 hands 2 inches	15	10	5
36	Jackass, not under 13 hands, for getting Mules for Agricultural purposes	†25	†15	†10
37	Mule, not under 15 hands, for Agricultural purposes	†25	†15	†10

Reference Number in Certificates.	CATTLE.	First Prize.	Second Prize.	Third Prize.	Fourth Prize.
Class	(ALL AGES CALCULATED TO JULY 1ST, 1873.)	£.	£.	£.	£.
	SHORTHORN.				
38	Bull, above three years old	30	20	15	10
39	Bull, above two and not exceeding three years old	25	15	10	5
40	Yearling Bull, above one and not exceeding two years old	25	15	10	5
41	Bull-Calf, above six and not exceeding twelve months old	15	10	5	..
42	Cow, above three years old	20	10	5	..
43	Heifer, in-milk or in-calf, not exceeding three years old	20	15	10	5
44	Yearling Heifer, above one and not exceeding two years old	20	15	10	5
45	Heifer-Calf, above six and under twelve months old	15	10	5	..
	HEREFORD.				
46	Bull, above three years old	25	15	5	..
47	Bull, above two and not exceeding three years old	25	15	5	..
48	Yearling Bull, above one and not exceeding two years old	25	15	5	..
49	Bull-Calf, above six and not exceeding twelve months old	10	5	..	..
50	Cow, above three years old	20	10	5	..
51	Heifer, in-milk or in-calf, not exceeding three years old	15	10	5	..
52	Yearling Heifer, above one and not exceeding two years old	15	10	5	
53	Heifer-Calf, above six and under twelve months old	10	5	..	
	DEVON.				
54	Bull, above three years old	25	15	5	..
55	Bull, above two and not exceeding three years old	25	15	5	..
56	Yearling Bull, above one and not exceeding two years old	25	15	5	..
57	Bull-Calf, above six and not exceeding twelve months old	10	5	..	..
58	Cow, above three years old	20	10	5	..
59	Heifer, in-milk or in-calf not exceeding three years old	15	10	5	..
60	Yearling Heifer, above one and not exceeding two years old	15	10	5	..
61	Heifer-Calf, above six and under twelve months old	10	5	..	..
	JERSEY.				
62	Bull, above one year old	10	5	..	..
63	Cow, above three years old	10	5	..	..
64	Heifer, in-milk or in-calf, not exceeding three years old	10	5	..	..

Reference Number in Certificates.	CATTLE—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	GUERNSEY.			
65	Bull, above one year old	10	5	..
66	Cow, above three years old	10	5	..
67	Heifer, in-milk or in-calf, not exceeding three years old	10	5	..
	SUSSEX.			
68	Bull, above two years old	20	10	..
69	Bull, above one year old	15	10	..
70	Cow, above three years old	15	10	..
71	Heifer, in-milk or in-calf, above two years old ..	15	10	..
	NORFOLK AND SUFFOLK.			
72	Bull, above two years old	20	10	..
73	Bull, above one year old	15	10	..
74	Cow, above three years old	15	10	..
75	Heifer, in-milk or in-calf, above two years old ..	15	10	..
	ANY BREED.			
76	Cow, of any breed, in-milk or in-calf, not eligible for entry in any herd book	*15	*10	..
	NOTE.—*No Cow entered as in-calf, and not in-milk, shall be eligible for this Prize, unless certified to have produced a live calf, in due course, subsequent to the Show.*			
77	Heifer, of any breed, in-milk or in-calf, not exceeding three years old, not eligible for entry in any herd book	*15	*10	..

SHEEP.

		First Prize.	Second Prize.	Third Prize.
	LEICESTER.			
78	Shearling Ram	20	10	5
79	Ram of any other age	20	10	5
80	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	COTSWOLD.			
81	Shearling Ram	20	10	5
82	Ram of any other age	20	10	5
83	Pen of Five Shearling Ewes, of the same flock ..	15	10	5

Reference Number in Certificates.	SHEEP—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	Lincolns.			
84	Shearling Ram	20	10	5
85	Ram of any other age	20	10	5
86	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Border Leicester.			
87	Shearling Ram	20	10	5
88	Ram of any other age	20	10	5
89	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Oxfordshire Down.			
90	Shearling Ram	20	10	5
91	Ram of any other age	20	10	5
92	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Southdown.			
93	Shearling Ram	20	10	5
94	Ram of any other age	20	10	5
95	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Shropshire.			
96	Shearling Ram	20	10	5
97	Ram of any other age	20	10	5
98	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Hampshire and other Short-Woolled Breeds.			
	Not qualified to compete as Southdown or Shropshire.			
99	Shearling Ram	20	10	5
100	Ram of any other age	20	10	5
101	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	Long-Woolled.			
102	Pen of Ten Breeding Ewes of any age, which shall have suckled lambs up to June 1st, 1874 ..	*12	*8	..
103	Pen of Ten Ewe Lambs	*12	*8	..
104	Pen of Ten Wether Lambs	*12	*8	..
105	Pen of Five Shearling Wethers	*12	*8	..

Reference Number in Certificates.	SHEEP—*continued.*	First Prize.	Second Prize.	Third Prize.
Class		£.	£.	£.
	SHORT-WOOLLED. *Including Oxfordshire and Shropshire.*			
106	Pen of Ten Breeding Ewes, of any age, which shall have suckled lambs up to June 1st, 1874 ..	*12	*8	..
107	Pen of Ten Ewe Lambs	*12	*8	..
108	Pen of Ten Wether Lambs	*12	*8	..
109	Pen of Five Shearling Wethers	*12	*8	..
	PIGS.			
	LARGE WHITE BREED.			
110	Boar, above six months and not exceeding twelve months old	10	5	..
111	Boar, above twelve months old	10	5	..
112	Pen of three Breeding Sow-Pigs of the same litter, above four and under eight months old	10	5	..
113	Breeding Sow	10	5	..
	SMALL WHITE BREED.			
114	Boar, above six months and not exceeding twelve months old	10	5	..
115	Boar, above twelve months old	10	5	..
116	Pen of three Breeding Sow-Pigs of the same litter, above four and under eight months old	10	5	..
117	Breeding Sow	10	5	..
	SMALL BLACK BREED.			
118	Boar, above six months and not exceeding twelve months old	10	5	..
119	Boar, above twelve months old	10	5	..
120	Pen of three Breeding Sow-Pigs of the same litter, above four and under eight months old ..	10	5	..
121	Breeding Sow	10	5	..
	BERKSHIRE BREED.			
122	Boar, above six months and not exceeding twelve months old	10	5	..
123	Boar, above twelve months old	10	5	..
124	Pen of three Breeding Sow-Pigs of the same litter, above four and under eight months old	10	5	..
125	Breeding Sow	10	5	..

Reference Number in Certificates.	PIGS—*continued.*	First Prize.	Second Prize.	Third Prize.
Class.		£.	£.	£.
	OTHER BREEDS.			
	Not eligible to compete in any of the preceding Classes.			
126	Boar, above six months and not exceeding twelve months old	10	5	..
127	Boar, above twelve months old	10	5	..
128	Pen of three Breeding Sow-Pigs of the same litter above four and under eight months old	10	5	..
129	Breeding Sow	10	5	..

II.—IMPLEMENT AND MACHINERY PRIZES OFFERED BY THE SOCIETY.

Class.		First Prize.	Second Prize.
	SECTION I.—DRILLS.	£.	£.
1	General purpose Drills	10	5
2	Corn Drills	15	10
3	For the best adaptation to a Corn Drill for hill-side delivery	10	..
4	Corn Drills for small occupations	10	5
5	Drills for Turnips and other roots on the flat ..	10	5
6	Drills for Turnips and other roots on the ridge ..	10	5
7	Drills for Turnips and other roots on the ridge, without manure-box	10	5
8	Water Drills	10	5
9	Drills for small seeds	10	5
10	Barrows for sowing small seeds	5	..
11	Drill Pressers	5	..
12	Potato Drills	15	10
	SECTION II.—HORSE HOES.		
13	Horse Hoes for general purposes	10	5
14	Horse Hoes combined with Drill, for small seeds ..	5	..
15	Single-row Horse Hoes for ridge and flat	10	5
16	Single-row Grubbers	5	..
17	Horse Hoes for thinning Turnips	15	10

Class.	IMPLEMENTS—*continued.*	First Prize.	Second Prize.
	SECTION III.—MANURE DISTRIBUTORS.	£.	£.
18	Distributors for liquid manure	10	..
19	Distributors for dry manure	5	..
	SECTION IV.—WAGGONS.		
20	Pair-horse Waggons	15	10
21	Light Waggons on springs	10	5
22	Other Waggons	10	..
	SECTION V.—CARTS.		
23	Single-horse Carts for general agricultural purposes	10	5
24	Harvest Carts	10	..
25	Market Carts on springs	10	..
26	Carts for the conveyance of water, with pump attached	10	5
27	Other Carts	10	..
	SECTION VI.—STOCK AND IMPLEMENT CARTS.		
28	Low-bodied Carts, on springs, for conveyance of stock	10	..
29	Lorries, or other vehicles, for the conveyance of implements	10	..
30	Carts with crank axle and low body	10	..
	SECTION VII.—MOVABLE HUTS.		
31	Shepherds' Huts on wheels	10	5
32	Vans for men engaged in steam cultivation, with fittings	15	10

SPECIAL PRIZE.

For the best Appliance or Guard to the Drum of a Threshing Machine for preventing Accidents to people employed.
The Society's large Gold Medal.

MISCELLANEOUS.

Awards to Agricultural Articles not included in the ordinary rotation .. .. 10 Silver Medals.

CONDITIONS APPLYING TO CERTAIN CLASSES OF LIVE STOCK ONLY.

CATTLE.

1. No bull above two years old will be eligible for a prize unless certified to have served not less than three different cows (or heifers) within the three months preceding the 1st of June in the year of the Show.

2. All bulls above one year old shall have rings or "bull-dogs" in their noses, and be provided with leading sticks.

3. No cow will be eligible for a prize unless certified either at the date of entry or between the date of entry and that of the Show, to have had a living calf, or that the calf, if dead, was born at its proper time, within the twelve months preceding the date of the Show.

4. No heifer, except yearlings, entered as in-calf, will be eligible for a prize unless she is certified to have been bulled before the 31st of March in the year of the Show, nor will her owner afterwards receive the prize until he shall have furnished the Secretary with a further certificate before the 31st of January in the subsequent year, that she produced a living calf; or that the calf, if dead, was born at its proper time.

5. Shorthorns.—Each animal entered in the Shorthorn Classes, must be certified by the Exhibitor to have not less than four crosses of Shorthorn blood which are registered in the herd book.

HORSES.

6. All foals must be the offspring of the mare along with which they are exhibited; and the sire of the foal must be given on the certificate of entry as well as the sire of the mare.

7. No mare entered in the classes for breeding animals will be eligible for a prize unless certified either at the date of entry, or between the date of entry and that of the Show, to have had a living foal—or that the foal, *if dead*, was born at its proper time, in the year of the Show;—or in the event of a mare being exhibited *without* a foal at foot, a certificate shall be produced at the time of entry of her having been served, and the prize shall be withheld till a certificate be produced of her having produced a foal.

8. No veterinary inspection of horses will be required except when considered necessary by the Judges, who will be accompanied by the Veterinary Inspectors.

9. Hunters and Hackneys entered to compete in the light-weight classes will be disqualified if, in the opinion of the Judges, they are eligible to compete in the heavy-weight classes.

10. A charge of 1*l.* for the accommodation of a horse-box, in addition to the entry-fee, will be made for each entry for stallions and mares in-foal, or with foals at foot.

11. A charge of 10*s.* will be made, in addition to the entry-fee, for the accommodation of a stall for each animal in the other Horse Classes.

Sheep.

12. All rams, except shearlings, must have been used in the preceding year.

13. Sheep exhibited for any of the prizes must have been *really and fairly shorn bare* after the 1st of April in the year of the Exhibition; and the date of such shearing must form part of the Certificate of Entry. Inspectors will be appointed by the Council to examine the sheep on their admission to the Show-Yard, with instructions to report to the Stewards any cases in which the sheep have not been *really and fairly shorn bare.*

14. Sheep unfairly prepared for Show by oiling or colouring may be disqualified on the recommendation of the Inspectors of Shearing.

Pigs.

15. The three sow-pigs in each pen must be of the same litter.

16. The breeding sows in Classes 113, 117, 121, 125, and 129, shall be certified to have had a litter of live pigs within the six months preceding the Show, or to be in-pig at the time of entry, so as to produce a litter before the 1st of September following. In the case of in-pig sows, the prize will be withheld until the Exhibitor shall have furnished the Secretary with a certificate of farrowing, as above.

17. No sow, if above eighteen months old, that has not produced a litter of live pigs, shall be eligible to compete in any of the classes.

18. The Judges of pigs will be instructed, with the sanction of the Stewards, to withhold prizes from any animals which shall appear to them to have been entered in a wrong class.

19. All pigs exhibited at the Country Meetings of the Society shall be subjected to an examination of their mouths by the Veterinary Inspector of the Society; and should the state of dentition in any pig indicate that the age of the animal has not been correctly returned in the Certificate of Entry, the Stewards shall have power to disqualify such pig, and shall report the circumstance to the Council at its ensuing Monthly Meeting. No pig shall be oiled or coloured while in the Show-Yard.

20. If a litter of pigs be sent with a breeding sow, the young pigs must be the produce of the sow, and must not exceed two months old.

RULES OF ADJUDICATION.

1. As the object of the Society in giving prizes for cattle, sheep, and pigs, is to promote improvement in *breeding* stock, the Judges in making their awards will be instructed not to take into their consideration the present value to the butcher of animals exhibited, but to decide according to their relative merits for the purpose of *breeding*.

2. If, in the opinion of the Judges, there should be equality of merit, they will be instructed to make a special report to the Council, who will decide on the award.

3. The Judges will be instructed to withhold any prize if they are of opinion that there is not sufficient merit in any of the stock exhibited for such prize to justify an award.

4. The Judges will be instructed to give in a *Reserved Number* in each class of live stock; viz., which animal would, in their opinion, possess sufficient merit for the prize, in case the animal to which the prize is awarded should subsequently become disqualified.

5. In the classes for stallions, mares, and fillies, the Judges in awarding the prizes will be instructed, in addition to symmetry, to take activity and strength into their consideration.

6. The attention of the Stewards and Judges is particularly called to the conditions applying to pigs. The Senior Steward of Live Stock is requested to report any malpractices on the part of Exhibitors, and any person found guilty will not be allowed to exhibit at future meetings of the Society.

CONDITIONS RELATING TO IMPLEMENTS.

General Conditions as regards Drills, Carts, Waggons, &c.

Section I.—Drills.

1. Such drills as may be selected by the Judges will be tested by a dynamometer arranged to draw as nearly as possible from the same height, and at the same angle as the horses.

Sections IV., V., VI.—Carts, Waggons, &c.

1. A course will be prepared partly on hard road, and partly on fields or soft ground.
2. The carts, &c., will be loaded in proportion to their capacity, build, and strength, to an extent determined by the Judges and Engineers.
3. The loads will consist of straw, roots, and corn, in sacks, disposed in the manner usual in actual farm work.
4. The weight on each wheel, loaded and unloaded, will be ascertained by suitable weighing machines.
5. The tractive force necessary to draw the carts, &c., will be compared with the useful load transported, and not with the gross load, which includes the cart, &c., itself.
6. Such carts, &c., as may be selected by the Judges, will be tested by a dynamometer arranged to draw as nearly as possible from the same height, and at the same angle, as horses, and two-wheeled carts will also have the load on the horses' backs determined.
7. The springs will be tested with reference to their range, absolute strength, and stiffness—that is, the deflection per ton.

Generally, such implements as the Judges may select will be tested for draught, either by a dynamometer or spring links.

Every drill, cart, waggon, or other vehicle entered for trial, must be arranged so that it can be drawn by a single pair of shafts, in order that the dynamometer may be applied to it, if selected by the Judges for such test.

*** Forms of Certificate for entry, as well as Prize-Sheets for the Bedford Meeting, containing the whole of the conditions and regulations, may be obtained at the Office of the Society, No. 12, Hanover Square, London, W.

DATES OF ENTRY FOR LIVE STOCK AND IMPLEMENTS.

Certificates for the entry of Implements for the Bedford Meeting must be forwarded to the Secretary of the Society, No. 12, Hanover Square, London, W., by the 1st of May, and Certificates for the entry of Live Stock by the 1st of June. Certificates received after those respective dates will not be accepted, but returned to the persons by whom they have been sent.

The Prizes of the Royal Agricultural Society of England, and all Prizes offered by the Bedford Local Committee, the Bedfordshire Agricultural Society, and other Donors, are open to general competition.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by the letter W, members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

General Meeting in London, May 22, 1874, at 12 o'clock.

Meeting at Bedford, July 13th, 1874, and four following days.

General Meeting in London, December, 1874.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Office Hours.—10 to 4. On Saturdays, from the Council Meeting in August until the Council Meeting in April, 10 to 2.

Diseases of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society, and of sending animals to the Royal Veterinary College on the same terms as if they were subscribers to the College.—(A statement of these privileges will be found in this Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in this Appendix.

Botanical Privileges.—The Botanical Privileges enjoyed by Members of the Society will be found stated in this Appendix.

Subscriptions.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June. 2. For Life.—Governors may compound for their subscription for future years by paying at once the sum of £50, and Members by paying £10. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose subscriptions are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member.

Payments.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory manner, either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of post-office orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or any other house of business in London will be equally available, if made payable on demand. In obtaining post-office orders care should be taken to give the postmaster the correct initials and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payment will be refused to him at the post-office on which such order has been obtained; and when remitting the money-orders it should be stated by whom, and on whose account, they are sent. Cheques should be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and should be drawn on a London (not on a local country) banker. When payment is made to the London and Westminster Bank, St. James's Square Branch, as the bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the banker's book may be at once identified, and the amount posted to the credit of the proper party. No coin can be remitted by post, unless the letter be registered.

New Members.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Proposal may be obtained on application to the Secretary.

*** Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chemical, Botanical, and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Members' Veterinary Privileges.

I.—Serious or Extensive Diseases.

No. 1. Any Member of the Society who may desire professional attendance and special advice in cases of serious or extensive disease among his cattle, sheep, or pigs, and will address a letter to the Secretary, will, by return of post, receive a reply stating whether it be considered necessary that Professor Simonds, the Society's Veterinary Inspector, should visit the place where the disease prevails.

No. 2. The remuneration of the Inspector will be 2*l.* 2*s.* each day as a professional fee, and 1*l.* 1*s.* each day for personal expenses; and he will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. The fees will be paid by the Society, but the travelling expenses will be a charge against the applicant. This charge may, however, be reduced or remitted altogether at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

No. 3. The Inspector, on his return from visiting the diseased stock, will report to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

No. 4. When contingencies arise to prevent a personal discharge of the duties confided to the Inspector, he may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—Ordinary or Other Cases of Disease.

Members may obtain the attendance of the Veterinary Inspector on any case of disease by paying the cost of his visit, which will be at the following rate, viz., 2*l.* 2*s.* per diem, and travelling expenses.

III.—Consultations without visit.

Personal consultation with Veterinary Inspector	5*s.*
Consultation by letter	5*s.*
Consultation necessitating the writing of three or more letters	10*s.*
Post-mortem examination, and report thereon	10*s.*

A return of the number of applications during each half-year being required from the Veteriuary Inspector.

IV.—Admission of Diseased Animals to the Veterinary College Investigations; Lectures, and Reports.

No. 1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the same terms as if they were Members of the College; viz., by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs "a small proportionate charge to be fixed by the Principal according to circumstances."

No. 2. The College has also undertaken to investigate such particular classes of disease, or special subjects connected with the application of the Veterinary art to cattle, sheep, and pigs, as may be directed by the Council.

No. 3. In addition to the increased number of lectures now given by Professor Simonds—the Lecturer on Cattle Pathology—to the pupils in the Royal Veterinary College, he will also deliver such lectures before the Members of the Society, at their house in Hanover Square, as the Council shall decide.

No. 4. The Royal Veterinary College will from time to time furnish to the Couucil a detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary.

By Order of the Council,

H. M. JENKINS, *Secretary.*

Members' Privileges of Chemical Analysis.

The Council have fixed the following rates of Charge for Analyses to be made by the Consulting Chemist for the *bonâ fide* use of Members of the Society; who (to avoid all unnecessary correspondence) are particularly requested, when applying to him, to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens, must be paid to him by members at the time of their application.

No. 1.—An opinion of the genuineness of Peruvian guano, bone-dust, or oil-cake (each sample)	5s.
„ 2.—An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts, and ammonia	10s.
„ 3.—An estimate of the value (relatively to the average of samples in the market) of sulphate and muriate of ammonia, and of the nitrates of potash and soda	10s.
„ 4.—An analysis of superphosphate of lime for soluble phosphates only	10s.
„ 5.—An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia ..	£1.
„ 6.—An analysis (sufficient for the determination of its agricultural value) of any ordinary artificial manure	£1.
„ 7.—Limestone:—the proportion of lime, 7s. 6*d*.; the proportion of magnesia, 10s.; the proportion of lime and magnesia	15s.
„ 8.—Limestone or marls, including carbonate, phosphate, and sulphate of lime, and magnesia with sand and clay ..	£1.
„ 9.—Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1.
„ 10.—Complete analysis of a soil	£3.
„ 11.—An analysis of oil-cake, or other substance used for feeding purposes; showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre; as well as of starch, gum, and sugar, in the aggregate	£1.
„ 12.—Analyses of any vegetable product	£1.
„ 13.—Analyses of animal products, refuse substances used for manure, &c.	from 10s. to 30s.
„ 14.—Determination of the "hardness" of a sample of water before and after boiling	10s.
„ 15.—Analysis of water of land drainage, and of water used for irrigation	£2.
„ 16.—Determination of nitric acid in a sample of water	£1.

N.B.—*The above Scale of Charges is not applicable to the case of persons commercially engaged in the Manufacture or Sale of any Substance sent for Analysis.*

The Address of the Consulting Chemist of the Society is, Dr. Augustus Voelcker, F.R.S., 11, Salisbury Square, London, E.C., to which he requests that all letters and parcels (postage and carriage paid) should be directed.

By Order of the Council,
H. M. JENKINS, *Secretary.*

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

ARTIFICIAL MANURES.—Take a large handful of the manure from three or four bags, mix the whole on a large sheet of paper, breaking down with the hand any lumps present, and fold up in tinfoil, or in oil silk, about 3 ozs. of the well-mixed sample, and send it to 11, Salisbury Square, Fleet Street, E.C., by post: or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a larger boxful, weighing from 10 to 12 ozs., should be sent either by post or railway.

Samples not exceeding 4 ozs. in weight may be sent by post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 ozs., for three postage stamps.

Samples not exceeding 12 ozs., for four postage stamps.

The parcels should be addressed: Dr. Augustus Voelcker, 11, Salisbury Square, Fleet Street, London, E.C., and the address of the sender or the number or mark of the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials. No parcel sent by post must exceed 12 ozs. in weight, 1 foot 6 inches in length, 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep; trim this block or plan of the field to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid and send it by goods or parcel to the laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—Two gallons of water are required for analysis. The water, if possible, should be sent in glass-stoppered Winchester half-gallon bottles, which are readily obtained in any chemist and druggist's shop. If Winchester bottles cannot be procured, the water may be sent in perfectly clean new stoneware spirit-jars surrounded by wickerwork. For the determination of the degree of hardness before and after boiling, only one quart wine-bottle full of water is required.

LIMESTONES, MARLS, IRONSTONES, AND OTHER MINERALS.—Whole pieces, weighing from 3 to 4 ozs., should be sent enclosed in small linen bags, or wrapped in paper. Postage 2*d.*, if under 4 ozs.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, leaving the ends open, and send parcel by post. The piece should weigh from 10 to 12 ozs. Postage, 4*d.* If sent by railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 ozs. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

Members' Botanical Privileges.

The Council have provisionally fixed the following Rates of Charge for the examination of Plants and Seeds for the *bonâ fide* use of Members of the Society, who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid to the Consulting Botanist at the time of application, and the carriage of all parcels must be prepaid.

No. 1.—	A general opinion as to the genuineness and age of a sample of clover-seed (each sample)	5*s.*
„ 2.—	A detailed examination of a sample of dirty or impure clover-seed, with a report on its admixture with seeds of dodder or other weeds (each sample)	10*s.*
„ 3.—	A test examination of turnip or other cruciferous seed, with a report on its germinating power, or its adulteration with 000 seed (each sample)	10*s.*
„ 4.—	A test examination of any other kind of seed, or corn, with a report on its germinating power (each sample) ..	10*s.*
„ 5.—	Determination of the species of any indigenous British plant (not parasitic), with a report on its habits (each species)	5*s.*
„ 6.—	Determination of the species of any epiphyte or vegetable parasite, on any farm-crop grown by the Member, with a report on its habits, and suggestions (where possible) as to its extermination or prevention (each species) ..	10*s.*
„ 7.—	Report on any other form of plant-disease not caused by insects	10*s.*
„ 8.—	Determination of the species of a collection of natural grasses indigenous to any district on one kind of soil (each collection)	10*s.*

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tin-foil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

Parcels or letters (Carriage or Postage prepaid) to be addressed to Mr. W. Carruthers, F.R.S., 25, Wellington Street, Islington, London.

H. M. JENKINS, *Secretary.*

Royal Agricultural Society of England.

1874-5.

President.

VISCOUNT BRIDPORT.

Trustees.

Year when Elected.	
1857	BRIDPORT, Viscount, *Cricket St. Thomas, Chard, Somersetshire.*
1850	CHESHAM, Lord, *Latimer, Chesham, Bucks.*
1861	HOLLAND, EDWARD, *Dumbleton Hall, Evesham, Gloucestershire.*
1867	KESTEVEN, Lord, *Caswick, Stamford, Lincolnshire.*
1863	KINGSCOTE, Colonel, M.P., *Kingscote, Wootton-under-Edge, Gloucestershire.*
1854	MACDONALD, Sir ARCHIBALD KEPPEL, Bt., *Woolmer Lodge, Liphook, Hants.*
1860	MARLBOROUGH, Duke of, K.G., *Blenheim Park, Oxford.*
1846	MILWARD, RICHARD, *Thurgarton Priory, Southwell, Notts.*
1839	PORTMAN, Viscount, *Bryanston, Blandford, Dorset.*
1856	POWIS, Earl of, *Powis Castle, Welshpool, Montgomeryshire.*
1858	RUTLAND, Duke of, K.G., *Belvoir Castle, Grantham, Leicestershire.*
1839	TREDEGAR, Lord, *Tredegar Park, Newport, Monmouthshire.*

Vice-Presidents.

1861	CATHCART, Earl, *Thornton-le-Street, Thirsk, Yorkshire.*
1839	CHICHESTER, Earl of, *Stanmer Park, Lewes, Sussex.*
1867	DEVONSHIRE, Duke of, K.G., *Holker Hall, Lancashire.*
1847	EVERSLEY, Viscount, *Heckfield Place, Winchfield, Hants.*
1848	GIBBS, B. T. BRANDRETH, *Halfmoon Street, Piccadilly, London,* W.
1847	HILL, Viscount, *Hawkstone Park, Salop.*
1858	KERRISON, Sir EDWARD C., Bart., *Brome Hall, Scole, Suffolk.*
1839	MILES, Sir WILLIAM, Bart., *Leigh Court, Bristol, Somersetshire.*
1852	RICHMOND, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1859	VERNON, Lord, *Sudbury Hall, Derby.*
1855	WYNN, Sir WATKIN WILLIAMS, Bart., M.P., *Wynnstay, Ruabon, Denbighshire.*

Other Members of Council.

1855	ACLAND, Sir THOMAS DYKE, Bart., M.P., *Sprydoncote, Exeter, Devonshire.*
1858	AMOS, CHARLES EDWARDS, 5, *Cedars Road, Clapham Common, Surrey.*
1848	BARNETT, CHARLES, *Stratton Park, Biggleswade, Bedfordshire.*
1853	BARTHROPP, NATHANIEL GEORGE, *Hacheston, Wickham Market, Suffolk.*
1873	BEDFORD, Duke of, *Woburn Abbey, Bedfordshire.*
1868	BOOTH, THOMAS CHRISTOPHER, *Warlaby, Northallerton, Yorkshire.*
1863	BOWLY, EDWARD, *Siddington House, Cirencester, Gloucestershire.*
1861	CANTRELL, CHARLES S., *Riding Court, Datchet, Bucks.*
1866	DAVIES, DAVID REYNOLDS, *Agden Hall, Lymm, Cheshire.*
1861	DENT, J. D., *Ribston Hall, Wetherby, Yorkshire.*
1860	DRUCE, JOSEPH, *Eynsham, Oxford.*

Year when Elected.	
1868	EDMONDS, WILLIAM JOHN, *Southrope, Lechlade, Gloucestershire.*
1871	EGERTON, Hon. WILBRAHAM, M.P., *Rostherne Manor, Knutsford, Cheshire.*
1873	EVANS, JOHN, *Uffington, Shrewsbury, Salop.*
1874	HEMSLEY, JOHN, *Shelton, Newark, Notts.*
1873	HORLEY, THOMAS, Jun., *The Fosse, Leamington, Warwickshire.*
1866	HORNSBY, RICHARD, *Spittle Gate, Grantham, Lincolnshire.*
1854	HOSKYNS, CHANDOS WREN, *Harewood, Ross, Herefordshire.*
1871	JONES, J. BOWEN, *Ensdon House, Shrewsbury, Salop.*
1848	LAWES, JOHN BENNET, *Rothamsted, St. Albans, Herts.*
1869	LEEDS, ROBERT, *Wicken Farm, Castleacre, Brandon, Norfolk.*
1872	LEICESTER, Earl of, K.G., *Holkham Hall, Wells, Norfolk.*
1868	LICHFIELD, Earl of, *Shugborough, Staffordshire.*
1867	LIDDELL, Hon. HENRY GEORGE, M.P., *Ravensworth Castle, Durham.*
1874	LINDSAY, Colonel LOYD, M.P., *Lockinge Park, Wantage, Berkshire.*
1865	LOPES, Sir MASSEY, Bart., M.P., *Maristow, Roborough, Devon.*
1871	McINTOSH, DAVID, *Havering Park, Romford, Essex.*
1871	MASFEN, R. HANBURY, *Pendeford, Wolverhampton, Staffordshire.*
1857	PAIN, THOMAS, *The Grove, Basingstoke, Hants.*
1861	RANDELL, CHARLES, *Chadbury, Evesham, Worcestershire.*
1868	RANSOME, ROBERT CHARLES, *Ipswich, Suffolk.*
1871	RAWLENCE, JAMES, *Bulbridge, Wilton, Salisbury, Wilts.*
1869	RIDLEY, M. WHITE, M.P., *Blagdon, Cramlington, Northumberland.*
1861	RIGDEN, WILLIAM, *Hove, Brighton, Sussex.*
1874	SANDAY, GEORGE HENRY, *Holme Pierrepont, Notts.*
1856	SHUTTLEWORTH, JOSEPH, *Hartsholme Hall, Lincoln.*
1872	SKELMERSDALE, Lord, *Lathom Hall, Ormskirk, Lancashire.*
1873	TORR, JOHN, M.P., *Carlett Park, Eastham, Chester.*
1857	TORR, WILLIAM, *Aylesby Manor, Great Grimsby, Lincolnshire.*
1845	TURNER, GEORGE, *Brampford Speke, Exeter, Devonshire.*
1871	TURNER, JABEZ, *Haddon, Huntingdonshire.*
1871	WAKEFIELD, WILLIAM H., *Kendal, Westmoreland.*
1870	WELBY, WILLIAM EARLE, M.P., *Newton House, Folkingham, Lincolnshire.*
1861	WELLS, WILLIAM, *Holmewood, Peterborough, Northamptonshire.*
1870	WHITEHEAD, CHARLES, *Barming House, Maidstone, Kent.*
1866	WILSON, Lieut.-Colonel FULLER MAITLAND, *Stowlangtoft Hall, Bury St. Edmund's, Suffolk.*
1865	WILSON, JACOB, *Woodhorn Manor, Morpeth, Northumberland.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London,* W.

Consulting Chemist—Dr. AUGUSTUS VOELCKER, F.R.S., 11, *Salisbury Square,* E.C.
Consulting Botanist—W. CARRUTHERS, F.R.S., F.L.S., *British Museum,* W.C.
Consulting Veterinary Surgeon — JAMES BEART SIMONDS, *Royal Veterinary College,* N.W.
Consulting Engineers—EASTONS & ANDERSON, *The Grove, Southwark Street,* S.E.
Seedsmen—THOMAS GIBBS and Co., *Corner of Halfmoon Street, Piccadilly,* W.
Publisher—JOHN MURRAY, 50, *Albemarle Street,* W.
Bankers—THE LONDON AND WESTMINSTER BANK, *St. James's Square Branch,* S.W.

STANDING COMMITTEES FOR 1874.

Finance Committee.

BRIDPORT, Viscount (Chairman).
DAVIES, D. R.
KINGSCOTE, Colonel.
RANDELL, CHARLES.
TORR, WILLIAM.

House Committee.

THE PRESIDENT.
CHAIRMAN of Finance Committee.
DAVIES, D. R.
KINGSCOTE, Colonel.
GIBBS, B. T. BRANDRETH.
TORR, WILLIAM.

Journal Committee.

DENT, J. D. (Chairman).
CATHCART, Earl.
VERNON, Lord.
ACLAND, Sir T. DYKE, Bart.
HOLLAND, EDWARD.
HOSKYNS, C. WREN.
JONES, J. BOWEN.
KINGSCOTE, Colonel.
MILWARD, RICHARD.
RAWLENCE, J.
RIDLEY, M. WHITE.
WELBY, W. E.
WELLS, W.
WHITEHEAD, CHARLES.
WILSON, JACOB.

Chemical Committee.

WELLS, WILLIAM (Chairman).
BEDFORD, Duke of.
LICHFIELD, Earl of.
VERNON, Lord.
DAVIES, D. R.
DENT, J. D.
EGERTON, Hon. W.
EVANS, JOHN.
HOSKYNS, C. WREN.
LAWES, J. B.
VOELCKER, Dr. A.
WAKEFIELD, W. H.
WELBY, W. E.
WHITEHEAD, CHARLES.
WILSON, Colonel.
WILSON, JACOB.

Botanical Committee.

VERNON, Lord.
DENT, J. D.
EDMONDS, W. J.
GIBBS, B. T. BRANDRETH.
JONES, J. BOWEN.
TORR, JOHN.
TURNER, JABEZ.
VOELCKER, Dr.
WELBY, W. E.
WELLS, W.
WHITEHEAD, CHARLES.

Veterinary Committee.

BRIDPORT, Viscount (Chairman).
CATHCART, Earl.
BOOTH, T. C.
BROWN, Professor.
DENT, J. D.
EGERTON, Hon. WILBRAHAM.
GIBBS, B. T. BRANDRETH.
KINGSCOTE, Colonel.
LEEDS, ROBERT.
MASFEN, R. H.
RIDLEY, M. WHITE.
SIMONDS, Professor.
WELLS, WILLIAM.
WILSON, JACOB.

Stock-Prizes Committee.

MILWARD, RICHARD (Chairman).
BRIDPORT, Viscount.
BARTHROPP, NATHANIEL G.
BOOTH, T. C.
BOWLY, EDWARD.
DAVIES, D. R.
DENT, J. D.
DRUCE, JOSEPH.
EVANS, JOHN.
GIBBS, B. T. BRANDRETH.
HORLEY, THOMAS.
LEEDS, ROBERT.
MASFEN, R. H.
RANDELL, CHARLES.
RIDLEY, M. WHITE
RIGDEN, WILLIAM.
TORR, WILLIAM.
TURNER, GEORGE.
WAKEFIELD, W. H.
WILSON, JACOB.
The Stewards of Live Stock.

Implement Committee.

Booth, Thomas C. (Chairman).
Bridport, Viscount.
Vernon, Lord.
Amos, C. E.
Cantrell, Chas. S.
Edmonds, W. J.
Evans, John.
Gibbs, B. T. Brandreth.
Horley, T.
Hornsby, Richard.
Hoskyns, C. Wren.
Jones, J. Bowen.
Leeds, Robert.
Milward, R.
Masfen, R. H.
Randell, Charles.
Ransome, R. C.
Shuttleworth, Joseph.
Torr, William.
Turner, Jabez.
Welby, W. Earle.
Whitehead, Charles.
Wilson, Jacob.
The Stewards of Implements.

General Taunton Committee.

Holland, E. (Chairman).
Bedford, Duke of.
Cathcart, Earl.
Powis, Earl of.
Bridport, Viscount.
Chesham, Lord.
Kesteven, Lord.
Vernon, Lord
Wynn, Sir Watkin W., Bart.
Barnett, Charles.
Booth, T. C.
Bowly, Edward.
Bult, J. L.
Cantrell, Charles S.
Davies, D. R.
Druce, Joseph.
Easton, R.
Easton, W.
Edmonds, W. J.
Gibbs, B. T. Brandreth.
Hornsby, Richard.
Knollys, J. E.
Leeds, Robert.
Luttrell, Colonel.
Masfen, R. H.
Milward, Richard.
Penny, T.
Randell, Charles.
Ransome, R. C.
Ridley, M. W.
Shuttleworth, Joseph.
Taylor, P.
Torr, William.
Turner, Jabez.
Wakefield, W. H.
Wells, William.
Whitehead, Charles.
Wilson, Jacob.

Show-Yard Contracts Committee.

Randell, Charles (Chairman).
Bridport, Viscount.
Vernon, Lord.
Amos, C. E.
Booth, T. C.
Gibbs, B. T. Brandreth.
Hornsby, Richard.
Milward, Richard.
Shuttleworth, Joseph.
Torr, William.
Wilson, Jacob.

Committee of Selection.

Kingscote, Colonel (Chairman).
Cathcart, Earl.
Bridport, Viscount.
Davies, D. R.
Dent, J. D.
Gibbs, B. T. Brandreth.
Holland, E.
Milward, R.
Randell, Charles.
Thompson, H. S.
Torr, William.
Wells, William.

And the Chairmen of the Standing Committees.

Education Committee.

Bedford, Duke of (Chairman).
Acland, Sir T. Dyke, Bart.
Lopes, Sir Massey, Bart.
Dent, J. D.
Holland, E.
Jones, J. Bowen.
Kingscote, Colonel.
McIntosh, David.
Voelcker, Dr.
Wells, William.
Whitehead, Charles.

Cattle Plague Committee.

The whole Council.

*** The President, Trustees, and Vice-Presidents are Members *ex officio* of all Committees.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Friday, May 22nd, 1874.

REPORT OF THE COUNCIL.

Since the General Meeting last December, 3 Governors and 88 Members have died, and the names of 39 Members have been removed from the list by order of the Council, as well as of 167 who resigned in the course of the year 1873. During the same period 1 Governor and 151 Members have been elected, so that the balance on the half-year is a reduction of the list by 2 Governors and 143 Members.

The Society now consists of:—

76 Life Governors,
58 Annual Governors,
1944 Life Members,
3756 Annual Members,
12 Honorary Members.

These numbers make a total of 5846, and when compared with those reported at the Annual Meeting last May, show a decrease of 2 Governors and 68 Members.

The accounts for the year 1873 have been examined and certified by the auditors and accountants of the Society, and have been published in the last number of the Journal, together with the statement of receipts and expenditure connected with the Country Meeting at Hull. The funded capital of the Society remains the same as the last half-yearly meeting, namely, 24,112*l.* 7*s.* 8*d.* New Three per Cents. The following sums are in the hands of the Bankers, towards defraying the current expenses of the establishment, and of the forthcoming Country Meeting at Bedford, namely, on deposit, 2,000*l.*, and the balance of the current account, which, on the 1st inst., amounted to 3,682*l.* 19*s.* 2*d.*

The Bedford Local Committee are cordially co-operating with the Council to promote the success of the ensuing Country Meeting. In conjunction with the Bedfordshire Agricultural Society, they have added to the Society's Prize-sheet offers of prizes for agricultural horses; for cows and heifers, in-milk or in-calf; and for long-woolled and short-woolled ewes, lambs, and wethers. The Society's List of Prizes offered for horses has been considerably augmented by the addition of classes for geldings and fillies for agricultural and hunting purposes, as well as for hackneys and ponies; and Mr. Pease, of Darlington, has continued his liberal offer of prizes for asses and mules, on the same terms as were attached to those offered at the Hull meeting. The total amount of the prizes for live stock offered for competition at the Bedford meeting is 3,935*l.*

At the General Meeting, held last December, a suggestion was made by Mr. H. Corbet, on behalf of Mr. C. S. Read, M.P., that the Council should offer a special prize for the most efficient guard to the drum of a threshing machine at work. The Council have carefully considered this suggestion, and have offered for competition at Bedford, the large gold medal of the Society, "for the best guard or appliance to the drum of a threshing machine for preventing accidents to people employed."

The offers of prizes for the two best managed farms in Bedfordshire, by Lord Charles Russell and the Society, have called forth an entry of twelve. Considering the restricted area of the competition, this must be considered a very satisfactory entry. The judges have already made two inspections of the competing farms; and they are instructed to pay their final visit in time to report their award at the General Meeting of the Members of the Society, which will be held in the show-yard at Bedford on July 14th.

The Council are desirous of increasing the usefulness and importance of these farm-prize competitions, especially with a view to the more complete description, in the Journal of the Society, of the best examples of farm-management in the locality in which the Country Meetings are held. They have, therefore, resolved that the prizes to be offered annually for the best-managed farms, with the conditions upon which they are offered, whether by individuals or by the Society, shall be published immediately after the July Council in each year;

and they have requested the Journal Committee to consider annually a scheme of prizes and conditions, and to report the same to the Council at their July meeting in each year.

The district assigned for the Country Meeting in 1875 comprises the counties of Cornwall, Devon, Somerset, Dorset, and Wilts. The Council, having received an invitation from the authorities of Taunton, appointed a Committee to inspect the site of the proposed show-yard and trial-fields, and to confer with the Local Committee in reference to the accommodation offered. This Committee reported in favour of the acceptance of the invitation by the authorities of Taunton, and the Council thereupon decided in favour of the Country Meeting for 1875 being held in that locality.

The Council have also to announce that, in accordance with the rotation of districts at present followed, the Country-meeting for 1876 will be held in the district comprising the counties of Derby, Leicester, Lincoln, Northampton, Nottingham, Rutland, and Warwick.

The Special Committee on the potato-disease, the appointment of which was reported at the last General Meeting, have carefully considered this important question from a scientific as well as a practical point of view, and with special reference to the recommendations of the Judges of the Essays which were sent in to compete for Lord Cathcart's prize of 100*l.*, offered for the best essay on the potato-disease and its prevention. This Committee eventually recommended a thorough inquiry into the whole subject, under the following heads:—(1) By the appointment of Professor de Bary to undertake a special investigation with a view of discovering, if possible, that portion of the life-history of the potato-fungus which is at present unknown. (2.) By the offer of prizes for potatoes that will resist disease for three years in succession in twenty different localities of the United Kingdom, with a view of testing the truth of the assertions made by growers and essayists that they possessed disease-proof potatoes; and at the same time of ascertaining the influence of climate, soil, and methods of management on the growth, productiveness, and ability to resist disease of different varieties of the potato. (3) By sending a schedule of questions to large potato-growers in different parts of the United Kingdom, with the object of obtaining from them the results of their past experience on the cultivation of the potato, with special reference to the potato-disease. (4) By the announcement that, in 1879, the Council will offer prizes for new varieties of potato, raised from seed in the mean time, which shall be found to resist disease during three years' trial, under the same conditions as the present competition. The Council adopted these recommendations, and they are able to announce that Professor de Bary has undertaken the proposed scientific investigations; that six varieties of potato, sent in to compete for the prizes offered, are at present being grown in twenty different districts of the United Kingdom, namely, ten in England, two in Wales, four in Scotland, and four in Ireland. A list of questions, carefully prepared by the Committee, has also been sent to about 300 potato-growers in the several potato-growing districts of the United Kingdom; and it is proposed to publish a report, based on the replies that may be received to them, in the next number of the Journal.

The Council have called the attention of the Secretary of State for the Home Department, and the President of the Local Government Board, to the present unsafe condition of many bridges throughout the country for the passage over them of ploughing and traction engines, the increased use of which in agricultural operations is becoming more and more necessary.

Ten Candidates, out of twelve who had entered, presented themselves for the usual educational examination on April 14th and following days. Mr. R. Rich, of the Royal Agricultural College, Cirencester, obtained a First Class Certificate, the Life Membership of the Society, and a Prize of 25*l.* All the other Candidates failed to satisfy the Examiners in Chemistry, and, with one exception, each Candidate also failed in at least one other necessary subject.

The Examiner in Agriculture reported very favourably of the papers written and the answers given, in the vivâ voce examination, by the majority of the Candidates, and considered that great credit was due to them for their proficiency in Practical Agriculture. The Examiners in Chemistry regarded the result of the examination in that science as very disappointing, and much below the standard attained by the Candidates last year; they added that the knowledge of general principles and common facts of General Chemistry shown by the Candidates was very imperfect, and that this deficiency was not compensated by practical acquaintance with analysis or technical details, while the papers on Agricultural Chemistry were particularly unsatisfactory. The results of the examination in Book-keeping were beyond the average of former years. The Examiner in Mechanics and Natural Philosophy, and in Mensuration and Land Surveying, reported unfavorably on the results of this year's examination in those subjects, and called attention to the fact that those who failed in Mechanics failed in the most elementary questions. In the optional subjects, one Candidate passed in Geology with fifty-three marks, one in Botany with fifty, and one in Anatomy and Physiology with fifty, fifty being the minimum pass-number in each of those subjects.

The Education Committee have recently had under consideration the question of the possibility of encouraging technical education, in subjects applicable to agriculture, in Middle-Class Schools. The Secretary has also attended, by invitation, a conference of the Head-Masters of such schools, when the following resolution was adopted :—

> "That a Sub-Committee be appointed for the purpose of communicating with the other Members of this Conference, and with the Royal Agricultural Society, with a view to the framing of some plan of examination for encouraging the preliminary study of Agriculture in Middle-Class Schools."

The Education Committee have held interviews with this Sub-Committee of Head-Masters, and they have proposed the following scheme, which has been accepted by the Council, and by which they hope to encourage in these schools the study of the rudiments of chemistry, mechanics, and other sciences as applied to the practice of agriculture.

I. That, in addition to the present yearly examination of advanced students, a more elementary examination be held annually by the Royal Agricultural Society.

II. That ten Scholarships of 20*l.* each shall be given on condition that the Scholar spend the ensuing year at a school, or with a practical agriculturist, to be approved by the Education Committee, or at one of the Agricultural

Colleges, such as Cirencester, Glasnevin, or the Agricultural Department at Edinburgh.

[NOTE.—In the event of the Scholar proceeding to Cirencester, he will be entitled (subject to the regulations of the College as to age) to compete for one of six Middle-Class Scholarships, given by the Council of the Royal Agricultural College, of the value of 40*l.* per annum, tenable for two years.]

III. That the Scholarship be not paid for any year until after a testimonial as to good conduct and industry be produced after the expiration of that year from the Head-Master of the School, Principal of the College, or the practical farmer under whom the Scholar has studied.

IV. That candidates for the Scholarships be not less than 15 years of age.

V. That the candidates shall be members of one of the following schools, viz. :—

ARDINGLEY COLLEGE ;
BEDFORD MIDDLE-CLASS SCHOOL ;
BLOXHAM (All Saints' School) ;
DEVON COUNTY SCHOOL ;
DORSET COUNTY SCHOOL ;
HURSTPIERPONT COLLEGE ;
NORFOLK COUNTY COLLEGE ;
FRAMLINGHAM (Albert College) ;
MIDDLE-CLASS CORPORATION SCHOOL ;
SURREY COUNTY SCHOOL ;
TRENT COLLEGE ;
WHITGIFT SCHOOL (Croydon) ;

or of Schools hereafter to be approved by the Council of the Royal Agricultural Society.

VI. That annual examinations shall be held simultaneously in the month of November, at such schools as have candidates, and that to the boys who stand highest the Scholarships shall be awarded.

VII. That the subjects for examination for the Scholarships be :—

1. Land Surveying.
2. Elementary Mechanics, as applied to Agriculture.
3. Chemistry, as applied to Agriculture.

4. The Principles of Agriculture, especially with reference to the rotation of Crops, the nutrition of Plants and Animals, and the Mechanical Cultivation of the Soil.

VIII. That for the conduct of the Examination a Local Secretary be appointed by the Royal Agricultural Society.

That to the Local Secretary sealed packets of the examination papers shall be sent; that these packets shall be opened and distributed to the Candidates in his presence, or in the presence of some one specially deputed by him.

That during the time the papers are being answered there shall be present the Local Secretary or his deputy, who shall, at the end of the time appointed by the Examiner for answering, collect the papers, seal them in packets, and forward them to the Secretary of the Royal Agricultural Society.

IX. That this scheme do not interfere with the Royal Agricultural Society's Senior Examinations, already in operation.

In reference to this subject, the Education Committee have reported that of two Candidates who came up from the Surrey County School at the recent examination, one passed a very good examination, although not fully qualified in Practical Agriculture.

By order of the Council,

H. M. Jenkins,

Secretary.

ROYAL AGRICULTURAL

Dr.

Half-yearly Cash Account

	£ s. d.	£ s. d.	£ s. d.
To Balance in hand, 1st January, 1874:—			
Bankers		433 18 9	
Secretary		54 19 10	
			488 18 7
To Income:—			
Dividends on Stock		357 3 3	
Subscriptions:—			
Governor's Life-Composition	40 0 0		
Governors' Annual	285 0 0		
Members' Life-Compositions	585 0 0		
Members' Annual	3,139 15 0		
		4,049 15 0	
Journal:—			
Sales	67 5 4		
Advertisements (3 parts)..	179 1 1		
		246 6 5	
Farm Inspection:—Entry Fees		29 0 0	
Hull Meeting		87 15 0	
Total Income		4,769 19 8	
To Bedford Meeting		5,501 15 7	
			10,271 15 3
			£10,760 13 10

Balance-Sheet,

LIABILITIES.	£ s. d.	£ s. d.	£ s. d.
To Capital:—			
Surplus, 31st December, 1873		27,586 3 0	
Surplus of Income over Expenditure during the Half-year, viz.:—			
Income	4,769 19 8		
Expenditure	2,827 17 11		
		1,942 1 9	
			29,528 4 9
Less half-year's interest and depreciation on Country Meeting Plant		.. .. ..	194 3 0
			£29,334 1 9

QUILTER, BALL, & CO., *Accountants.*

SOCIETY OF ENGLAND.

FROM 1ST JANUARY TO 30TH JUNE, 1874. Cr.

	£ s. d.	£ s. d.	£ s. d.
By Expenditure :—			
Establishment :—			
Salaries, Wages, &c.	537 10 0		
House :—Rent, Taxes, Repairs, &c.	272 19 5		
Office :—Printing, Postage, Stationery, &c.	232 15 1		
		1,043 4 6	
Journal :—			
Printing and Stitching	411 18 9		
Postage and Delivery	132 0 0		
Literary Contributions	145 1 0		
Woodcuts	64 6 0		
Advertising	9 14 0		
		762 19 9	
Chemical :—			
Consulting Chemist's Salary	150 0 0		
Grant for Investigations	200 0 0		
		350 0 0	
Veterinary :			
Grant to Royal Veterinary College to Christmas 1873		200 0 0	
Botanical :—			
Consulting Botanist's Salary		50 0 0	
Education :—			
Fees to Examiners	36 15 0		
Prize	25 0 0		
Printing, Advertising, &c.	29 8 2		
		91 3 2	
Subscriptions (paid in error) returned		2 0 0	
Potato Disease Investigations		156 3 6	
Farm Inspection :—Advertising, &c.		31 13 9	
Sundries :—			
Books for Library	26 17 5		
Expenses of Inspection Committee	14 13 0		
		41 10 5	
Hull Meeting		98 17 10	
Total Expenditure			2,827 17 11
By Bedford Meeting			3,338 13 3
			6,166 11 2
By Balance in hand, 30th June :—			
Bankers		2,552 2 9	
Secretary		41 19 11	
			2,594 2 8
At Deposit with London and Westminster Bank			2,000 0 0
			10,760 13 10

30TH JUNE, 1874.

ASSETS.	£ s. d.	£ s. d.
By Cash in hand	2,594 2 8	
By Deposit Account	2,000 0 0	
By New 3 per Cent. Stock 24,112*l.* 7*s.* 8*d.* cost*	22,920 7 1	
By Books and Furniture in Society's House	1,451 17 6	
By Country Meeting Plant	2,394 12 0	
		31,360 19 3
Less at credit of Bedford Meeting		2,026 17 6
		£29,334 1 9

* *Value at* 91⅞ = £22,123 2*s.* 3*d.*

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 30th June, 1874, which at that date amounted to 1051*l.*

Examined, audited, and found correct, this 14th day of September, 1874.

A. H. JOHNSON,
FRANCIS SHERBORN,
HENRY CANTRELL,
} *Auditors on behalf of the Society.*

SHOW AT BEDFORD,

JULY, 1874.

STEWARDS OF THE YARD.

Stock.

Robert Leeds,
M. White Ridley, M.P.,
William H. Wakefield,
Hon. W. Egerton, M.P.

Implements.

Thomas C. Booth,
Charles Whitehead,
Jabez Turner,
J. Bowen Jones.

Forage.

Christopher Stephenson.

Honorary Director.

B. T. Brandreth Gibbs.

JUDGES OF STOCK.

HORSES, &c.

N. G. Barthropp,
Thomas Gibbons,
Henry Lowe,
William Forster,
E. Paddison,
Jacob Smith,
Henry Beevor,
George Botham,
J. Parrington.

CATTLE.

Shorthorns.

Hugh Aylmer,
E. Bowly,
Henry Smith.

Herefords and Devons.

F. Evans,
S. P. Newbury,
Thomas Pope.

Sussex, Norfolk and Suffolk, and any Breed.

Henry Overman,
Josiah Pitcher.

Jerseys and Guernseys.

James Dumbrell,
C. P. Le Cornu.

SHEEP.

Leicesters.

John Painter,
R. Salter,
J. H. Burbery.

Cotswolds, Lincolns, and Longwools.

William Garne,
H. Mackinder,
R. J. Newton.

Border Leicesters.

L. C. Chrisp,
William C. Thomson.

Oxfordshire Downs, Southdowns, Hampshires, and Shortwools.

Henry Fookes,
William Parsons,
J. S. Turner.

Shropshires.

John Coxon,
John Evans,
George Cureton.

PIGS.

John Angus,
John Lynn,
Joseph Smith.

Inspectors of Shearing.

HENRY BONE,	WILLIAM JOBSON,	J. B. WORKMAN.

Veterinary Inspectors.

PROFESSOR BROWN.	R. L. HUNT.

JUDGES OF IMPLEMENTS.

Sections I., II., and III.—Drills, Horse Hoes, and Manure Distributors.

MAJOR GRANTHAM,	J. W. KIMBER,	T. P. OUTHWAITE,
JOHN HICKEN,	J. D. OGILVIE,	MATTHEW SAVIDGE.

Sections IV., V., VI., and VII.—Waggons, Carts, Stock and Implement Carts, and Movable Huts.

JOHN COLEMAN,	GEORGE TURNBULL,	JOHN WHEATLEY.

Miscellaneous Articles, and Special Prize for Guard to the Drum of a Threshing Machine.

HENRY CANTRELL,	J. FORD,	JOHN HEMSLEY.

Reporter.—G. PURVES SMITH.

Farm Judges.

T. PLOWRIGHT, Jun.,	J. RAWLENCE,	G. H. SANDAY.

AWARD OF PRIZES.

NOTE.—The Judges were instructed, in addition to awarding the Prizes, to designate as the *Reserve Number* one animal in each Class, next in order of merit, if it possessed sufficient for a Prize; in case an animal to which a Prize was awarded should subsequently become disqualified.

Prizes given by the Bedford Local Committee and the Bedfordshire Agricultural Society are marked thus (*).

HORSES.

Agricultural Stallions—Two Years-old.

GEORGE EKINS DAINTREE, Fenton, Huntingdon: FIRST PRIZE, 20*l.*, for "Grand Prince," bay, bred by Mr. J. Flintham, Aldborough, Suffolk; sire, "Black Prince;" dam, "Dapper," by "Farmer's Glory."

CHARLES GOLDEN, The Grange, Ramsey, Hunts: SECOND PRIZE, 10*l.*, for "Champion," brown, bred by Mr. Beharell, Stone Bridge, Whittlesea; sire, "Young Thumper."

THOMAS RUSSELL, Lower Shuckburgh, Daventry: THIRD PRIZE, 5*l.*, for his dark bay, bred by himself; sire, "Walker's Warwick;" dam, "Boney."

WILLIAM J. HIPWELL, Station Road, Rugby: the *Reserve Number*, to his red roan, bred by Mr. Watson, Flintham, Newark; sire, "Enterprise."

Agricultural Stallions foaled before the 1st of January, 1872.

THOMAS BRIGGS, Babraham, Cambridge: FIRST PRIZE, 25*l.*, for "Heart of Oak," bay, 3 years-old; bred by Mrs. Foster, Brooklands, Cambridge; sire, "Honest Tom;" dam by "Smiler."

THOMAS STATTER, Stand Hall, Whitefield, Manchester: SECOND PRIZE, 15*l.*, for "Young Champion," chestnut, 7 years-old; bred by Mr. T. Stokes, Caldecot, Rockingham; sire, Mr. Stokes's "Champion."

THOMAS STATTER, Stand Hall: THIRD PRIZE, 5*l.*, for "King Tom," bay, 3 years-old; bred by Mr. T. Wayman, Wallingham, St. Ives; sire, "Honest Tom;" dam by "Young Active."

CHARLES BROOKES, Claxby Grange, Alford, Lincolnshire: the *Reserve Number*, to "Honest Tom 2nd," brown, 3 years-old; bred by Mr. R. Ekins, Hemmington, Huntingdon; sire, Welcher's "Honest Tom;" dam by "Farmer's Glory."

Clydesdale Stallions—Two Years-old.

RICHARD TWEEDIE, The Forest, Catterick, Yorkshire: FIRST PRIZE, 20*l.*, for "Tam O'Shanter," dark brown; bred by Mr. W. H. Thompson, Hillwood, Ratho, N.B.; sire, "Rantin Robin;" dam, "Nell," by "Strathaven."

Clydesdale Stallions foaled before the 1st of January, 1872.

THOMAS TAGG, Newhall, Burton-on-Trent: FIRST PRIZE, 25*l.*, for "Young Lofty," bay, 13 years-old; bred by Mr. J. Clarke, Mansurae, Kilbarchan, N.B.

EDWARD and ALFRED STANFORD, Eatons, Steyning, Sussex: SECOND PRIZE, 15*l.*, for "The Duke," brown, 7 years-old; bred by the Duke of Hamilton, Hamilton Park, N.B.; sire, "Sir Walter Scott;" dam, "Bell," by "Lothian Tom."

EDWARD PEASE, Greencroft West, Darlington: THIRD PRIZE, 5*l.*, for "Emperor," dark bay, 4 years-old; bred by Mr. L. Clark, Campbelton, N.B.; sire, "Larg's Jock;" dam, "Lilly," by "Young Clyde."

JAMES FIRTH CROWTHER, Knowl Green, Mirfield, Yorkshire: the *Reserve Number*, to "Sir Roger," brown, 4 years-old: bred by Mr. Stones, Barnby Hall, Cawthorne, Barnsley; sire, "Great Britain; dam by "John Bull."

Suffolk Stallions—Two Years-old.

MANFRED BIDDELL, Playford, Ipswich: FIRST PRIZE, 20*l.*, for "The Templar," chestnut, bred by Mr. Shoebridge, Witham, Essex; sire, "Young Talbot."

RICHARD GARRETT, Carleton Hall, Saxmundham: SECOND PRIZE, 10*l.*, for his chestnut, bred by himself; sire, "Cupbearer;" dam, "Moggy," by "Talbot."

JAMES TOLLER, Blaxhall, Wickham Market: THIRD PRIZE, 5*l.*, for "Defendant," chestnut, bred by Mr. Herman Biddell; sire, a son of "Harwich Emperor;" dam, "Brag," by "Marquis."

WILLIAM BYFORD, The Court, Glemsford, Suffolk: the *Reserve Number*, to his chestnut, bred by himself; sire, "Volunteer;" dam, "Diamond," by "The Farmer."

Suffolk Stallions foaled before the 1st of January, 1872.

CHARLES FROST, Wherstead, Ipswich: FIRST PRIZE, 25*l.*, for "Cupbearer 2nd," chestnut, 4 years-old; bred by himself; sire, Crisp's "Cupbearer;" dam by "Captain."

LIEUT-COLONEL FULLER MAITLAND WILSON, Stowlangtoft Hall, Bury St. Edmund's: SECOND PRIZE, 15*l.*, for "Heir Apparent," 5 years-old, chestnut; bred by Mr. S. Wolton, Newbourn Hall, Woodbridge; sire, "Monarch;" dam, "Victoria."

RICHARD GARRETT, Carleton Hall: THIRD PRIZE, 5*l.*, for "Claimant," chestnut, 3 years-old; bred by Mr. Ogilvie, Oldringham, Saxmundham; sire, "Cupbearer;" dam by Mr. Johnson's "Leiston."

WILLIAM BYFORD, The Court, Glemsford: the *Reserve Number*, to "The Statesman," chestnut, 3 years-old; bred by Mr. C. Frost, Wherstead; sire, "Talbot;" dam by Barthropp's "Hero."

Stallions suitable for getting Hackneys.

CHRISTOPHER W. WILSON, High Park, Kendal, Westmoreland: FIRST PRIZE, 20*l.*, for "Sir George," brown, 7 years-old; bred by Mr. W. Walker, Shadwell; sire, "Sportsman."

George Andrew Lepper, Walton-street, Aylesbury: Second Prize, 10*l.*, for "Rapid Roan," red roan, 12 years-old; bred by General Angerstein; sire, "Performer."

Frederick Barlow, Hasketon, Woodbridge: Third Prize, 5*l.*, for "President," chestnut, 8 years-old; bred by Mr. Warter, Gilling, Yorkshire; sire, "President, junior"; dam by "Owton Merrylegs."

Frederick Branwhite, Chapel House, Long Melford, Sudbury: the *Reserve Number*, to "Defiance," bay roan, 5 years-old; bred by himself; sire, "Ambition;" dam, "Pretty Lass" by "Phenomenon."

Thoroughbred Stallions suitable for getting Hunters.

Frederick Barlow, Hasketon, Woodbridge: First Prize, 50*l.*, for "Citadel," chestnut, 15 years-old; bred by the Earl of Derby; sire, "Stockwell;" dam, "Sortie" by "Melbourne."

Robert Hutton, 74, Gloucester Place, Portman Square, London: Second Prize, 25*l.*, for "Laughing Stock," dark bay, 15 years-old; bred by Sir C. Monks, Bart., Belsea Castle, Morpeth; sire, "Stockwell;" dam, "Gaiety," by "Touchstone."

William Blenkiron, Middle Park, Eltham, Kent: Third Prize, 10*l.*, for "King John," bay, 13 years-old; bred by the late Mr. Blenkiron; sire, "Kingston;" dam, "Dinah," by "Clarion."

Frederick Barlow, of Hasketon: the *Reserve Number*, to "Massanissa," brown, 8 years-old; bred in France by M. Fridolin; sire, the "Flying Dutchman;" dam, "Calparina," by "Ion."

Agricultural Mares, in-foal or with foal at foot.

Charles Lister, Coleby Lodge, Lincoln: First Prize, 20*l.*, for "Royal Duchess;" bay, 7 years-old, in foal to Mr. Colton's "Boxer;" bred by himself; sire, "Champion;" dam, "Diamond."

Frederick Street, Harrowden House, Bedford: Second Prize, 10*l.*, for "Beauty," roan, 8 years-old, in foal to Mr. Manning's "Nonpareil;" bred by Mr. Granger, Haddenham, Isle of Ely; sire, Tibbet's "Thumper."

Arthur Tomlinson, Stenson House, Derby: Third Prize, 5*l.*, for "Smiler," grey, 6 years-old, in foal to "Young Lofty;" bred by himself; sire, "Champion;" dam, "Poppet," by "Regulator."

Henry Purser, Willington Manor, Bedford: the *Reserve Number*, to "Honest Lass," bay, 4 years-old, in foal to "Nonpareil;" bred by Mr. J. L. Curtis, Chatteris; sire, "Honest Tom;" dam, "Pink."

Clydesdale Mares, in-foal or with foal at foot.

Thomas Statter, Stand Hall, Whitefield, Manchester: First Prize, 20*l.*, for "Mrs. Muir;" bay, 8 years-old, in foal to "King Tom;" bred by the late Mr. Muir, Loch Fergus, Kirkcudbright, N.B.; sire, "Champion."

Lieut.-Col. R. Loyd Lindsay, V.C., M.P., Lockinge Park, Wantage: Second Prize, 10*l.*, for "Darling," bay, 10 years-old, in foal to "Prince Albert;" bred by Mr. Mair, Udderstone, Midcalder, N.B.

Lieut.-Col. R. Loyd Lindsay, V.C., M.P.: Third Prize, 5*l.*, for "Isabella," bay, 8 years-old, in foal to "Prince Albert;" bred by Mr. R. Waugh, Seathill, Irthington, Carlisle; sire, "Champion;" dam, "Nancy," by "Byron."

CHRISTOPHER W. WILSON, High Park, Kendal: the *Reserve Number*, to "Highland Lassie," bay, 8 years-old, in foal to "Black Prince;" breeder unknown.

Suffolk Mares, in-foal or with foal at foot.

HORACE WOLTON, Newbourn Hall, Woodbridge: FIRST PRIZE, 20*l.*, for "Pride," bright chestnut, 6 years-old, and foal by Wolton's "Royal Duke 2nd;" bred by Mr. S. Wolton, sen., Newbourne Hall; sire, Wolton's "Monarch;" dam, "Pride."

SIR WILLIAM THROCKMORTON, Bart., Buckland, Faringdon: SECOND PRIZE, 10*l.*, for "Jolley," chestnut, 9 years-old, and foal by "Duke;" bred by himself; sire, "Briton;" dam, "Violet," by "Turpin."

GEORGE ARTHUR COULSON, The Haye, Fingringhoe, Essex: THIRD PRIZE, 5*l.*, for "Violet," chestnut, 8 years-old, and foal by Ketley's "Talbot;" bred by the late Mr. J. Tettrell, Monk Wick, Berechurch, Essex.

LIEUT-COLONEL FULLER MAITLAND WILSON, Stowlangtoft Hall, Bury St. Edmunds: the *Reserve Number*, to "Violet," chestnut, 11 years-old, in foal to "Heir Apparent;" bred by Mr. Cant, Mile End, Colchester; sire, "Duke;" dam by "Newcastle Captain."

*Mares and Foals for Agricultural purposes.**

GEORGE STREET, Maulden, Ampthill, Beds: FIRST PRIZE, 15*l.*, for "Cardiff Lass," roan, 4 years-old, and foal by Mr. Stokes's "Young Champion;" bred by himself; sire, "Young Britain;" dam, "Brown."

THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds: SECOND PRIZE, 10*l.*, for "Brisk," chestnut, 13 years-old, and foal; bred by Mr. J. Skeet, Rushmere, Ipswich; sire, "Canterbury Pilgrim."

THE MARQUIS OF BRISTOL: the *Reserve Number*, to "Diamond," chestnut, 16 years-old; bred by the late Marquis of Bristol; sire, Mr. Sexton's "Champion."

Mares in-foal or with foal at foot, suitable for breeding Coach Horses.

ROBERT HUTTON, 74, Gloucester Place, Portman Square, London: FIRST PRIZE, 20*l.*, for "Pauline," black, 9 years-old, in foal to "The Dean;" bred by Mr. C. Graham, Clifton, Penrith; sire, "Goblin;" dam by "Jericho."

JAMES HORNSBY, Castlegate House, Grantham: THIRD PRIZE, 5*l.*, for "Lady Tichborne," brown, 16 years-old, and foal by "Odd Trick;" breeder unknown.

Mares in-foal or with foal at foot, suitable for breeding Hackneys.

ALFRED E. W. DARBY, Little Ness, Shrewsbury: FIRST PRIZE, 20*l.*, for "Kitty," bay, about 27 years-old, and foal by "Gloucester;" bred by Mr. A. Christy, Apperfield Court, Sevenoaks.

THOMAS HORROCKS MILLER, Singleton Park, Poulton-le-Fylde: SECOND PRIZE, 10*l.*, for "Mabel Gray," grey, aged, in foal to "Jack;" breeder unknown.

WILLIAM C. BRANFORD, The Heritage, Upton, Southwell: THIRD PRIZE, 5*l.*, for "Acherner," chestnut, 9 years-old, and foal by "Leybourne;" bred by himself; sire, "Musjid;" dam by "Idler."

John Warth, Westmoreland House, Chatteris: the *Reserve Number*, to "Gentle Annie," chestnut, 11 years-old, and foal by "The Gentleman;" breeder unknown.

Mares in-foal or with foal at foot, suitable for breeding Hunters.

Edmund Hornby, Flotmanby, Ganton, Yorkshire: First Prize, 25*l.*, for "Lady Derwent;" bay, 11 years-old, and foal by "Cathedral;" bred by Mr. T. Lambe, Winteringham, Rillington, Yorkshire; sire, "Codrington."

James Moffat, Kirklinton Park, Carlisle: Second Prize, 15*l.*, for "Lady Lina," bay, 13 years-old, and foal by "Slap Bang;" bred by Sir G. Cholmeley; sire, "Codrington;" dam, "Waxy."

George Sydney Smith, Stowe Farm, Stainford: Third Prize, 5*l.*, for "The Wren," bay, 10 years-old, and foal by "Snowstorm;" breeder unknown; sire, "Irish Birdcatcher."

Thomas Horrocks Miller, Singleton, Poulton-le-Fylde; the *Reserve Number*, to "Flora," grey, 11 years-old, in foal to "Carbineer;" bred by Mr. H. R. Phillips; sire, "Ellington;" dam, "Clotilde," by "Pyrrhus 1st."

*Yearling Geldings for Agricultural purposes.**

George Hine, jun., Oakley, Bedford: First Prize, 10*l.*, for "Royal," bright bay, bred by himself; sire, "England's Glory;" dam, "Spanker," by "Sampson."

*Yearling Cart Fillies for Agricultural purposes.**

John Walker, Goldington, Bedford: First Prize, 10*l.*, for his brown; bred by himself; sire, "Young Champion;" dam, "Brisk."

Henry Purser, Willington Manor, Bedford: Second Prize, 5*l.*, for "Grand Duchess," bay; bred by himself; sire, "The Czar;" dam, "Duchess."

Thomas Statter, Stand Hall, Whitefield, Manchester: the *Reserve Number*, to "Miss Honesty," bay; bred by Mr. W. Welcher, Snare Hill Park, Thetford; sire, Welcher's "Royal Albert;" dam, "Bonny," by "Drayman."

Agricultural Geldings—Two Years-old.

Daniel Henman, Kempston, Hardwicke, Bedford: First Prize, 15*l.*, for "Prince," chestnut; bred by himself; sire, "Champion;" dam, "Flower."

Frederick Allwood, Wallsworth Farm, Hitchin: Second Prize, 10*l.*, for his bay; breeder unknown.

Thomas Arch, Bloxwich, Walsall, Staffordshire: Third Prize, 5*l.*, for "Sampson," light bay; bred by himself; sire, "Yeoman's Pride of England;" dam, "Smiler," by Yeoman's "Ploughboy."

Frederick Allwood, Wallsworth Farm: the *Reserve Number*, to his bay; breeder unknown.

Agricultural Fillies—Two Years-old.

Thomas Henry Vergette, Boro' Fen, Peterborough: First Prize, 15*l.*, for "Violet," brown; bred by himself; sire, Mr. Cook's "Emperor;" dam, "Blossom," by Mr. Taylor's "England's Glory."

William Nix, jun., Somersham, St. Ives, Hunts: Second Prize, 10*l.*, for his bay; bred by the late Mr. Todd, Waterbeach, Cambridge.

SAMUEL MORTON, Upwell, Isle of Ely: THIRD PRIZE, 5*l*., for "Jewel," brown; bred by himself; sire, Mr. Welcher's "Honest Tom;" dam, by Mr. J. Morton's "Honest Tom."

FREDERICK STREET, Harrowden House, Bedford: the *Reserve Number*, to "Smart," light brown; bred by Mrs. Rowland, Shabbington, Bucks; sire, Lord Norrey's "Black Prince."

Suffolk Fillies—Two Years-old.†

MANFRED BIDDELL, Playford, Ipswich: FIRST PRIZE, 25*l*., for "Jewel," chestnut; bred by Mr. Scotchmer, Gipping, Stowmarket.

WILLIAM WILSON, Baylham Hall, Ipswich: SECOND PRIZE, 10*l*., for "Smart," chestnut; bred by himself; sire, "Bismark;" dam, "Ramper."

ROBERT EMLYN LOFFT, Troston, Bury St. Edmunds: the *Reserve Number*, to "Blossom," chestnut; bred by himself; dam, "Moggy."

Agricultural Geldings—Three Years-old.

THOMAS PLOWRIGHT, jun., The Hall, Pinchbeck, Lincolnshire: FIRST PRIZE, 15*l*., for "Dragon," grey; bred by Mr. Pacy, Bingham, Notts.

FOWLER CARTWRIGHT, The Grove, Drakelow, Burton-on-Trent: SECOND PRIZE, 10*l*., for "Drayman," brown; bred by the late Mr. T. Rose, the Ash Farm, Derby; sire, "Sweet William;" dam, "Brown," by "Old Black Legs."

JAMES and FREDERICK HOWARD, Park Farm, Clapham, Bedford: THIRD PRIZE, 5*l*., for "Roger," brown; bred by Mr. T. Clayton, Thorpe Arnold, Melton Mowbray; sire, "Young Draysman;" dam by "Old Blaze."

JOHN BAYS, Chatteris: the *Reserve Number*, to "Prince;" bred by himself; sire, "Samson;" dam, "Short," by "Volunteer."

Agricultural Fillies—Three Years-old.

THOMAS HENRY VERGETTE, Boro' Fen, Peterborough: FIRST PRIZE, 15*l*., for "Gipsy," black; bred by himself; sire, Roach's "Samson;" dam, "Blossom," by Mr. B. Taylor's "England's Glory."

JONATHAN LESTER, Barway, Thetford, Ely: SECOND PRIZE, 10*l*., for "Blossom," bay; bred by himself; sire, Mr. Welcher's "Honest Tom;" dam, "Diamond," by "Champion of England."

HENRY MIDDLETON, Cutteslowe, Oxford: THIRD PRIZE, 5*l*., for "Flower Girl," brown; bred by himself; sire, "Prince;" dam, "Flower."

JAMES and FREDERICK HOWARD, Park Farm, Clapham, Bedford: the *Reserve Number*, to "Jess," brown; bred by Mr. H. Reynolds, Dauntsey, Chippenham; sire, "Young Noble;" dam, "Violet."

*Pairs of Agricultural Horses (Mares or Geldings).**

JAMES and FREDERICK HOWARD: FIRST PRIZE, 20*l*., for their bay geldings, "Colonel," 5 years-old, and "Captain," 6 years-old; breeders unknown.

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† County of Suffolk Prize, given by breeders of Suffolk horses.

CHARLES HOWARD, Biddenham, Bedford; SECOND PRIZE, 10*l.*, for his geldings, "Lion," brown, 6 years-old, breeder unknown, and "Dodman," grey, 6 years-old; bred by Mr. L. Ekins, Woodhurst, St. Ives.

CHARLES WILLIAM BRIERLEY, Rhodes House, Middleton, Lancashire: THIRD PRIZE, 5*l.*, for his geldings, "The Shah," chestnut, 6 years-old, and "Dick," chestnut, 5 years-old; breeders unknown.

CHARLES WILLIAM BRIERLEY: the *Reserve Number*, to his mares, "Sensation," grey, 9 years-old; bred by Mr. W. Tennant, Barlow, Selby; sire, "John Bull;" and "Honesty," bay, 5 years-old; bred by Mr. C. Dook, Levels, Thorne, Yorkshire; sire, "John Bull."

Hunter Fillies—Two Years-old.

CHARLES HICKMAN, Cardington, Bedford: FIRST PRIZE, 15*l.*, for "Silver Cloud," iron grey; bred by himself; sire, "Glenmasson;" dam by "Rochester."

J. BOWEN JONES, Ensdon House, Baschurch, Shrewsbury: SECOND PRIZE, 10*l.*, for "Bessie," bay; bred by himself; sire, "Honiton;" dam, "Fenella," by "Fulbeck."

EDWARD and ALFRED STANFORD, Eatons, Steyning, Sussex: the *Reserve Number*, to his dark brown; bred by themselves; sire, "Master Fenton;" dam, "Lady Mary," by "Royal William."

Hunter Geldings—Two Years-old.

WILLIAM KENNING, Bradden, Towcester: FIRST PRIZE, 15*l.*, for "Tom King," bay, bred by himself; sire, "Dalesman;" dam, "Flight," by "Grampion."

WESTLEY RICHARDS, Ashwell, Oakham: SECOND PRIZE, 10*l.*, for his bay; bred by himself; sire, "Knight of Kars;" dam, "Heads or Tails," by "Sir Hercules."

THOMAS HORROCKS MILLER, Singleton Park, Poulton-le-Fylde, Lancashire: the *Reserve Number*, to "Victor II.;" bay, bred by himself; sire, "Carbineer;" dam, "Lady Emily," by "Irish Birdcatcher."

Hunter Mares—Three Years-old.

THOMAS DARRELL, Spicker's Hill, West Ayton, Yorkshire: FIRST PRIZE, 20*l.*, for "Ebor Witch," black brown; bred by Mr. T. Lofthouse, Bondle Ash, Yorkshire; sire, "Neptunus;" dam by "Speculation."

GEORGE BOULTON LYNES, Bedford: SECOND PRIZE, 15*l.*, for "Honeydew," bay, bred by himself; sire, "Idler;" dam, "Flying Buck."

EDWARD and ALFRED STANFORD, Eatons, Steyning, Sussex: THIRD PRIZE, 10*l.*, for "Sabina," dark brown, bred by themselves; sire, "Master Fenton;" dam, "Lady Mary," by "Royal William."

THOMAS HORROCKS MILLER, Singleton, Poulton-le-Fylde: the *Reserve Number*, to "Fidelity," chestnut; bred by Mr. Carr, Silloth; sire, "Sincerity;" dam by "Laughing Stock."

Hunter Geldings—Three Years-old.

THOMAS F. JACKSON, Tattenhall Hall, Chester: FIRST PRIZE, 20*l.*, for "Sober Truth," brown; bred by Mr. Fryer, Windy Harbour Farm, Spital, Birkenhead; sire, "Grosvenor;" dam, "Betsy," by Abbot's "Mercer."

Earl Spencer, K.G., Althorpe Park, Northampton: Second Prize, 15*l.*, for his chestnut; bred by himself; sire, "Dalesman;" dam, "Miss Buckland," by "Venison."

John B. Booth, Killerby Hall, Catterick: Third Prize, 10*l.*, for "Berwick," brown; bred by Mr. L. Potts, Wigton; sire, "The Judge;" dam by "Nimrod."

John B. Booth, the *Reserve Number*, to "Baldersby," bay; bred by Mr. Lomas, Baldersby, Thirsk; sire, "Ainderby;" dam by "St. Bennett."

Hunter Mares—Four Years-old.

Lewis Thomas White, Bury Farm, Goldington, Bedford: First Prize, 30*l.*, for his bay; bred by Mr. J. White, Bury Farm; sire, "King Christian;" dam by "Cannick."

Joseph Trueman Mills, Clermont, Thetford, Nórfolk: Second Prize, 20*l.*, for "Rosebud," brown; bred by himself; sire, "Bowland;" dam, "Judy."

Hunter Geldings—Four Years-old.

Thomas Darrell, Spicker's Hill, West Ayton, Yorkshire: First Prize, 30*l.*, for "King of Diamonds," chestnut; bred by Mr. R. Beale, Shipton; sire, "King of Hearts."

William Wright, Wollaton, Nottingham: Second Prize, 20*l.*, for his bay breeder unknown; sire, "Morocco."

Frederick Barlow, Hasketon, Woodbridge: Third Prize, 10*l.*, for "Cornishman," chestnut; bred by Mr. James, Merther, Truro; sire, "Rallywood."

Teasdale Hilton Hutchinson, Manor House, Catterick: the *Reserve Number*, to "Breakaway," bay; bred by Mr. Kearney, Lanchester, Durham; sire, "Harkforward;" dam by "Largehopes."

Hunters (Mares or Geldings), Five Years-old and upwards, up to not less than 12 *stone.*

Teasdale Hilton Hutchinson, Manor House, Catterick, Yorkshire: First Prize, 30*l.*, for "Jester," brown gelding, 5 years-old; bred by Mr. T. Gibbons, Burnfoot, Longtown; sire, "Laughing Stock;" dam by "Roland."

John N. Sanders, Wollaston, Wellingborough: Second Prize, 20*l.*, for "Yellow Jack," bay gelding, 5 years-old; breeder unknown.

Westley Richards, Ashwell, Oakham: Third Prize, 10*l.*, for "Viceroy," dark chestnut gelding, 5 years-old; bred by Mr. Scott, county Mayo, Ireland; sire, "Lothario;" dam, "Medora," by "Woodpecker."

Westley Richards, the *Reserve Number*, to "Weston," bay brown gelding, aged; bred by Mr. Wadlow, Shifnal; sire, "Knight of Kars;" dam by "Barnton."

Hunters (Mares or Geldings), Five Years-old and upwards, up to not less than 14 *stone.*

William Whitehead, Wollaston, Wellingborough: First Prize, 30*l.*, for "Baron," bay gelding, 5 years-old; breeder unknown.

THOMAS PERCIVAL, Wansford, Northamptonshire: SECOND PRIZE, 20*l.*, for "Mullingar," bay gelding, 6 years-old; bred by Mr. J. Eivers, Willyfield, Ireland; sire, "Domino;" dam, "Molly," by "Blackfoot."

WILLIAM WHITEHEAD, Wollaston: THIRD PRIZE, 10*l.*, for "Rufus," chestnut gelding, 5 years-old; breeder unknown.

LEVI CROSON, Lidlington Vale, Ampthill: the *Reserve Number*, to "Young Rothchild," bay gelding, 5 years-old; bred by himself; sire, "Baron Segnius."

Hackneys (Mares or Geldings), up to not less than 12 *stone.*

MAJOR G. A. F. QUENTIN, Woodleigh, Cheltenham: FIRST PRIZE, 20*l.*, for "Sparkling Moselle," bay mare, 5 years-old; breeder unknown.

WILLIAM STEPHENSON, Cottingham, Hull: SECOND PRIZE, 10*l.*, for "Princess," chestnut mare, 6 years-old; bred by Mr. Vickerman, Swine, Hull; sire, "Young Charlie;" dam by "Phenomenon."

WALTER GILBEY, Hargrave Park, Stanstead, Essex: THIRD PRIZE, 5*l.*, for "Maud," bay mare, 7 years-old; bred by Lord Lismore.

SAMUEL DAY, St. Neots, Hunts: the *Reserve Number*, to "Rockrose," bay mare, 6 years-old; bred by Mr. Hollis, Nether Dean, Kimbolton; sire, "Corner Stone."

Hackneys (Mares or Geldings), up to not less than 14 *stone.*

T. HARVEY D. BAYLY, Edwinston House, Ollerton: FIRST PRIZE, 20*l.*, for "Enterprise," chestnut gelding, 6 years-old; breeder unknown; sire, "Volturno."

HENRY FRISBY, 13, James Street, Buckingham Gate, London: SECOND PRIZE, 10*l.*, for "Filbert," bay mare, 7 years-old; breeder unknown.

WESTLEY RICHARDS, Ashwell, Oakham: THIRD PRIZE, 5*l.*, for "Black Friar," black gelding, 4 years-old: breeder unknown; sire, "Juryman."

JOHN GROUT, Woodbridge, Suffolk: the *Reserve Number*, to "Kitty," bay mare, 5 years-old; breeder unknown; sire, "Prickwillow."

Ponies (Mares or Geldings), above 13 *hands* 2 *inches and not exceeding* 14 *hands* 2 *inches.*

JOHN HIGGINS, Market Harborough: FIRST PRIZE, 15*l.*, for "Princess Louise," roan mare, 5 years-old; breeder unknown; sire, "Plenipotentiary;" dam by "Bedford Phenomenon."

HENRY FRISBY, 13, James Street, Buckingham Gate, London: SECOND PRIZE, 10*l.*, for "Princess Polo," mare, 6 years-old; breeder unknown.

WILLIAM READ COCKLE, Hillrow, Haddenham, Cambridgeshire: THIRD PRIZE, 5*l.*, for "Kingfisher," black gelding, 5 years-old; bred by himself; sire, "Clear the Way."

RICHARD WRIGHT, 72, Regent Road, Salford, Manchester: the *Reserve Number*, to "Young Apricot," chestnut gelding, 4 years-old; breeder unknown; sire, "Apricot."

Ponies (Mares or Geldings), not exceeding 13 *hands* 2 *inches.*

ROBERT LOWRY PARKER, North Kilworth, Rugby: FIRST PRIZE, 15*l.*, for "Whimsical," grey mare, 7 years-old; breeder unknown.

William Nix Saberton, Wilburton, Ely, Cambridgeshire: Second Prize, 10*l.*, for "The Shah," blue roan gelding, 10 years-old; breeder unknown.

Trevor Lee Senior, Broughton House, Aylesbury: Third Prize, 5*l.*, for "Pride of the Vale," bright bay mare, about 6 years-old; breeder unknown.

Christopher W. Wilson, High Park, Kendal: the *Reserve Number*, to "Bobby," grey gelding, 8 years-old; breeder unknown.

Jackasses not under 13 *hands, for getting Mules for Agricultural purposes.*†

Charles Leslie Sutherland, Coombe, Croydon, Surrey: First Prize, 25*l.*, for "Jago," black brown, 6 years-old; bred in Spain.

Samuel Lang, 108, Pembroke Road, Clifton, Bristol: Second Prize, 15*l.*, for "Lad of Poitou," dark brown, 2 years-old; Poitou breed.

Mules not under 15 *hands, for Agricultural purposes.*†

Charles Leslie Sutherland, Coombe, Croydon: First Prize, 25*l.*, for "Rousseau," grey, 4 years-old; bred in Poitou.

Samuel Lang, 108, Pembroke Road, Clifton, Bristol: Second Prize, 15*l.*, for "Lass of Poitou," dark brown, 3 years-old; bred in Poitou.

Charles Leslie Sutherland, Coombe, Croydon: Third Prize, 10*l.*, for "Blossom," brown, 6 years-old; bred in Poitou.

Charles Leslie Sutherland: the *Reserve Number*, to "Robin," bay, 5 years-old; bred in Poitou.

CATTLE.

Shorthorns—Bulls above Three Years old.

Robert Bruce, Newton-Struthers, Forres, Morayshire: First Prize, 30*l.*, for "Lord Irwin" (29,123), white, 5 years, 5 months, 1 week-old; bred by Mr. W. Linton, Sheriff Hutton, York; sire, "British Hope" (21,324); dam, "Handmaid" by "May Day" (20,323); g. d., "White Rose" by "Magnus Troil" (14,880); gr. g. d., "Miss Henderson," by "Magnus Troil" (14,880).

The Marquis of Exeter, K.G., Burghley Park, Stamford: Second Prize, 20*l.*, for "Telemachus" (27,603), roan, 6 years, 2 months, 2 weeks, 4 days-old; bred by himself; sire, "Nestor" (24,648); dam, "Louisa 9th," by "Prince Albert" (18,579); g. d., "Louisa 7th," by "Baron Farnley" (14,129); gr. g. d., "Louisa 2nd" by "3rd Duke of York" (10,166).

Alexander Henry Browne, Doxford, Chathill, Northumberland: Third Prize, 15*l.*, for "Duke of Aosta" (28,356), roan, 3 years, 7 months, 3 weeks, 6 days-old; bred by Mr. T. H. Hutchinson, Manor House, Catterick; sire, "K.C.B." (26,492); dam, "Queen of Spain," by "Valasco" (15,443); g. d., "Ciss," by "Young Hopewell" (14,719); gr. g. d., "Cicely," by "Bellmont" (11,164).

† Prizes given by Edward Pease, Esq., Greencroft, West Darlington.

Richard Stratton, The Duffryn, Newport, Monmouthshire: Fourth Prize, 10*l.*, for "Protector" (32,221), roan, 3 years, 3 months, 2 weeks, 2 days-old; bred by the late Mr. R. Stratton; sire, "James 1st" (24,202); dam, "Glo'ster Maid," by "Coronet" (23,624); g. d., "Duchess of Glo'ster 6th," by "King John" (14,763); gr. g. d., "Duchess of Glo'ster," by "Red Duke" (8624).

The Earl of Lichfield, Shugborough Hall, Stafford: the *Reserve Number*, to "Knight Templar the 3rd," light roan, 5 years, 1 week, 4 days-old; bred by himself; sire, "Knight Templar the 2nd; dam, "Orange Blossom," by "Knight Gwynne;" g. d., "Lady Olivia," by "Sir James the Rose" (15,290); gr. g. d., "Little Red Rose," by "Patriarch" (7329).

Shorthorns—Bulls above Two and not exceeding Three Years-old.

William Linton, Sheriff Hutton, York: First Prize, 25*l.*, for "Sir Arthur Ingram," roan, 2 years, 5 months, 6 days-old; bred by himself; sire, "Serjeant-Major" (29,957); dam, "Fragrance," by "Mountain Chief" (20,383); gr. d., "Miss Topsy," by "Blood Royal" (17,423); gr. g. d., "York Lass," by "Magnus Troil" (14,880).

William and Henry Dudding, Panton House, Wragby, Lincolnshire: Second Prize, 15*l.*, for "Robert Stephenson" (32,313); roan, 2 years, 8 months-old; bred by Mr. Torr, Aylesby Manor, Grimsby; sire, "Royal Prince" (27,384); dam, Riby Peeress," by "Breastplate" (19,337); g. d., "Riby Queen," by "Booth Royal" (15,673); gr. g. d., "Riby Rose," by "Vanguard" (10,994).

Thomas Statter, Stand Hall, Whitefield, Manchester: Third Prize, 10*l.*, for "Oxford Cheerboy," red, 2 years, 8 months, 3 weeks, 3 days-old; bred by Colonel Towneley, Towneley Park, Burnley; sire, "Baron Oxford" (23,375); dam, "Cheerful" by "Mystic" (20,391); g. d., "Coquette," by "Mameluke" (13,289); gr. g. d., "Charmer 5th," by "Garrick" (11,506).

Thomas Willis, Manor House, Carperby, Bedale: Fourth Prize, 5*l.* for "Prince of Cashmere" (32,164), roan, 2 years, 1 month, 1 week, 1 day-old; bred by himself; sire, "Windsor's Prince" (32,881); dam, "Rose of Cashmere," by "Lord Frederick" (22,156); g. d., "Rose of Lucknow," by "Sir Colin" (16,953); gr. g. d., "Rose of the Glen," by "King Alfred" (16,334).

Benjamin St. John Ackers, Prinknash Park, Painswick, Gloucestershire: the *Reserve Number*, to "Cymbeline" (30,835), white, 2 years, 3 months, 3 weeks, 4 days-old; bred by himself; sire, "County Member" (28,268) dam, "Cymbal," by "Eighth Duke of York" (23,808); g. d., "Clarion," by "Archbishop" (17,313); gr. g. d., "Eurydice," by "The Red Duke" (8694).

Shorthorns—Yearling Bulls above One and not exceeding Two Years-old.

John Outhwaite, Bainesse, Catterick, Yorkshire: First Prize, 25*l.*, for "Lord Godolphin," roan, 1 year, 10 months, 1 week, 4 days-old; bred by himself; sire, "Royal Windsor" (29,890); dam, "Whitesocks," by "Baron Killerby" (27,949); g. d., "Bertha," by "Welcome Guest" (15,497); gr. g. d., by "Vanguard" (10,994).

Lieut-Colonel R. Loyd-Lindsay, V.C., M.P., of Lockinge Park, Wantage: Second Prize, 15*l.*, for "Prince Ruffert," roan, 1 year, 11 months, 2 weeks, 5 days-old; bred by himself; sire, "Lord Napier;" dam, "Roan

Duchess," by "Glo'ster's Grand Duke" (12,949); g. d., "Charmer," by "4th Duke of York" (10,167); gr. g. d., "Chaplet," by "Usurer" (9763).

EMILY, LADY PIGOT, Branches Park, Newmarket: THIRD PRIZE, 10*l.*, for "Rapid Rhone," red roan, 1 year, 6 months, 3 weeks-old; bred by herself; sire, "Bythis" (25,700); dam, "Dame Swift," by "Prince of Buckingham" (27,161); g. d., "Dame Quickly," by "Valasco" (15,443); gr. g. d., "Barmaid," by "British Prince" (14,197).

WILLIAM G. GARNE, Broadmoor, Northleach, Gloucestershire: FOURTH PRIZE, 5*l.*, for "Aachen," roan, 1 year, 6 months, 6 days-old; bred by Mr. G. Garne, Churchill Heath, Chipping Norton; sire, "St. Swithin" (22,833); dam, "Nightwatch," by "Cynric" (19,542); g. d., "Nightshade," by "Royal Oak" (16,870); gr. g. d., "Nightlight," by "Havelock" (14,676).

GERARD JAMES DAY, Horsford House, Norwich: the *Reserve Number*, to "Charon," red, 1 year, 11 months, 2 weeks-old; bred by Mr. C. Bayes, Kettering; sire, "Satan" (27,430); dam, "Cameo," by "Sir James" (22,902); g. d., "Cytherea," by "Gold Nugget" (16,176); gr. g. d., "Cinderella," by "Meteor" (10,526).

Shorthorns—Bull Calves above Six and not exceeding Twelve Months-old.

LIEUT.-COLONEL R. LOYD-LINDSAY, V.C., M.P., Lockinge Park, Wantage: FIRST PRIZE, 15*l.*, for "Lord Rockville," roan, 11 months, 2 weeks, 1 day-old; bred by himself; sire, "Rob Roy;" dam, "Garland," by "Duke of Towneley" (21,615); g. d., "Gazelle," by "Gondomar" (17,985); gr. g. d., "Genteel" by "Bashaw" (12,449).

JOHN OUTHWAITE, Bainesse, Catterick: SECOND PRIZE, 10*l.*, for "Duke of Chamburgh," roan, 10 months, 2 weeks, 6 days-old; bred by himself; sire, "Royal Windsor" (29,890); dam, "Whitesocks," by "Baron Killerby" (27,949); g. d., "Bertha," by "Welcome Guest" (15,497); gr. g. d., by "Vanguard" (10,994).

WILLIAM G. GARNE, Broadmoor, Northleach: THIRD PRIZE, 5*l.*, for "Ranger Prince," red, 10 months, 2 weeks, 1 day-old; bred by Mr. J. Houlton, Aldsworth, Northleach; sire, "Ranger;" dam, "Pippin," by "Cynric" (19,542); g. d., "Pica," by "Royal Oak" (16,870); gr. g. d., "Piccola," by "General Pelissier" (14,605).

CHARLES JOHN WEBB, Elford, Tamworth: the *Reserve Number*, to "Royal Oxford Gwynne," red, little white, 10 months, 3 weeks, 5 days-old; bred by himself; sire, "Baron Oxford" (23,375); dam, "Gipsy Gwynne," by "Grand Duke of Lightburn" (26,290); g. d., "Goody Gwynne," by "5th Grand Duke" (19,875); gr. g. d., "Golden Gwynne," by "May Duke" (13,320).

Shorthorns—Cows above Three Years-old.

JOHN OUTHWAITE, Bainesse, Catterick, Yorkshire: FIRST PRIZE, 20*l.*, for "Vivandière" roan, 6 years, 3 weeks, 6 days-old, in-milk; bred by himself; sire, "Brigade-Major" (21,312); dam, "Rosamond," by "Apollo," (9899); g. d., "Ruth," by "Albert" (7767); gr. g. d., "Rachel," by "Noble" (4579). Calved October 14, 1873.

GEORGE GARNE, Churchill Heath, Chipping Norton, Oxfordshire: SECOND PRIZE, 10*l.*, for "Butterfly's Duchess," roan, 3 years, 11 months, 2 weeks, 1 day-old, in-milk; bred by himself; sire, "Royal Butterfly 20th"

(25,007); dam, "Delicacy," by "The Druid" (20,948); gr. d., "Destiny," by "Progression" (16,770); gr. g. d., "Damsel," by "Enterprise" (11,443). Calved Jan. 15, 1874.

TEASDALE HILTON HUTCHINSON, Manor House, Catterick: THIRD PRIZE 5*l*., for "Dairygirl," light roan, 6 years, 3 weeks, 4 days-old, in-milk and in-calf; bred by himself; sire, "Brigade-Major" (21,312); dam, "Dairymaid," by "Perfection" (27,059); g. d., by "Highflyer" (11,576); gr. g. d., by "Hornby" (16,048). Calved November 1873.

RICHARD STRATTON, The Duffryn, Newport, Monmouthshire: the *Reserve Number*, to "Rosalind," roan, 3 years, 4 months, 1 day-old, in-calf; bred by the late Mr. R. Stratton; sire, "Majesty" (26,784); dam, "Rosa," by "Lamp of Lothian" (16,356); g. d., "Michaelmas," by "Hermit" (4280); gr. g. d., "Mossrose," by "Phœnix" (6290).

Shorthorns—Heifers in-milk or in-calf, not exceeding Three Years-old.

JOHN OUTHWAITE, Bainesse, Catterick, Yorkshire: FIRST PRIZE, 20*l*., for "Baroness Conyers," roan, 2 years, 9 months, 2 weeks, 1 day-old; in-calf; bred by himself; sire, "Baron Killerby" (27,949); dam, "Sylvia," by "Champion" (23,529); g. d., "Sunflower," by "Son of Apollo" (9899); gr. g. d., "Sally," by "Chieftain" (10,048).

JOHN THOM, Lark Hill, Chorley, Lancashire: SECOND PRIZE, 15*l*., for "Royal Rose," roan, 2 years, 4 months, 2 weeks-old, in-calf; bred by Mr. J. Downing, Ashfield, Fermoy; sire, "Royal Duke" (25,014); dam, "Young Moss Rose," by "Dr. McHale" (15,887); g. d., "Young Harriette," by "Dorrington" (17,691); gr. g. d., "Harriette," by "Hopewell" (10,332).

EMILY, LADY PIGOT, Branches Park, Newmarket: THIRD PRIZE, 10*l*., for "Rose of Wytham," red and white, 2 years, 8 months-old, in-calf; bred by herself; sire, "Gunpowder" (28,801); dam, "Imperial Rose 2nd," by "Prince of the Empire" (20,578); g. d., "Imperial Rose," by "Prince Imperial" (15,095); gr. g. d., "Red Rose," by "Vanguard" (10,994).

RICHARD STRATTON, The Duffryn, Newport, Monmouthshire: FOURTH PRIZE, 5*l*., for "Nectarine Bud," light roan, 2 years, 4 months, 3 days-old, in-calf; bred by himself; sire, "Brilliant" (28,084); dam, "Nectarine," by "Bude Light" (21,342); g. d., "Nectarine Blossom," by "Warwick" (19,120); gr. g. d., "Nectarine," by "Hermit" (14,697).

WILLIAM AND HENRY DUDDING, Panton House, Wragby: the *Reserve Number*, to "Blooming Bride," red, 2 years, 10 months, 1 week, 4 days-old, in-calf; bred by themselves; sire, "Robin" (24,968); dam, "Bloomer," by "Lord Panton" (22,204); g. d., "Birthright," by "Royal Favourite" (15,200); gr. g. d., "Daisy," by "Sylvan" (10,907).

Shorthorns—Yearling Heifers, above One and not exceeding Two Years-old.

THE REV. ROBERT BRUCE KENNARD, Marnhull, Blandford, Dorset: FIRST PRIZE, 20*l*., for "Queen Mary," roan, 1 year, 11 months, 2 weeks, 5 days-old; bred by himself; sire, "Grand Duke of Oxford" (28,763); dam, "Queen Anne," by "Lord Stanley 2nd" (26,745); g. d., "Queen Bertha," by "Maccaroni" (24,498); gr. g. d., "Mildred," by "Duke of Norfolk" (17,735).

THOMAS STATTER, Stand Hall, Whitefield, Manchester: SECOND PRIZE, 15*l*., for "Robin's Rose," roan, 1 year, 9 months, 2 days-old; bred by himself;

sire, "Robin" (24,968); dam, "Rosa," by "Thorndale Duke" (25,309); g. d., "Beatrice," by "Touchstone" (20,987); gr. g. d., "Bessie," by "Don Juan" (15,896).

LORD SUDELEY, Toddington, Winchcombe, Gloucestershire: THIRD PRIZE, 10*l.*, for "Seraphina Bella 2nd," roan, 1 year, 7 months, 3 days-old; bred by himself; sire, "Mandarin" (29,269); dam, "Booth's Seraphina," by "Baron Booth" (21,212); g. d., "Seraphina 13th," by "John O'Gaunt" (16,322); gr. g. d., "Seraphina 7th," by "Duke of Sussex" (12,772).

THOMAS STATTER, Stand Hall, Whitefield, Manchester: FOURTH PRIZE, 5*l.*, for "Robin's Stanley Rose," red and white," 1 year, 7 months, 1 week-old; bred by himself; sire, "Robin" (24,968); dam, "Stanley Rose," by "Thorndale Duke" (25,309); g. d., "Stella," by "Garibaldi" (17,919); gr. g. d., "Stanley Roan," by "Crusade" (7938).

ROBERT E. OLIVER, Sholebroke Lodge, Towcester: the *Reserve Number*, to "Orange Chips," roan, 1 year, 9 months, 1 week, 6 days-old; bred by himself; sire, "Grand Duke 19th" (28,746); dam, "Orange Tree," by "Cherry Grand Duke 2nd" (25,758); g. d., "Orange Leaf," by "Grand Duke 7th" (19,877); gr. g. d., "Orange Fruit," by "First Fruits" (16,048).

Shorthorns—Heifer Calves, above Six and under Twelve Months-old.

LIEUT.-COLONEL R. LOYD-LINDSAY, V.C., M.P., of Lockinge Park, Wantage: FIRST PRIZE, 15*l.*, for "Diana," roan, 10 months, 3 weeks, 3 days-old; bred by himself; sire, "Rob Roy;" dam, "Débonnaire," by "Duke of Jamaica" (23,758); g. d., "Dolly Varden," by "His Highness" (14,708); gr. g. d., "Delia," by "Humphrey Clinker" (13,055).

EMILY, LADY PIGOT, Branches Park, Newmarket: SECOND PRIZE, 10*l.*, for "Moorish Captive," red, 9 months, 3 weeks, 5 days-old; bred by herself; sire, "Bythis" (25,700); dam, "Moorish Maid," by "Prince Boabdil" (27,120); g. d., "Hollyberry," by "Cheery Chap" (21,401); gr. g. d., "Princess," by "Prince Rupert" (20,604).

RICHARD STRATTON, The Duffryn, Newport, Monmouthshire: THIRD PRIZE, 5*l.*, for "Regalia," roan, 7 months, 4 days-old; bred by himself; sire, "Protector" (32,221); dam, "Ruby," by "James 1st" (24,202); g. d., "Refulgence," by "Lamp of Lothian" (16,356); gr. g. d., "Maid of Honour," by "Young Windsor" (17,246).

SIR TALBOT CLIFFORD CONSTABLE, Bart., Burton Constable, Hull: the *Reserve Number*, to "Evelina," white, 11 months, 1 week, 4 days-old; bred by himself; sire, "Oxford Baronet" (29,499); dam, "Eve," by "Stonegrave" (27,575); g. d., "Strawberry," by "Homer" (14,714); gr. g. d., by "Starling" (15,338).

Herefords—Bulls above Three Years-old.

SARAH EDWARDS, Wintercott, Leominster, Herefordshire: FIRST PRIZE, 25*l.*, for "Winter De Cote" (4253), red, white face, 3 years, 10 months, 3 weeks-old; bred by the late Mr. Thomas Edwards, Wintercott, Leominster; sire, "Leominster 3rd" (3211); dam, "Pinky 3rd;" by "Young Grove" (2888).

THOMAS FENN, Stonebrook House, Ludlow, and JOHN HARDING, The Greenhouse, Bridgnorth: SECOND PRIZE, 10*l.*, for "Bachelor" (2941), red, white face, 7 years, 2 months, 1 week, 3 days-old; bred by Mr. S. Robinson, The Moor, Kington, Herefordshire; sire, "Douglas" (2505); dam, "Spinster," by "Sir Thomas" (2228).

William Clement Davy, Horn Park, Beaminster, Dorset: Third Prize, 5*l.*, for "Chevalier," red, white face, 4 years, 9 months-old; bred by Mr. J. H. Arkwright, Hampton Court, Leominster; sire, "Sir Hungerford" (3447); dam, "Curly 3rd," by "Mortimer" (1328).

John and George Crane, Benthall, Shrewsbury: the *Reserve Number*, to "Oliver," red, white face, 3 years, 1 month-old; bred by Mr. Price, The Vern, Hereford; sire, "Master Oliver."

Herefords—Bulls above Two and not exceeding Three Years-old.

Warren Evans, Llandowlais, Usk, Monmouthshire: First Prize, 25*l.* for "Von Moltke 2nd," red, white face, 2 years, 4 months, 1 week, 5 days-old; bred by himself; sire, "Von Moltke" (4234); dam, "Countess 3rd;" by "Monaughty" (2117).

Henry James Bailey, Rosedale, Tenbury, Herefordshire: Second Prize, 15*l.*, for "King of the Dale" (3891), red, white face, 2 years, 6 months, 3 weeks-old; bred by himself; sire, "Prince Charles" (4041); dam, "Queen of the Valley 2nd;" by "Battenhall" (2406).

Edward Lister, Cefn Ila, Usk, Monmouthshire: Third Prize, 5*l.*, for "Troubadour" (4213), red, white face, 2 years, 9 months, 2 weeks-old; bred by himself; sire, "Chanter" (3738); dam, "Sonnet," by "The Doctor" (1083).

Edward Lister, Cefn Ila, Usk: the *Reserve Number*, to "Black Eagle," red, white face, 2 years, 5 months, 3 weeks, 2 days-old; bred by himself; sire, "Chanter" (3738); dam, "Cherry," by "Orphan" (2662).

Herefords—Yearling Bulls above One and not exceeding Two Years-old.

William Taylor, Showle Court, Ledbury, Herefordshire: First Prize, 25*l.*, for "Tredegar," red, white face, 1 year, 6 months, 4 weeks-old; bred by himself; sire, "Mercury" (3967); dam, "Beauty," by "Holmer" (2043).

George Child, Westonbury, Pembridge, Herefordshire: Second Prize, 15*l.*, for "Treasure Trove," red, white face, 1 year 7 months, 1 week, 1 day-old: bred by himself; sire, "Provost" (4067); dam, "Pigeon," by "Young Treasurer" (1473).

Henry Nicholas Edwards, Broadward, Leominster, Herefordshire: Third Prize, 5*l.*, for "Alfred," red, white face, 1 year, 10 months, 1 day-old; bred by himself; sire, "Sir John" (3451); dam, "Annie," by "Dan O'Connell" (1952).

Henry Nicholas Edwards, Broadward: the *Reserve Number*, to "Concord," red, white face, 1 year, 11 months, 3 weeks, 4 days-old; bred by himself; sire, "Albert" (3648); dam, "Columbine 8th," by "Lord Raglan" (3225).

Herefords—Bull Calves above Six and not exceeding Twelve Months-old.

William Tudge, Adforton, Leintwardine, Herefordshire: First Prize, 10*l.*, for "Regulator," red, white face, 11 months, 3 weeks, 2 days-old; bred by himself; sire, "Sir Roger" (4133); dam, "Belladonna," by "Orleans" (2661).

Thomas Fenn, Stonebrook House, Ludlow: Second Prize, 5*l.*, for red, white face, 10 months, 3 weeks-old bred by himself; sire, "Sir John 2nd" (3455); dam, "Miss Twyford," by "Weston" (3597).

Sarah Edwards, Wintercott, Leominster, Herefordshire: the *Reserve Number*, to "Plato," red, white face, 11 months, 3 weeks, 4 days-old; bred by herself; sire, "Winter De Cote" (4253); dam, "Young Lady 2nd," by "Tomboy" (3546).

Herefords—Cows above Three Years-old.

Thomas Thomas, St. Hilary, Cowbridge, Glamorganshire: First Prize, 20*l.*, for "Rosaline," red, white face, 3 years, 11 months, 1 week, 3 days-old, in-milk; bred by himself; sire, "Sir John 3rd;" dam, "Fairy," by "Shamrock." Calved May 16, 1874.

Richard Tanner, Frodesley, Dorrington, Salop: Second Prize, 10*l.*, for "Lady Milton," red, white face, 5 years, 11 months, 3 weeks, 3 days-old, in-milk and in-calf; bred by the late Mr. J. V. Ashwood, Longden-upon-Tern, Wellington, Salop; sire, "Chieftain the 5th" (3018); dam by "Milton" (2114). Calved October 1873.

Thomas Thomas, St. Hilary: Third Prize, 5*l.*, for "Sunflower," red, white face, 4 years, 11 months, 2 weeks, 3 days-old, in-calf; bred by himself; sire, "Sir John 3rd;" dam, "Curly 2nd," by "Goldfinder 2nd."

Sarah Edwards, Wintercott, Leominster, Herefordshire; the *Reserve Number*, to "Young Mermaid 2nd," red, white face, 4 years, 9 months, 3 weeks, 1 day-old, in-milk; bred by the late Mr. T. Edwards, Wintercott; sire, "Tomboy" (3546); dam, "Young Mermaid," by "Adforton" (1839). Calved January 6, 1874.

Herefords—Heifers, in-milk or in-calf, not exceeding Three Years-old.

Thomas Fenn, Stonebrook House, Ludlow: First Prize, 15*l.*, for "Lady Stanton," red, white face, 2 years, 11 months, 3 weeks, 1 day-old, in-calf; bred by himself; sire, "Severus 2nd" (2747); dam, "Miss Stanton," by "Sir Thomas" (2228).

Herefords—Yearling Heifers above One and not exceeding Two Years-old.

Philip Turner, The Leen, Pembridge, Herefordshire: First Prize, 15*l.*, for "Verbena," red, white face, 1 year, 11 months, 4 weeks, 1 day-old; bred by himself; sire, "Provost" (4067); dam, "Luna," by "Franky" (1243).

Philip Turner, The Leen, Pembridge: Second Prize, 10*l.*, for "Isabel," red, white face, 1 year, 11 months, 3 weeks, 6 days-old; bred by himself; sire, "Mercury" (3967); dam, "Grace," by "Bachelor" (2941).

Henry Nicholas Edwards, Broadward, Leominster: Third Prize, 5*l.*, for "Dolly," red, white face, 1 year, 11 months, 2 days-old; bred by himself; sire, "Albert" (3648); dam, "Dahlia 2nd," by "San-Jacinto" (2209).

John Harding, The Greenhouse, Bridgnorth, Salop: the *Reserve Number*, to "Greenhouse Lass," red, white face, 1 year, 2 weeks-old; bred by himself; sire, "Severus 2nd" (2747); dam, "Gentle Annie," by "Symmetry" (2799).

Herefords—Heifer Calves above Six and under Twelve Months-old.

Thomas James Carwardine, Stockton Bury, Leominster: First Prize, 10*l.*, for "Helena," red, white face, 11 months, 3 weeks, 4 days-old; bred by himself; sire, "De Cote" (3060); dam, "Regina," by "Heart of Oak" (2035).

Henry Nicholas Edwards, Broadward, Leominster: Second Prize, 5*l.*, for "Cary," red, white face, 11 months, 3 weeks, 5 days-old; bred by himself; sire, "Alexander" (3652); dam, "Cherry 2nd," by "Lord Raglan" (3225).

William Taylor, Showle Court, Ledbury, Herefordshire: the *Reserve Number*, to red, white face, 9 months, 2 weeks, 5 days-old; bred by himself; sire, "Triumph 4th" (4212); dam, "Duchess," by "Twin" (2284).

Devons—Bulls above Three Years-old.

Walter Farthing, Stowey Court, Bridgwater, Somersetshire: First Prize, 25*l.*, for "Master Harry," red, 4 years, 6 months, 3 weeks, 2 days-old; bred by himself; sire, "Master Arthur;" dam, "Lofty," by "Sir Peregrine."

Viscount Falmouth, Tregothnan, Probus, Cornwall: Second Prize, 15*l.*, for "Kingcraft," red, 4 years, 11 months, 2 weeks-old; bred by himself; sire, "Sunflower" (937); dam, "Peach" (2905a).

Mrs. Maria Langdon, Flitton Barton, North Molton, Devon: Third Prize, 5*l.*, for "Duke of Flitton 8th," red, 3 years, 2 months, 2 weeks, 2 days-old; bred by the late Mr. James Davy, of Flitton Barton; sire, "Duke of Flitton 4th" (827); dam, "Temptress 2nd" (3070), by "Duke of Cornwall" (820).

Devons—Bulls above Two and not exceeding Three Years-old.

Walter Farthing, Stowey Court, Bridgwater: First Prize, 25*l.*, for "Master Robin," red, 2 years, 11 months, 4 weeks-old; bred by himself; sire, "Master Arthur;" dam, "Verbena," by son of "Duke of Somerset."

Devons—Yearling Bulls above One and not exceeding Two Years-old.

Walter Farthing, Stowey Court: First Prize, 25*l.*, for "The Shah," red, 1 year, 6 months, 2 weeks, 1 day-old; bred by himself; sire, "Able;" dam, "Cheerful," by "St. Audries."

Mrs. Maria Langdon, Flitton Barton, North Molton: Second Prize, 15*l.*, for "Duke of Plymouth," red, 1 year, 7 months, 3 weeks-old; bred by the late Mr. J. Davy, Flitton Barton; sire, "Duke of Flitton 5th;" dam, "Duchess of Plymouth" (2661), by "Gold Medal Duke of Flitton" (613).

John Gould, Bampfylde Lodge, Exeter: Third Prize, 5*l.*, for "Bampfylde," red, 1 year, 10 months, 2 weeks, 2 days-old; bred by himself; sire, "Triumph;" dam, "Spot," by "Alabama."

Walter Farthing, Stowey Court: the *Reserve Number*, to "Master Willie," red, 1 year, 3 weeks, 5 days-old; bred by himself; sire, "Master Harry;" dam, "Picture," by "Eclipse."

Devons—Bull Calves above Six and not exceeding Twelve Months-old.

Walter Farthing, Stowey Court: First Prize, 10*l.*, for "Mr. Disraeli," red, 6 months, 4 weeks-old; bred by Sir A. A. Hood, Bart., St. Audries, Bridgwater; sire, "Major;" dam, "Lady," by "Lord Quantock."

John Azariah Smith, Bradford Peverell, Dorchester, Dorset: Second Prize, 5*l.*, for "Albert Victor," red, 7 months, 5 days-old; bred by himself; sire, "Duke of York;" dam, "Yellow Bat" (3107), by "Trio" (940).

John Azariah Smith: the *Reserve Number*, to "Duke of York," red, 8 months, 3 weeks, 6 days-old; bred by himself; sire, "Duke of York;" dam, "Picture," by "Stratton Prince."

Devons—Cows above Three Years-old.

John Azariah Smith, Bradford Peverell: First Prize, 20*l.*, for "Picture," red, 4 years, 3 months, 2 weeks, 4 days-old, in-milk; bred by himself; sire, "Stratton Prince;" dam, "Picture" (2923), by "Augustus" (778). Calved October 3, 1873.

Trevor Lee Senior, Broughton House, Aylesbury, Bucks: Second Prize, 10*l.*, for "Moss Rose," light red, 6 years, 3 months, 3 weeks-old, in-milk; bred by Mr. Wilkinson, Isle of Wight; sire, "Island Prince;" dam, "Modesty." Calved September 1873.

William Taylor, of Glynleigh, Eastbourne, Sussex: Third Prize, 5*l.*, for "Abbess," red, 4 years 11 months, 2 days-old, in-milk; bred by himself; sire, "Alabama" (774); dam, "Beauty" (1788), by "Napoleon" (464). Calved March 27, 1874.

George Turner, Brampford Speke, Exeter: the *Reserve Number*, to "Marguerite," red, 4 years, 11 months-old, in-milk; bred by himself; sire, "Albert Victor;" dam, "Lady Evelyn 1st." Calved April, 1874.

Devons—Heifers in-milk or in-calf, not exceeding Three Years-old.

Walter Farthing, Stowey Court: First Prize, 15*l.*, for "Nellie," red, 2 years, 2 months, 2 weeks, 1 day-old, in-calf; bred by Mr. R. Farthing, Farrington, North Petherton; sire, "Duke."

Walter Farthing: Second Prize, 10*l.*, for "Duchess," red, 2 years, 3 weeks, 5 days-old, in-calf; bred by himself; sire, "Able;" dam, "Dairymaid," by "Viscount."

William Taylor, of Glynleigh, Eastbourne: Third Prize, 5*l.*, for "Lady Love 3rd," red, 2 years, 7 months, 1 week, 3 days-old, in-calf; bred by himself; sire, "Pretty Boy" (905);" dam, "Lady Love" (2806), by "Duke of Flitton 2nd" (825).

Devons—Yearling Heifers, above One and not exceeding Two Years-old.

William Perry, Alder, Lewdown, Devon: First Prize, 15*l.*, for "Camellia," red, 1 year, 10 months, 3 days-old; bred by himself; sire, "Champion;" dam, "Croquet" (2592), by "Prince" (906).

Viscount Falmouth, Tregothnan, Probus, Cornwall: Second Prize, 10*l.*, for "Plymouth Queen," 1 year, 11 months, 1 week, 3 days-old; bred by himself; "Jonquil;" dam, "Rubra."

Trevor Lee Senior, Broughton House, Aylesbury: Third Prize, 5*l.*, for "Moss Rose 1st," light red, 1 year, 11 months, 3 weeks-old; bred by himself; sire, "Stowey;" dam "Moss Rose."

Her Majesty the Queen, Windsor Castle: the *Reserve Number*, to "Princess Victoria Louise," red, 1 year, 8 months, 4 weeks-old; bred by Her Majesty at Norfolk Farm, Windsor; sire, "Napier;" dam, "Violet 2nd," by "Saracen."

Devons—Heifer-Calves above Six and under Twelve Months-old.

Trevor Lee Senior, Broughton House, Aylesbury: First Prize, 10*l.*, for "Moss Rose 2nd," dark red, 10 months, 1 week-old; bred by himself; sire, "Gaylad," by "Moss Rose."

John Azariah Smith, Bradford Peverell, Dorchester: Second Prize, 5*l.*, for "Picture," red, 8 months, 3 weeks, 5 days-old; bred by himself; sire, "Sultan;" dam "Picture," by "Duke of York."

Mrs. Maria Langdon, Flitton Barton, North Molton: the *Reserve Number*, to "Actress 8th," red, 10 months, 2 weeks, 5 days-old; bred by herself; sire, "Duke of Flitton 8th;" dam, "Actress 5th," by "Duke of Flitton 4th" (827).

Jerseys—Bulls above One Year-old.

John Gerard Leigh, Luton Hoo, Luton, Beds: First Prize, 10*l.*, for "Fitz Yankee," grey, 2 years, 4 months, 4 weeks-old; bred by Mr. J. Le Brun, St. Owen, Jersey; sire "Yankee" (27); dam, "Georgette" (309).

John C. F. Ramsden, Busbridge Hall, Godalming, Surrey: Second Prize, 5*l.*, for "Modoc," black and silver, 1 year, 7 months, 1 week, 5 days-old; bred by himself; sire, Mr. Simpson's "Wraypark;" dam, "Deerfoot."

George Simpson, Wray Park, Reigate, Surrey: the *Reserve Number*, to "Prince Crocus," silver grey, 2 years, 4 months, 3 weeks-old, bred by himself; sire, "Prince;" dam, "Crocus," by "Young Duke."

Jerseys—Cows above Three Years-old.

Walter Gilbey, Hargrave Park, Stanstead, Essex: First Prize, 10*l.*, for "Duchess," fawn, 6 years, 4 months, 1 week, 4 days-old, in-milk and in-calf; breeder unknown. Calved Oct. 17, 1873.

Walter Gilbey: Second Prize, 5*l.*, for "Medora," fawn, 7 years, 7 months-old, in-milk; bred by Mr. W. G. Duncan, Bradwell, Stony Stratford; sire, "Gipsy;" dam, "Miriam," by "The Beau." Calved Feb. 19, 1874.

The Rev. Morton Shaw, Rougham Rectory, Bury St. Edmunds: the *Reserve Number*, to "Pansy," fawn, 5 years, 5 months, 6 days-old, in-milk and in-calf; bred by Mr. W. G. Blake, Nowton Hall, Bury St. Edmunds; sire, "Rioter." Calved Sept. 20, 1873.

Jerseys—Heifers, in-milk or in-calf, not exceeding Three Years-old.

John Gerard Leigh, Luton Hoo, Luton: First Prize, 10*l.*, for "Bonny," fawn, 1 year, 6 months, 3 weeks, 1 day-old, in-calf; bred by himself; sire, "Duke Humphrey;" dam, "Bonny."

Walter Gilbey, Hargrave Park, Stanstead, Essex: Second Prize, 5*l.*, for "Duchy," fawn, 2 years, 6 months, 1 week-old, in-calf; bred by himself; sire "Banboy;" dam, "Duchess," by "Cardinal."

Lord Braybrooke, Audley End, Saffron Walden: the *Reserve Number*, to "Flame," silver grey, 1 year, 11 months, 2 weeks, 4 days-old, in-calf; bred by himself; sire "Latimer;" dam, "Lamplight," by "King Pippin."

Guernseys—Bulls above One Year-old.

The REV. JOSHUA R. WATSON, La Favorita, Guernsey: FIRST PRIZE, 10*l.*, for "Cloth of Gold," fawn, 3 years, 3 months, 3 weeks, 4 days-old; bred by Mr. Robin, Les Landes, Guernsey; sire, "Fair Lad;" dam, "Charbonnée."

The REV. JOSHUA R. WATSON: SECOND PRIZE, 5*l.*, for "No. 3 Cloth of Gold," fawn, 1 year, 4 months, 2 weeks, 1 day-old; bred by Mr. N. Lainé, Maigays, Guernsey; sire, "Son of Fair Lad."

Guernseys—Cows above Three Years-old.

The REV. JOSHUA R. WATSON; FIRST PRIZE, 10*l.*, for "Portia," red and white, 4 years, 8 months-old, in-calf; bred by Mr. P. Le Poidevin, La Galleot, Guernsey.

Guernseys—Heifers, in-milk or in-calf, not exceeding Three Years-old.

The REV. JOSHUA R. WATSON: FIRST PRIZE, 10*l.*, for "Esmeralda," fawn and white, 2 years, 3 weeks, 6 days-old, in-calf; bred by Miss Martin, Le Forêt, Guernsey; sire, "Billy."

Sussex—Bulls above Two Years-old.

JOHN TURVILL, Hartley Park Farm, Alton, Hants: FIRST PRIZE, 20*l.*, for "Hartley," red, 3 years, 11 months, 2 weeks, 1 day-old; bred by himself; sire, "Sultan;" dam, "Miss Dennett."

GEORGE SMITH, Paddockhurst, Crawley, Sussex: SECOND PRIZE, 10*l.*, for "Lion," dark red, 4 years, 1 month, 2 weeks, 3 days-old: bred by himself; sire, "Bill;" dam, "Lively," by "Summerveer."

ALFRED AGATE, West Street, Horsham, Sussex: the *Reserve Number*, to "Alfred 2nd" (177), red, 2 years, 8 months, 3 weeks, 6 days-old; bred by himself; sire, "Grand Duke" (183); dam, "Actress" (1146), by "Westminster" (138).

Sussex—Bulls above One Year-old.

JOHN and ALFRED HEASMAN, Angmering, Arundel, Sussex: FIRST PRIZE, 15*l.*, for "Bristol," red, 1 year, 9 months, 2 days-old; bred by themselves; sire, "Southampton;" dam, "Leicester."

EDWARD and ALFRED STANFORD, Ashurst, Steyning, Sussex: SECOND PRIZE, 10*l.*, for red, 1 year, 3 months-old; bred by themselves.

Sussex—Cows above Three Years-old.

JOHN TURVILL, Hartley Park Farm, Alton: FIRST PRIZE, 15*l.*, for "Colley," red, 7 years-old, in-calf; bred by the late Mr. Holden, Ashlam Farm, Slinfold, Horsham.

ALFRED AGATE, West Street, Horsham: SECOND PRIZE, 10*l.*, for "Lofty," red, 7 years, 1 month-old, in-milk; bred by Mr. E. Cane, Berwick Court, Sussex; dam, "Lofty." Calved Feb. 17.

EDWARD and ALFRED STANFORD, of Ashurst, Steyning: the *Reserve Number*, to "Mary Fern" (1189), red, 7 years-old, in-calf; bred by Mr. Martin, Ewhurst, Hurstpierpoint; sire, "Westminster" (138); dam, "Fanny Fern" (789), by "Sir Marmaduke" (38).

Sussex—Heifers in-milk or in-calf, above Two Years-old.

ALFRED AGATE, West Street, Horsham: FIRST PRIZE, 15*l.*, for "Auburn," red, 2 years, 8 months, 5 days-old, in-calf; bred by himself; sire, "Grand Duke" (183); dam, "Grand Duchess 4th" (1169), by "Crown Prince."

JOHN and ALFRED HEASMAN, Angmering, Arundel: SECOND PRIZE, 10*l.*, for "Marie Stuart," red, 2 years, 5 months, 3 weeks, 5 days-old, in-calf; bred by themselves; sire, "Southampton;" dam, "Devonport," by the "Duke."

GEORGE SMITH, Paddockhurst, Crawley: the *Reserve Number*, to "Pride of the Family," red, 2 years, 3 weeks-old, in-calf; bred by himself; sire, "Lion;" dam, "Milley," by "Summerveer."

Norfolks and Suffolks—Bulls above Two Years-old.

JEREMIAH JAMES COLMAN, M.P., Carrow House, Norwich: FIRST PRIZE, 20*l.*, for "Powell" [Norfolk], red, 6 years, 5 months-old; bred by Mr. N. Powell, Little Snoring, Fakenham; sire, "Norfolk Duke."

LORD SONDES, Elmham Hall, Dereham, Norfolk: SECOND PRIZE, 10*l.*, for "The Palmer" [Norfolk], red, 3 years, 3 months, 2 weeks-old, 1 day-old; bred by himself; sire, "Hammond" (81); dam, "Brettenham Handsome" (A 3), by "Hero of Newcastle" (85).

THOMAS BROWN, Marham Hall, Downham Market: the *Reserve Number*, to "The Beau" [Norfolk], red, 2 years, 8 months, 2 weeks, 4 days-old; bred by himself; sire, "Tenant Farmer" (213); dam, "The Elmham Belle" (2), by "Hero 2nd" (86).

Norfolks and Suffolks—Bulls above One Year-old.

JEREMIAH JAMES COLMAN, M.P., Carrow House, Norwich: FIRST PRIZE, 15*l.*, for "Elmham Duke" (66) [Norfolk], red, 1 year, 6 months, 1 week, 1 day-old; bred by himself; sire, "Hero 3rd" (87); dam, "Cowslip" (P 3), by "Norfolk Duke" (127).

HENRY BIRKBECK, Stoke Holy Cross, Norwich: SECOND PRIZE, 10*l.*, for "Suffolk" [Norfolk], red, 1 year, 10 months-old; bred by himself; sire, "Powell;" dam, "Witch."

JEREMIAH JAMES COLMAN, M.P.: the *Reserve Number*, to "Easton Duke" (61) [Norfolk], red, 1 year, 5 months, 1 week, 5 days-old; bred by himself; sire, "Norfolk Duke" (127); dam, "Primrose" (W 6), by "Cherry Duke" (32).

Norfolks and Suffolks—Cows above Three Years-old.

JEREMIAH JAMES COLMAN, M.P.: FIRST PRIZE, 15*l.*, for "Easton Nelly" (W 3) [Suffolk], red, 4 years, 9 months, 3 weeks, 3 days-old, in-milk and in-calf; bred by Mr. S. Wolton, Newbourn Hall, Woodbridge; sire, "King Theodore" (98), dam, "Nelly," by "Robinson" (178). Calved Dec. 1, 1873.

LORD SONDES, Elmham Hall, Dereham, Norfolk: SECOND PRIZE, 10*l.*, for "Skelton" [Norfolk], red, about 15 years-old, in-milk; bred by the late Mr. Skelton, Necton, Shipdham. Calved Feb. 4, 1874.

SIR WILLOUGHBY JONES, Bart., Cranmer Hall, Fakenham, Norfolk: the *Reserve Number*, to "Cherry" [Norfolk], red, 5 years, 4 months-old, in-milk; bred by Mr.. Smith, Rainham, Norfolk. Calved Nov. 18, 1873.

Norfolks and Suffolks—Heifers in-milk or in-calf, above Two Years-old.

Lord Sondes, Elmham Hall, Dereham, Norfolk: First Prize, 15*l.*, for "Fanny" (a 9) [Norfolk], red, 2 years, 10 months-old, in-calf; bred by himself; sire, "Hero 3rd" (81); dam, "Madame Freeman."

Benjamin Brown, Thursford, Dereham: Second Prize, 10*l.*, for "Nonpareil" [Norfolk], red, 2 years, 4 months, 1 week, 4 days-old, in-calf; bred by Mr. Nicholls, Norton, Dereham; dam, "Lucy," by "Wiscton."

Henry Birkbeck, Stoke Holy Cross, Norwich: the *Reserve Number*, to "Wave" [Norfolk], red, 2 years, 8 months, 2 weeks-old, in-calf; bred by himself; sire, "Powell;" dam, "Witch," by "Tommy."

*Any Breed—Cows, in-milk or in-calf.**

William Looker, Wyton Manor, Huntingdon: First Prize, 15*l.*, for "White Rose" [Shorthorn], white, 7 years, 3 months-old, in-milk and in-calf; bred by Mr. B. H. Rowell, Old Hurst, Huntingdon; sire, "British Hope" (21,324). Calved March 1, 1874.

Thomas Kingsley, Boarscroft, Tring: Second Prize, 10*l.*, for "Seraphana" [Shorthorn], roan, 8 years, 4 months-old, in-milk and in-calf; bred by himself; sire, Honeycomb;" dam, "Lady Thynne." Calved, Oct. 1873.

Thomas Statter, Stand Hall, Whitefield, Manchester: the *Reserve Number*, to "Buttercup" [Yorkshire], roan, in-milk and in-calf; age and breeder unknown. Calved about August 28, 1873.

*Any Breed—Heifers, in-milk or in-calf, not exceeding Three Years-old.**

Richard Stratton, The Duffryn, Newport, Mon.: First Prize, 15*l.*, for "Brilliance" [Shorthorn], roan, 2 years, 3 months, 1 day-old, in-calf; bred by himself; sire, "Brilliant" (28,084); dam, "Llanwern."

William Looker, Wyton Manor, Huntingdon: Second Prize, 10*l.*, for "Lottery" [Shorthorn], roan, 2 years, 3 months, 1 week, 1 day-old, in-milk and in-calf; bred by Mr. J. Clifton, Houghton Hall, Huntingdon; sire, "Prince of the Realm" (22,627); dam, "White Rose," by "British Hope" (21,324).

Thomas Kingsley, Boar's Croft, Tring: the *Reserve Number*, to "Lady Thynne 3rd" [Shorthorn], red, 1 year, 8 months, 1 week-old, bred by himself; sire, "Sorcerer;" dam, "Seraphina."

SHEEP.

Leicesters—Shearling Rams.

George Turner, jun., Thorpelands, Northampton: First Prize, 20*l.*, for his about 1 year, 3 months, 2 weeks-old; bred by himself.

George Turner, jun.: Second Prize, 10*l.*, for his about 1 year, 3 months, 2 weeks-old; bred by himself.

George Turner, jun.: Third Prize, 5*l.*, for his about 1 year, 3 months, 2 weeks-old; bred by himself.

John Borton, Barton House, Barton-le-Street, Malton: the *Reserve Number*, to his 1 year, 4 months-old; bred by himself.

Leicesters—Rams of any other age.

George Turner, of Brampford Speke, Exeter: First Prize, 20*l.*, for his 2 years, 3 months, 2 weeks-old; bred by himself.

George Turner, jun.: the Second Prize, 10*l.*, for his about 2 years, 3 months, 2 weeks-old; bred by himself.

John Borton, Barton House: Third Prize, 5*l.*, for his 3 years, 4 months-old; bred by himself.

John Borton, Barton House: the *Reserve Number*, to his 2 years, 4 months-old; bred by himself.

Leicesters—Pens of Five Shearling Ewes.

George Turner, jun.: First Prize, 15*l.*, for his about 1 year, 3 months-old; bred by himself.

John Borton, Barton House: Second Prize, 10*l.*, for his 1 year, 4 months-old; bred by himself.

George Turner, jun.: Third Prize, 5*l.*, for his about 1 year, 3 months, 2 weeks-old; bred by himself.

Teasdale Hilton Hutchinson, Manor House, Catterick: the *Reserve Number*, to his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Tamworth."

Cotswolds—Shearling Rams.

Thomas Brown, Marham Hall, Downham Market: First Prize, 20*l.*, for his 1 year, 4 months, 2 weeks-old; bred by himself.

Thomas Brown, Marham Hall: Second Prize, 10*l.*, for his 1 year, 4 months, 2 weeks-old: bred by himself.

Thomas Brown, Marham Hall: Third Prize, 5*l.*, for his 1 year, 4 months, 2 weeks-old; bred by himself.

Thomas Brown, Marham Hall: the *Reserve Number*, to his 1 year, 4 months, 2 weeks-old; bred by himself.

Cotswolds—Rams of any other Age.

Thomas Brown, Marham Hall: First Prize, 20*l.*, for his 2 years, 4 months, 2 weeks-old; bred by himself.

Russell Swanwick, Royal Agricultural College Farm, Cirencester: Second Prize, 10*l.*, for his 2 years, 4 months-old; bred by himself.

Thomas Brown, Marham Hall: Third Prize, 5*l.*, for his 2 years, 4 months, 2 weeks-old; bred by himself.

Hugh E. Raynbird, Basingstoke: the *Reserve Number*, to his 3 years, 4 months-old; bred by himself.

Cotswolds—Pens of Five Shearling Ewes.

Russell Swanwick, Royal Agricultural College Farm, Cirencester: First Prize, 15*l.*, for his 1 year, 4 months-old; bred by himself.

T. and S. G. Gillett, Kilkenny, Faringdon: Second Prize, 10*l.*, for their 1 year, 4 months, 1 week-old; bred by themselves.

T. and S. G. Gillett, Kilkenny: Third Prize, 5*l.*, for their 1 year, 4 months-old; bred by themselves.

Thomas Thomas, St. Hilary, Cowbridge, Glamorganshire: the *Reserve Number*, to his 1 year, 3 months-old; bred by himself.

Lincolns—Shearling Rams.

Edward John Howard, Nocton Rise, Lincoln: First Prize, 20*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself.

John Pears, Mere, Lincoln: Second Prize, 10*l.*, for his 1 year, 4 months-old; bred by himself.

Robert Wright, Nocton Heath, Lincoln: Third Prize, 5*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself.

Thomas Cartwright, Dunstan Pillar, Lincoln; the *Reserve Number*, to his 1 year, 4 months, 2 weeks-old; bred by himself.

Lincolns—Rams of any other Age.

John Pears, Mere, Lincoln: First Prize, 20*l.*, for his 2 years, 4 months-old; bred by himself.

Robert Wright, Nocton Heath, Lincoln: Second Prize, 10*l.*, for his 3 years, 3 months, 2 weeks-old; bred by himself.

Robert Wright, Nocton Heath: Third Prize, 5*l.*, for his 3 years, 3 months, 2 weeks-old; bred by himself.

Willam and Henry Dudding, Panton House, Wragby: the *Reserve Number*, to their 2 years, 3 months, 2 weeks-old; bred by themselves.

Lincolns—Pens of Five Shearling Ewes.

Thomas Gunnell, Milton, Cambridge: First Prize, 15*l.*, for his 1 year, 4 months-old; bred by himself.

John Byron, Kirkby Green, Sleaford: Second Prize, 10*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself.

John Pears, Mere, Lincoln: Third Prize, 5*l.*, for his 1 year, 4 months-old; bred by himself.

Charles Clarke, Ashby-de-la-Launde, Sleaford: the *Reserve Number*, to his about 1 year, 3 months-old; bred by himself.

Border Leicesters—Shearling Rams.

Thomas Forster, jun., Ellingham, Chathill, Northumberland: First Prize, 20*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself.

Thomas Forster, jun., Ellingham: Second Prize, 10*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself.

William Purves, Linton Burnfoot, Kelso, Roxburgh, N.B.: Third Prize, 5*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Mellendine;" sire of dam, "Merton."

William Purves: the *Reserve Number*, to his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Mellendine;" sire of dam, "Merton."

Border Leicesters—Rams of any other Age.

THOMAS FORSTER, jun., Ellingham, Chathill: FIRST PRIZE, 20*l.*, for "Royal Exchange," 4 years, 3 months, 2 weeks-old; bred by himself; sire, "Number Two."

Border Leicesters—Pens of Five Shearling Ewes.

WILLIAM PURVES, Linton Burnfoot: FIRST PRIZE, 15*l.*, for his 1 year, 3 months, 1 week-old; bred by himself; sire, "Mellendine;" sire of dam, "Merton."

HENRY NEWBY-FRASER, Hay Close, Penrith, Cumberland: SECOND PRIZE, 10*l.*, for his 1 year, 3 months, 1 week-old; bred by himself.

RICHARD TWEEDIE, The Forest, Catterick, Yorkshire: THIRD PRIZE, 5*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Sir James."

HENRY NEWBY-FRASER, Hay Close: the *Reserve Number*, to his 1 year, 3 months-old; bred by himself.

Oxfordshire Downs—Shearling Rams.

THE DUKE OF MARLBOROUGH, K.G., Blenheim Palace, Woodstock: FIRST PRIZE, 20*l.*, for his 1 year, 4 months-old; bred by himself.

A. F. MILTON DRUCE, Twelve Acres, Eynsham, Oxon: SECOND PRIZE, 10*l.*, for his 1 year, 5 months-old; bred by himself.

THE DUKE OF MARLBOROUGH, K.G., Blenheim Palace: THIRD PRIZE, 5*l.*, for his 1 year, 4 months-old; bred by himself.

GEORGE WALLIS, Old Shifford, Bampton, Faringdon: the *Reserve Number*, to his 1 year, 5 months, 2 weeks-old; bred by himself.

Oxfordshire Downs—Rams of any other age.

JOHN TREADWELL, Upper Winchendon, Aylesbury, Bucks: FIRST PRIZE, 20*l.*, for "Guildford," about 4 years, 4 months, 2 weeks-old; bred by himself; sire, "Grendon."

JOHN TREADWELL: SECOND PRIZE, 10*l.*, for "Gillett," about 3 years, 5 months-old; bred by Mr. Charles Gillett, Cote House, Bampton, Oxon.

A. F. MILTON DRUCE, Twelve Acres, Eynsham: THIRD PRIZE, 5*l.*, for his 3 years, 5 months-old; bred by himself.

CHARLES HOWARD, Biddenham, Bedford: the *Reserve Number*, to his 2 years, 4 months, 2 weeks-old; bred by himself.

Oxfordshire Downs—Pens of Five Shearling Ewes.

A. F. MILTON DRUCE, Twelve Acres, Eynsham: FIRST PRIZE, 15*l.*, for his 1 year, 5 months-old; bred by himself.

THE DUKE OF MARLBOROUGH, K.G., Blenheim Palace: SECOND PRIZE, 10*l.*, for his 1 year, 4 months-old; bred by himself.

GEORGE WALLIS, Old Shifford, Bampton, Faringdon: THIRD PRIZE, 5*l.*, for his 1 year, 5 months, 2 weeks-old; bred by himself.

CHARLES HOWARD, Biddenham: the *Reserve Number*, to his 1 year, 4 months, 2 weeks-old; bred by himself.

Southdowns—Shearling Rams.

William Rigden, Hove, Brighton: First Prize, 20*l.*, for his 1 year, 4 months-old; bred by himself.

Lord Walsingham, Merton Hall, Thetford: Second Prize, 10*l.* for his 1 year, 4 months-old; bred by himself.

Lord Walsingham: Third Prize, 5*l.*, for his 1 year, 4 months-old, bred by himself.

John and Alfred Heasman, Angmering, Arundel, Sussex: the *Reserve Number*, to their 1 year, 5 months-old; bred by themselves; sire, "Young Guildford."

Southdowns—Rams of any other Age.

Lord Walsingham, Merton Hall, Thetford: First Prize, 20*l.*, for his 2 years, 4 months-old; bred by himself.

William Rigden, Hove, Brighton: Second Prize, 10*l.*, for his 2 years, 4 months-old; bred by himself.

Sir William Throckmorton, Bart., Buckland, Faringdon: Third Prize, 5*l.*, for his 2 years, 4 months-old; bred by himself.

H.R.H. The Prince of Wales, K.G., Sandringham, King's Lynn: the *Reserve Number*, to his 2 years, 4 months-old; bred by His Royal Highness.

Southdowns—Pens of Five Shearling Ewes.

Lord Walsingham, Merton Hall, Thetford: First Prize, 15*l.*, for his 1 year, 4 months-old; bred by himself.

Sir William Throckmorton, Bart., Buckland, Faringdon: Second Prize, 10*l.*, for his 1 year, 4 months-old; bred by himself.

Jeremiah James Colman, M.P., Carrow House, Norwich: Third Prize, 5*l.*, for his 1 year, 4 months-old; bred by himself.

Hugh Sidney Waller, Farmington, Northleach, Gloucestershire: the *Reserve Number*, to his 1 year, 3 months, 1 week-old; bred by himself.

Shropshires—Shearling Rams.

Lord Chesham, Latimer, Chesham, Bucks: First Prize, 20*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Son of Oxford Hero;" sire of dam, "Latimer."

Thomas and Thomas James Mansell, Ercall Park, Wellington, Salop: Second Prize, 10*l.*, for their 1 year, 3 months, 3 weeks-old; bred by themselves.

Edward Crane, Shrawardine, Shrewsbury: Third Prize, 5*l.*, for his 1 year, 3 months-old; bred by himself; sire, "Buckskin."

Sarah Beach, The Hattons, Brewood, Penkridge; the *Reserve Number*, to her 1 year, 4 months, 1 week-old; bred by herself.

Shropshires—Rams of any other Age.

Thomas and Thomas James Mansell, Adcott Hall, Baschurch, Salop: First Prize, 20*l.*, for their 2 years, 4 months-old; bred by themselves: sire, "Calcot;" sire of dam, "Conservative."

EDWARD CRANE, Shrawardine, Shrewsbury: SECOND PRIZE, 10*l.*, for "Cymro," 2 years, 3 months, 1 week-old; bred by himself; sire, "Cambrian," sire of dam, "The Duke of Newcastle."

LORD CHESHAM, Latimer, Chesham: THIRD PRIZE, 5*l.*, for "Paddy," 2 years, 3 months, 2 weeks-old; bred by himself; sire, "Grandson of Duke of Manchester."

WILLIAM GERMAN, Measham Lodge, Atherstone: the *Reserve Number*, to "The Ruler," 3 years, 4 months-old; bred by Mr. Benjamin Walker, of Odstone Hill, Atherstone; sire, "Son of Cardinal;" sire of dam, "Young Duke."

Shropshires—Pens of Five Shearling Ewes.

LORD CHESHAM, Latimer, Chesham: FIRST PRIZE, 15*l.*, for his 1 year, 3 months, 1 week-old; bred by himself.

SARAH BEACH, The Hattons, Brewood, Penkridge: SECOND PRIZE, 10*l.*, for her 1 year, 4 months-old; bred by herself.

JOSEPH PULLEY, Lower Eaton, Hereford: THIRD PRIZE, 5*l.*, for his 1 year, 3 months, 2 weeks-old; bred by himself; sire, "Windsor."

WILLIAM ORME FOSTER, Apley Park Farm, Shifnal, Salop: the *Reserve Number*, to his 1 year, 3 months, 1 week-old; bred by himself; sire, "Shropshire."

Hampshires and other Short Wools—Shearling Rams.

ALFRED MORRISON, Fonthill House, Tisbury, Wilts: FIRST PRIZE, 20*l.*, for his Hampshire Down, 1 year, 4 months, 2 weeks-old; bred by himself.

ALFRED MORRISON, Fonthill House: SECOND PRIZE, 10*l.*, for his Hampshire Down, 1 year, 5 months-old; bred by himself.

ROBERT and JOHN RUSSELL, Horton Kirby, Dartford, Kent: THIRD PRIZE, 5*l.*, for their Hampshire Down, 1 year, 5 months, 2 weeks-old; bred by themselves.

ROBERT COLES, Middleton Farm, Warminster: the *Reserve Number*, to his Hampshire Down, 1 year, 4 months, 2 weeks-old; bred by himself.

Hampshires and other Short Wools—Rams of any other Age.

THOMAS CHAPMAN SAUNDERS, Watercombe, Dorchester: FIRST PRIZE, 20*l.*, for his Hampshire Down, 2 years, 5 months-old; bred by himself.

THOMAS CHAPMAN SAUNDERS: SECOND PRIZE, 10*l.*, for his Hampshire Down, 2 years, 5 months-old; bred by himself.

Hampshires and other Short Wools—Pens of Five Shearling Ewes.

THOMAS CHAPMAN SAUNDERS, Watercombe, Dorchester: FIRST PRIZE, 15*l.*, for his Hampshire Downs, 1 year, 5 months-old; bred by himself.

WILLIAM PARSONS, Monk Sherborne, Basingstoke: SECOND PRIZE, 10*l.*, for his Hampshire Downs, 1 year, 5 months, 1 week-old; bred by himself.

JOHN WALTER, M.P., Bearwood, Wokingham: THIRD PRIZE, 5*l.*, for his Hampshire Downs, 1 year, 5 months, 2 weeks-old; bred by himself.

WILLIAM SNAZELL GARDNER, French Hall, Moulton, Newmarket: the *Reserve Number*, to his Black Faced Suffolks, about 1 year, 4 months, 1 week-old; bred by himself.

*Long Wools—Pens of Ten Breeding Ewes of any Age.**

T. and S. G. Gillett, Kilkenny, Faringdon, Oxfordshire: First Prize, 12*l.*, for their Cotswolds, ages various; bred by the late T. Gillett, Kilkenny, and the late Robert Lane, Cottage Farm, Northleach.

Thomas Gunnell, Milton, Cambridge: Second Prize, 8*l.*, for his Lincolns, ages various; bred by himself.

Charles Clarke, Ashby-de-la-Launde, Sleaford, Lincolnshire: the *Reserve Number*, to his Lincolns, ages various; bred by himself.

*Long Wools—Pens of Ten Ewe Lambs.**

Frederick Allwood, Walsworth Farm, Hitchin: First Prize, 12*l.*, for his Lincolns, 4 months, 1 week-old; bred by himself.

Frederick Ellis, Manor Farm, Chesterton, Cambridge: Second Prize, 8*l.*, for his 4 months, 2 weeks-old; bred by himself.

Short Wools—Pens of Five Shearling Wethers.

Charles Crawshay, Hingham, Attleboro': First Prize, 12*l.*, for his 1 year, 4 months, 1 week-old; bred by Mr. Charles Cobon, Cradle Hall, Lynn.

Thomas Gunnell, Milton, Cambridge: Second Prize, 8*l.*, for his Lincolns, 1 year, 4 months-old; bred by himself.

Joseph Newman, Harrowden, Bedford: the *Reserve Number*, to his Improved Leicesters, 1 year, 4 months, 2 weeks-old; bred by himself.

*Short Wools—Pens of Ten Breeding Ewes of any Age.**

The Duke of Marlborough, Blenheim Palace, Woodstock: First Prize, 12*l.*, for his Oxfordshire Downs, ages various; bred by himself.

J. Bowen Jones, Ensdon House, Shrewsbury: Second Prize, 8*l.*, for his Shropshires, ages various; bred by himself.

Charles Howard, Biddenham, Bedford: the *Reserve Number*, to his Oxfordshire Downs, ages various; bred by himself.

*Short Wools—Pens of Ten Ewe Lambs.**

Thomas Nock, Sutton House, Shifnal: First Prize, 12*l.*, for his Shropshires, 4 months-old; bred by himself.

Frederick Street, Harrowden, Bedford: Second Prize, 8*l.*, for his Oxfordshire Downs, 5 months-old; bred by himself.

Thomas and T. James Mansell, Ercall Park, Wellington, Salop: the *Reserve Number*, to their Shropshires, 4 months-old; bred by themselves.

Short Wools—Pens of Ten Wether Lambs.

James and Frederick Howard, Park Farm, Clapham, Bedford: First Prize, 12*l.*, for their Oxfordshire Downs, about 5 months-old; bred by themselves.

George Street, Maulden, Ampthill, Bedfordshire: Second Prize, 8*l.*, for his Oxfordshire Downs, about 5 months-old; bred by himself.

Lord Sondes, Elmham Hall, Dereham, Norfolk: the *Reserve Number*, to his Southdowns, 4 months, 2 weeks-old; bred by himself.

*Short Wools—Pens of Five Shearling Wethers.**

The Executors of the late Samuel Druce, Eynsham, Oxon: First Prize, 12*l.*, for their Oxfordshire Downs, 1 year, 5 months, 2 weeks-old; bred by the late Mr. Samuel Druce.

The Duke of Marlborough, K.G., Blenheim Palace: Second Prize, 8*l.*, for his Oxfordshire Downs, 1 year, 4 months, 1 week-old; bred by himself.

Grimwood Cooke, Horseheath Park, Linton, Cambs.: the *Reserve Number*, to his Shropshires, 1 year 4 months, 1 week-old; bred by himself.

PIGS.

Large White Breed—Boars above Six and not exceeding Twelve Months-old.

The Earl of Ellesmere, Worsley Hall, Manchester: First Prize, 10*l.*, for his 10 months, 3 weeks, 3 days-old; bred by Mr. H. Neild, Worsley, Manchester.

Richard Elmhirst Duckering, Northorpe, Kirton-in-Lindsey, Lincolnshire: Second Prize, 5*l.*, for "10th Cultivator," 11 months, 1 week-old; bred by himself; sire, "Cultivator 9th."

Jacob Dove, Hambrook House, Hambrook, Gloucestershire; the *Reserve Number*, to "Perfection's Son," 11 months, 2 weeks-old; bred by himself; dam, "Perfection," by "Old Jack."

Large White Breed—Boars above Twelve Months-old.

Clement R. N. Beswicke-Royds, Pyke House, Littleborough, Lancashire: First Prize, 10*l.*, for "Velocipede," 4 years, 3 days-old; bred by Mr. Henry Neild, Worsley, Manchester; sire, "Punch;" dam, "Lancashire Witch," by "Silverhair."

The Earl of Ellesmere, Worsley Hall: Second Prize, 5*l.*, for "Cultivator 9th," 2 years, 10 months, 2 weeks, 1 day-old; bred by Mr. R. E. Duckering, Northorpe, Kirton-in-Lindsey.

James and Frederick Howard, Park Farm, Clapham, Bedford: the *Reserve Number*, to "Duke," 3 years, 4 months, 3 weeks, 3 days-old; bred by themselves; sire, "Manchester;" dam, "Duchess."

Large White Breed—Pens of Three Breeding Sow Pigs.

Matthew Walker, Stockley Park, Anslow, Burton-on-Trent: First Prize, 10*l.*, for "Minnie, Mina, Myra," 7 months, 3 weeks, 1 day-old; bred by himself; sire, "Victor 2nd;" dam, "Lily," by "Ranger."

James and Frederick Howard, Park Farm, Clapham, Bedford: Second Prize, 5*l.*, for "The Three Damsels," 5 months, 3 weeks, 3 days-old; bred by themselves; sire, "Victor 4th," dam, "Topsey."

Thomas Satchwell, Hernfield House, Knowle, Warwickshire: the *Reserve Number*, to his 6 months, 1 week, 6 days-old; bred by himself; dam, "Wigston."

Large White Breed—Breeding Sows.

The Earl of Ellesmere, Worsley Hall, Manchester: First Prize, 10*l.*, for his 2 years, 6 months-old, in-pig; bred by himself.

Clement R. N. Beswicke-Royds, Pyke House, Littleborough: Second Prize, 5*l.*, for "Acorn," 3 years, 1 month, 4 weeks-old, in-pig; bred by Mr. Peter Eden, Cross Lane, Salford; sire, "John Bull;" dam, "Lucy."

John Wheeler, Long Compton, Shipston-on-Stour, Warwickshire: the *Reserve Number*, to "Young Princess," 2 years, 2 months-old; bred by himself.

Small White Breed—Boars above Six and not exceeding Twelve Months-old.

Jacob Dove, Hambrook House, Hambrook: First Prize, 10*l.*, for "Curly Jolly Boy," 11 months, 5 days-old; bred by himself; sire, "Mouse;" dam, "Polly."

The Earl of Ellesmere, Worsley Hall, Manchester: Second Prize, 5*l.*, for his 11 months, 3 weeks-old; bred by himself; sire, "Uncle Tom;" dam, by "Prince."

George Mumford Sexton, Wherstead Hall, Ipswich: the *Reserve Number*, to "The Czar," 8 months-old; bred by himself; sire, "Suffolk;" dam, "Sister to Rivalry," by "Peter."

Small White Breed—Boars above Twelve Months-old.

George Mumford Sexton, Wherstead Hall, Ipswich: First Prize, 10*l.*, for "Disturbance," 2 years, 5 months, 2 weeks-old; bred by himself; sire, "Peter;" dam, "Commotion," by "Suffolk."

Clement R. N. Beswicke-Boyds, of Pyke House, Littleborough: Second Prize, 5*l.*, for "Cupid," 1 year, 10 months, 3 weeks, 1 day-old; bred by himself; sire, "Peacock;" dam, "Primrose," by "King of the West."

The Earl of Ellesmere, Worsley Hall: the *Reserve Number*, to "Curly Locks," 1 year, 5 months-old; bred by himself.

Small White Breed—Pens of Three Breeding Sow Pigs.

The Earl of Ellesmere, Worsley Hall: First Prize, 10*l.*, for his 7 months, 2 weeks, 2 days-old; bred by himself; sire, "X 2;" dam by "Charlie."

Clement R. N. Beswicke-Royds, Pyke House, Littleborough: Second Prize, 5*l.*, for his 7 months, 2 days-old; bred by himself; sire, "Cupid;" dam, "Bumble Bee."

Jacob Dove, Hambrook House: the *Reserve Number*, to "Three Princesses," 7 months, 2 weeks, 2 days-old; bred by himself; sire, "Mouse;" dam, "Queen by Sam."

Small White Breed—Breeding Sows.

The Earl of Ellesmere: First Prize, 10*l.*, for his 1 year, 10 months-old, in-pig; bred by himself; sire, "Charlie;" dam by "King."

Richard Elmhirst Duckering, Northorpe, Kirton-in-Lindsey: Second Prize, 5*l.*, for his 1 year, 11 months, 2 weeks, 1 day-old, in-pig; bred by himself.

Clement R. N. Beswicke-Royds, Pyke House: the *Reserve Number*, to "Venus," 2 years, 9 months, 3 weeks-old, in-pig; bred by Mr. Peter Eden, Cross Lane, Salford, Manchester.

Small Black Breed—Boars above Six and not exceeding Twelve Months-old.

George Mumford Sexton, Wherstead Hall, Ipswich: First Prize, 10*l.*, for "The Shah," 10 months, 1 week-old; bred by himself; sire, "Adventurer;" dam, by "Blair Athol."

George Mumford Sexton: Second Prize, 5*l.*, for "The Ashantee," 10 months, 4 days-old; bred by himself; sire, "Gladiateur;" dam by "Adventurer."

Small Black Breed—Boars above Twelve Months-old.

Clement R. N. Beswicke-Royds: First Prize, 10*l.*, for "Indian Chief," 1 year, 4 months-old; bred by Mr. G. M. Sexton, Wherstead Hall, Ipswich.

George Turner, jun., of Thorpelands, Northampton: Second Prize, 5*l.*, for his 1 year, 2 months, 2 weeks, 1 day-old; bred by himself.

Small Black Breed—Pens of Three Breeding Sow Pigs.

Clement R. N. Beswicke-Royds, Pyke House: First Prize, 10*l.*, for his 7 months, 1 week, 1 day-old; bred by Mr. G. M. Sexton, Wherstead Hall.

George Mumford Sexton, Wherstead Hall: Second Prize, 5*l.*, for "Truth in Breeding," 7 months, 3 weeks-old; bred by himself; sire, "Adventurer;" dam, "Sister to Achievement," by "Stockwell."

Small Black Breed—Breeding Sows.

John Wheeler, Long Compton: First Prize, 10*l.*, for "Miss Chester," 1 year, 9 months, 1 week-old; bred by himself.

George Mumford Sexton, Wherstead Hall: Second Prize, 5*l.*, for "Apology," nearly 2 years old, in-pig; bred by himself; sire, "Adventurer;" dam, "Sister to Achievement," by "Stockwell."

George Mumford Sexton: the *Reserve Number*, to "Coomassie," about 3 years old, in-pig; bred by himself; sire, "Blair Athol;" dam, "Breeze," by "Battersea Prince."

Berkshire Breed—Boars above Six and not exceeding Twelve Months-old.

Arthur Stewart, Saint Bridge Farm, Gloucester: First Prize, 10*l.*, for "Prince," 11 months, 6 days-old; bred by himself; sire, "Blacksmith;" dam, "Princess 1st," by "Tim Whiffler."

Russell Swanwick, R. A. College Farm, Cirencester; Second Prize, 5*l.*, for "Young Liverpool," 9 months, 3 weeks, 2 days-old; bred by himself; sire, "Stumpy 2nd;" dam, "Topsy 4th," by "B. A."

Berkshire Breed—Boars above Twelve Months-old.

William Hewer, Sevenhampton, Highworth, Wilts: First Prize, 10*l.*, for "Hector," 1 year, 11 months, 1 week, 4 days-old; bred by himself; sire, "Wallace;" dam, "Handsome," by "Exchange."

William Hewer, Sevenhampton: Second Prize, 5*l.*, for "Cardiff Hero," 2 years, 11 months, 5 days-old; bred by himself; sire, "Exchange;" dam, "Hope," by "Sennington Lad 5th."

Heber Humfrey, Kingstone Farm, Shrivenham, the *Reserve Number*, to "Sir D. C.," 3 years, 2 weeks, 3 days-old; bred by himself; sire, "Leamington;" dam, "Idstonia," by "Rainbow."

Berkshire Breed—Pens of Three Breeding Sow Pigs.

Russell Swanwick, R. A. College Farm, Cirencester: First Prize, 10*l.*, for his 8 months-old; bred by himself; sire, "Sambo;" dam, "Sally IX.," by "Othello."

John Looker, Hemingford Abbots, St. Ives, Hunts: Second Prize, 5*l.*, for his 7 months, 3 weeks, 5 days-old; bred by himself; sire, "No. 413;" dam by Sevenhampton."

Heber Humfrey, Kingstone Farm: the *Reserve Number*, to "Nos. 454 A B C," 7 months, 2 weeks, 3 days-old; bred by himself; sire, "Tannerson;" dam, "Rugby," by "Leamington."

Berkshire Breed—Breeding Sows.

Matthew Walker, Stockley Park, Anslow, Burton-on-Trent: First Prize, 10*l.*, for "Gipsy," 3 years, 6 months, 1 week, 5 days-old; bred by himself; sire, "Solicitor-General;" dam, "Lilac Bloom," by "King Pippin."

Arthur Stewart, Saint Bridge Farm, Gloucester: Second Prize, 5*l.*, for "Helen," 1 year, 2 weeks, 2 days-old, in-pig; bred by himself; sire, "Blacksmith 5th;" dam, "Sniper 1st.

Russell Swanwick, R. A. College Farm: the *Reserve Number*, to "Sally VII.," 1 year, 2 months, 4 weeks-old; bred by himself; sire, "Othello;" dam, "Lady Liverpool," by "B. A."

Other Breeds—Boars above Six and not exceeding Twelve Months-old.

The Earl of Ellesmere, Worsley Hall, Manchester: First Prize, 10*l.*, for his 11 months, 3 weeks-old; bred by himself; sire, "Uncle Tom;" dam, by "Prince."

Peter Eden, Cross Lane, Salford: Second Prize, 5*l.*, for "Fire King," 9 months-old; bred by himself; sire, "King;" dam, "Fire Queen," by "Peacock."

Richard Elmhirst Duckering, Northorpe, Kirton-in-Lindsey: the *Reserve Number*, to his improved Lincolnshire, 10 months, 3 weeks, 5 days-old; bred by himself.

Other Breeds—Boars above Twelve Months-old.

The Earl of Ellesmere: First Prize, 10*l.*, for "Pride of Idle," 2 years, 10 months, 2 weeks, 4 days-old; bred by Mr. J. Bullock, Idle, Leeds; sire, "Bolivar;" dam, by "Shadow."

The Earl of Ellesmere: Second Prize, 5*l.*, for "Pretender," 2 years, 11 months, 3 days-old; bred by Mr. J. Mitchell, Hipperholme, Halifax; sire, "Pretender."

Richard Elmhirst Duckering, Northorpe: the *Reserve Number*, to his improved Lincolnshire, 2 years, 1 month, 3 weeks-old; bred by himself.

Other Breeds—Pens of Three Breeding Sow Pigs.

PETER EDEN, Cross Lane, Salford: FIRST PRIZE, 10*l.*, for his 7 months, 2 weeks, 3 days-old; bred by himself; sire, "Kingcraft;" dam, "Young Flo," by "Priam."

THE EARL OF ELLESMERE: SECOND PRIZE, 5*l.*, for his 7 months, 3 weeks, 4 days-old; bred by himself; sire, "Brother to Peacock;" dam by "Pretender."

JACOB DOVE, Hambrook House: the *Reserve Number*, to his improved Yorkshire, 7 months, 1 week, 4 days-old; bred by himself; sire, "Mouse;" dam, "White Diamond," by "Sailor."

Other Breeds—Breeding Sows.

RICHARD ELMHIRST DUCKERING, Northorpe, Kirton-in-Lindsey: FIRST PRIZE, 10*l.*, for his improved Lincolnshire, 2 years, 2 months, 1 week-old, in-pig; bred by himself.

THE EARL OF ELLESMERE: SECOND PRIZE, 5*l.*, for his 1 year, 8 months, 2 weeks-old, in-pig; bred by himself; sire, "Jerry;" dam by "King's Head."

PETER EDEN, Cross Lane, Salford: the *Reserve Number*, to "Cerito," 2 years, 8 months-old, in-pig; bred by himself; sire, "King Lear 3rd;" dam, "Sister to Effie Dean," by "King Lear 2nd."

BEDFORDSHIRE PRIZE FARMS.

For the Best Managed Farm in the County.

RICHARD CHECKLEY, Brogborough, Woburn: FIRST PRIZE of 50*l.* and a Silver Cup of like value; given by Lord Charles J. F. Russell.

THOMAS CROUCH, Boughton End Farm, Lidlington, Ampthill: the SECOND PRIZE of 50*l.*; given by the Society.

CHARLES HOWARD, the Priory, Biddenham: SPECIAL PRIZE, the Society's Gold Medal.

Highly Commended.

The Farms in the occupation of—

ZACHARIAH PHILLIPS, Birchmoor.
GEORGE STREET, Moulden.
JOHN LILLEY, Knotting Green.
ULYSSES PAINE, Goldington.

Commended.

JAMES HENMAN, Stagsden.
WILLIAM LEABERRY, Stagsden.
JAMES LESTER, Kempston and Broughton.

IMPLEMENTS.

General Purpose Drills.

James Coultas, Spittlegate, Grantham: First Prize, 10*l.*
Thomas Harrison, Burton Road, Lincoln: Second Prize, 5*l.*

Corn Drills.

James Coultas: First Prize, 15*l.*
Holmes and Sons, Norwich: Second Prize, 10*l.*
William Walker and Son, Tithby, Bingham, Notts: Commended.
A. W. Gower and Son, Hook, Winchfield, Hants: Commended.

The best Adaptation of Corn Drills for Hill-side Delivery.

C. Dening and Co., Chard, Somerset: the Prize of 10*l.*

Corn Drills for Small Occupations.

William Walker and Son, Tithby, Bingham: First Prize, 10*l.*
A. W. Gower and Son, Hook, Winchfield: Second Prize, 5*l.*
William Coleman, St. John Street, Northampton: Highly Commended.
William Gilbert, Shippon, Abingdon: Highly Commended.
James Coultas, Spittlegate, Grantham: Highly Commended.

Drills for Turnips and other Roots on the Flat.

James Coultas: First Prize, 10*l.*
R. and J. Reeves and Son, Bratton, Westbury, Wilts: Second Prize, 5*l.*

Drills for Turnips and other Roots on the Ridge.

James Coultas: First Prize, 10*l.*
R. and J. Reeves and Son: Second Prize, 5*l.*
William S. Underhill, Newport, Salop: Commended.

Drills, without Manure Box, for Turnips and other Roots on the Ridge.

John D. Snowden, Doncaster: First Prize, 10*l.*
G. W. Murray and Co., Banff, N.B.: Second Prize, 5*l.*
Corbett and Peele, Shrewsbury: Commended.

Water Drills.

R. and J. Reeves and Son: First Prize, 10*l.*
James Coultas: Second Prize, 5*l.*

Drills for Small Seeds.

James Coultas: First Prize, 10*l.*
W. Walker and Sons, Tithby, Bingham: Second Prize, 5*l.*

Barrows for Sowing Small Seeds.

Corbett and Peele: the Prize of 5*l.*
A. W. Gower and Son, Market Drayton, Salop: Highly Commended.

Drill Pressers.

A. W. Gower and Son, Market Drayton: the Prize of 5*l.*

Potato Drills.

James Coultas: First Prize, 10*l.*

Horse Hoes for General Purposes.

Smith and Grace, Thrapston, Northamptonshire: First Prize, 10*l.*
Fordham Mote, Wisbeach Road, March: Second Prize, 5*l.*
Vipan and Headly, Leicester: Highly Commended.
G. Læwis and Son, Kettering: Commended.

Horse Hoes combined with Drill, for Small Seeds.

Corbett and Peele: the Prize of 5*l.*
William Smith, Kettering: Commended.

Single-row Horse Hoes for Ridge and Flat.

Corbett and Peele: First Prize, 10*l.*
Vipan and Headly: Second Prize, 5*l.*
Carson and Toone, Warminster: Highly Commended.
Corbett and Peele: Highly Commended.
William Ashton, Horncastle: Commended.
James Gillett, Dallington Road, Northampton: Commended.
J. D. Snowden, Doncaster: Commended.

Single-row Grubbers.

Mellard's Trent Foundry, Rugeley: the Prize of 5*l.*
Corbett and Peele: Highly Commended.

Horse-Hoes for Thinning Turnips.

William Smith, Kettering: First Prize, 15*l.*
William Smith: Second Prize, 10*l.*

William Smith : Highly Commended :
Holmes and Son, Norwich : Commended.

Distributors for Liquid Manure.

R. and J. Reeves and Son : the Prize of 10*l.*
James Coultas : Highly Commended.

Distributors for Dry Manure.

Thomas Chambers, Colkirk Hall, Fakenham : the Prize of 5*l.*
James Coultas : Highly Commended.
R. and J. Reeves and Son : Commended.

Pair-Horse Waggons.

Thomas Milford and Son, Thorverton, Cullompton : First Prize, 15*l.*
William Ball and Son, Rothwell, Kettering : Second Prize, 10*l.*
William Glover and Sons, Warwick : Highly Commended.
Frank P. Milford, Haldon Works, Kenn, Exeter : Commended.

Light Waggons on Springs.

Henry Hayes and Son, Stamford : First Prize, 15*l.*, for their Pair-horse Waggon.

William Ball and Son : Second Prize, 5*l.*, for their Pair-horse Waggon.

Other Waggons.

William Ball and Son : the Prize of 10*l.*, for their Three or Four-horse Waggon.

T. Milford and Son : Highly Commended for their Three or Four-horse Waggon.

George Ball, North Kilworth, Rugby : Highly Commended for his Three or Four-horse Waggon.

Frank P. Milford : Commended.

Single-horse Carts for General Agricultural Purposes.

William Ball and Son : First Prize, 10*l.*
Frank P. Milford : Second Prize, 5*l.*
T. Milford and Son : Highly Commended.
George Ball : Highly Commended.
Henry Hayes and Son : Highly Commended.

Harvest Carts.

Henry Hayes and Son : the Prize of 10*l.*
Frank P. Milford : Highly Commended.

Market Carts on Springs.

Henry Hayes and Son : the Prize of 10*l.*

Corbett and Peele : Commended.

Carts for the Conveyance of Water with Pump attached.

R. and J. Reeves and Son : First Prize, 10*l.*

William Affleck, Swindon : Second Prize, 5*l.*

John Fowler and Co., Leeds : Highly Commended.

William Affleck : Highly Commended for his Water Cart for carting water to farm stock.

Other Carts.

Frank P. Milford : the Prize of 10*l.*, for his Harvest Cart and for General Farm Purposes.

George Ball : Highly Commended, for his strong One or Two-horse Cart.

Henry Hayes and Son : Commended for their Two-horse Cart.

Stock and Implement Carts.

Corbett and Peele : the Prize of 10*l.*, for their Low-bodied Cart on Springs.

Lorries or other Vehicles for the Conveyance of Implements.

Frank P. Milford : the Prize of 10*l.*, for his Improved Lorrie.

Carts with Crank Axle and Low Body.

W. Ball and Son : the Prize of 10*l.*

Shepherds' Huts on Wheels.

John P. Fison, Teversham, Cambridge : First Prize of 10*l.*

Henry Inman, Stretford, Manchester : Second Prize, 5*l.*

Vans with Fittings for Men engaged in Steam Cultivation.

John Fowler and Co., Leeds : First Prize, 15*l.*

Aveling and Porter, Rochester : Second Prize, 10*l.*

Michael Faulks, Colston Bassett, Bingham, Notts : Highly Commended for Ventilation and Sleeping Accommodation.

MISCELLANEOUS AWARDS.

Miscellaneous Awards to Agricultural Articles not included in the Ordinary Rotation.

Silver Medals.

Reading Iron Works (Limited), Reading: for their 4-Horse Power Patent "Nozzle" Vertical Boiler.

John Fowler and Co., Leeds: for their Patent 4-Wheel Windlass for Steam Cultivation (Round-about System).

W. N. Nicholson and Son, Newark-on-Trent: for their Adaptation of Self-acting Delivery to Horse Rake.

Barford and Perkins, Peterborough: for their 10-Horse Power Agricultural Locomotive Engine, the driving wheels being utilised as Winding Drums.

G. Lewis and Son, Kettering: for their New Patent Machine for Elevating, Shooting, Loading, and Unloading Sacks of Corn and other articles.

Fairbanks and Co., King William Street, London: for their 3-ton Weigh-bridge for Carts and Waggons.

W. R. Dell and Son, Mark Lane, London: for their Duplex Grain Sorter, for separating round seeds from wheat.

Ransomes, Sims, and Head, Ipswich: for their Patent Straw-burning Apparatus attached to a 10-Horse Power Portable Steam-Engine.

Clayton and Shuttleworth, Lincoln: for their Variable Expansion Motion, acted on by the Governor attached to a 7-Horse Power Portable Steam Engine.

Davey, Paxman, and Co., Colchester: for their Patent "Paxman" Water Heater, B. No. 1.

AGRICULTURAL EDUCATION.

Examination Papers, 1874.

EXAMINATION IN AGRICULTURE.

Maximum Number of Marks, 200. Pass Number, 100.

Thursday, April 16*th, from* 10 *a.m. till* 1 *p.m.*

1. Describe a Homestead—namely, buildings, yards, or courts, with their general arrangement, dimensions, and internal fittings and furniture, suitable for 400 acres arable of medium soil in the Midland district of England; the cropping consisting of one-fifth roots, one-fifth artificial grasses, and the remainder corn; sixty cattle of all ages to be wintered; ten cows to calve in the spring, the calves to be brought up by hand, and twenty bullocks to be fattened in boxes.

2. Describe the order of horse and manual operations throughout one year in the field cultivation of a farm consisting of 400 acres arable, cropped as above, and of 200 acres of old pasture, one-fifth mown for hay; a breeding flock kept, and half the lambs or tegs wintered.

3. Write an inventory of the field implements, carriages, and barn and feeding-house machinery on such a farm, supposing no steam-cultivation to be adopted, and the land of such a character that a pair of horses can plough an acre per day six inches deep.

4. What are about the ordinary prices for a general-purpose one-horse cart, a set of harness for a shaft-horse, a corn-dressing machine, and an eight-horse-power portable steam-engine, all purchased of the best makers?

5. Give full directions for setting down and working a set of "round-about" or stationary-engine tackle, with self-moving anchors, in smashing up a stubble on heavy clay soil.

6. State at what age a heifer should drop her first calf, and describe the signs of approaching calving, the position of the fœtus in ordinary presentations, the attention or assistance requisite from the herdman, the best treatment for a calf brought up away from the mother, the details of feeding and management, changes in the food, and other matters connected with the rearing of calves till they are nine months old.

7. Give particulars of the feeding and management, breeding, rearing, and breaking-in of farm horses.

8. State common prices for piece-work, including wheat hoeing, turnip hoeing, and singling, topping and filling mangolds into carts, mowing meadow-hay, mowing and lying wheat, and filling muck-cart, with the district to which the statements apply.

9. What are suitable depths and distances for parallel pipe-tile drains in a heavy clay soil without gravel, sand-beds, or springs; and in a porous sandy subsoil respectively? What are the reasons for drainage with or against the greatest fall, supposing the surface to be on a uniform slope, and not laid up in high-backed lands or ridges? Describe the successive operations in setting out the work, excavating, levelling, laying the pipes, &c.; and give an estimate of the ordinary cost of pipes, haulage, and manual labour, at the depths and distances, and in the kind of soil supposed, taking wages of drainers at 4*s.* per day.

Afternoon vivâ voce *examination commencing at* 2 *o'clock.*

EXAMINATION IN CHEMISTRY.

Maximum Number of Marks, 200. Pass Number, 100.

I. General Chemistry.

Wednesday, April 15*th, from* 10 *a.m. till* 1 *p.m.*

1. Describe three different ways in which water is decomposed, and show what becomes of the components in each case.

2. Give an account of the preparation and properties of nitrogen, chlorine, and potassium.

3. Describe the preparation of hydro-chloric acid, and explain the chemistry of it. Show how to find the proportion of acid in any sample of solution of that acid.

4. Explain the reactions of caustic soda with (1) sulphuretted hydrogen, (2) ferric chloride, (3) stearine. What quantity of caustic soda will be required to precipitate all the iron from a solution containing 130 grains of ferric chloride? (Na : Fe : Cl = 23 : 56 : 35·5.)

5. Give the composition of the oxides of carbon and of marsh gas. Mention the circumstances under which they are naturally formed. Given a mixture of the oxides of carbon, how can you find out the proportion in which they are mixed?

6. A bladder is filled with a solution of alum mixed with ammonia, is tied up, and immersed in a tub of water: state the results which ensue, and point out the general principle on which they depend.

7. Explain the formation of acetic acid from beer, and the circumstances which are most favourable to the process. By what other means may the like acid be procured? Why does bottling beer, which has begun to turn sour, stop the acetification?

8. Show how you detect (1) the phosphate in a mixture of calcium phosphate and carbonate, (2) ammonia in rain water, (3) lead in tin alloyed with lead.

9. What is carbolic acid? How is it obtained? Describe its most distinctive chemical characters, and explain how it is related to benzol, and how to test its genuineness.

10. Explain how to find (1) whether an organic substance contains nitrogen, (2) how much it contains?

II. Agricultural Chemistry.

Wednesday, April 15th, from 2 p.m. till 5 p.m.

1. Give an account of the properties and composition of the various constituents of milk.

2. What is the composition of blood, and what is its value as a manure?

3. What is the composition of raw and boiled bones? How do you detect the adulteration of gypsum, crushed limestone, vegetable ivory, and of sand in bone-dust?

4. If commercial nitrate of soda containing 95 per cent. of pure nitrate cost 14*l.* a ton, and commercial sulphate of ammonia containing 24 per cent. of pure sulphate 18*l.* a ton, it is cheaper to use nitrate of soda or sulphate of ammonia as a source of nitrogenous plant food. How much nitrogen is contained in 100 lbs. of sulphate of ammonia, and in 100 lbs. of nitrate of soda?

5. In what states of combination does potash occur in soils? In what form is it best applied to the land? How may it be distinguished from soda, and the quantity of it in a mixture of chloride of potassium and sodium be determined?

6. Mention some practical points on which you may obtain definite information from soil-analyses.

7. Describe briefly the characters of clay marls, chalk marls, peaty and sandy marls. How do you proceed in analysing a marl with a view of ascertaining its agricultural value?

8. Write a short paper on the changes which take place in the field and stack in hay-making.

9. Explain the fallacies involved in the so called Humus theory, and at the same time point out in what way vegetable mould may contribute to the fertility of the soil.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

Maximum Number of Marks, 200. Pass Number, 100.

Tuesday, April 14*th, from* 10 *a.m. till* 1 *p.m.*

1. Give the rule for finding the centre of gravity of two heavy points. Draw on your paper a square ABCD, and let the diagonals AC, BD intersect in E; masses of 2 lbs. and 3 lbs. are placed at A and B respectively: show where a mass of 10 lbs. must be placed that the centre of gravity of the three masses may be at E.

2. What is meant by the accelerative effect of a force? The units of distance and time being feet and seconds, it is found that the accelerative effect of a certain force on a body is represented by the number 15; what is indicated by this number?

3. A lever is supported in a horizontal position on two points, one under each end, 10 feet apart; a weight of 30 lbs. is hung from it, at a distance of 3 ft. from one point; find the pressure on each point.

4. Explain what is meant by the sensibility of a balance. Other things being the same the sensibility is greater as the arms are longer. Why is this?

5. A mass weighing 500 lbs. moves at the rate of 50 ft. a second; what number of units of work is it capable of doing against a resistance, by whose action it is brought to rest?

6. Explain how the specific gravity of a liquid can be determined by a common hydrometer. A mark [P] is put on the stem of a hydrometer showing its immersion in a liquid whose specific gravity is 1.; a second mark [Q] is put on the stem, showing its immersion in a liquid whose specific gravity is 0·8; the stem is of uniform thickness, and Q is 4 in. above P. The hydrometer is now placed in a third liquid and is found to sink to a point R, which is 2 in. above P; what is the specific gravity of the third liquid?

7. Find the force which must act along the piston rod to work a common suction pump. Diameter of piston is 6 in., distance between spout and water in well 20 ft.; what is the required force?

8. If a dish of sulphuric acid and a small vessel of water are put under a receiver and the air exhausted, it is found that in a short time the water is converted into ice; explain the action which takes place, and the part played by the sulphuric acid.

9. Show by a pen sketch the arrangement of the governor and throttle-valve of a steam-engine; explain the action of the instrument, and state why the balls should be of considerable weight.

EXAMINATION IN MENSURATION AND SURVEYING.

Maximum Number of Marks, 100. Pass Number, 50.

Tuesday, April 14th, from 2 p.m. till 5 p.m.

1. If 4,500 bricks are required for a rod of brickwork; how many bricks will be required to build a wall 300 feet long, the two lowest courses being 2 bricks thick, the next two $1\frac{1}{2}$ brick thick, the next 24 courses 1 brick thick? (Four courses go to a foot.)

2. The external and internal radii of the rim of a flywheel are 10 ft. and 9 ft. respectively; its thickness is 6 in.; What is its weight? (Specific gravity 7·2.)

3. A quadrilateral (ABCD) has its four sides in order (AB) 500, (BC) 300, (CD) 400, (DA) 600 ft. long respectively; what is the greatest area it can contain? If the diagonal AC is 600 ft. long, what is then its area?

4. In drawing the plan of an estate you wish to represent every 200 acres, on not more than a square foot of paper, what is the largest scale you should use?

5. Describe briefly the vernier, and explain its use in the measurement of small distances.

6. Two walls of a garden are at right angles to each other; when the sun is due south the shadow of that which inclines towards the west is 3ft. wide; the shadow of that which inclines towards the east is 5ft. wide; find the exact bearing of the walls to the east and west of north. (It is assumed that both the shadows fall within the right angle made by the walls, that the ground is horizontal, and the walls of the same height.)

7. Two sides of a triangle are 7549 and 8536 ft. long; they contain an angle of 135° 19′; calculate the length of the third side and the area of the triangle.

8. AB are two points 573 ft. apart; PQ two other points on the same side of AB; it is found that the angle PAB contains 113° 10′; QAB 23° 10′; PBA 57° 30′; QBA 145° 42′; determine PQ (1) by a construction made with scale and protractor, (2) by calculation.

9. Plot the Section given by the following entry of levels:—

Back Sights.	Fore Sights.	Distances.
2′ 6″	4′ 8″	2·00 Chains
1′ 4″	5′ 9″	4·00 "
0′ 8″	8′ 3″	5·00 "
3′ 4″	5′ 7″	7·00 "
8′ 6″	2′ 6″	8·00 "
5′ 6″	3′ 4″	10.00 "

(Distances are reckoned from the first position of the levelling staff.)

EXAMINATION IN BOOK-KEEPING.

Maximum Number of Marks, 200. Pass Number, 100.

Friday, April 17th, from 10 *a.m. till* 1 *p.m.*

Journalise and post into a ledger the following transactions, and draw out a Trial Balance, Profit and Loss Account, and Balance Sheet:—

On the 1st of January, 1874, A. Wylam set up in business as an Oil and Tallow Merchant; his father, J. Wylam, advancing to him for that purpose 1500*l.* in cash, and an acceptance of J. Brown's for 500*l.*

His transactions during the month of January were as follows:—

	£	*s.*	*d.*
Bought of M. Story: Petroleum, value	545	0	0
Paid M. Story:—			
In Cash	17	15	0
J. Brown's acceptance	500	0	0
Discount allowed by Story	27	5	0
Bought of J. Arnold: Essential Oils	654	0	0
Accepted J. Arnold's draft at three months' date	654	0	0
Bought of A. Rayner: Tallow	318	0	0
Paid A. Rayner:—			
In Cash	286	12	0
Discount allowed by A. Rayner	31	8	0
Sold to A. Cory: Petroleum	35	0	0
Sold to G. Cowan: Petroleum:	42	10	0
Received of G. Cowan:—			
In Cash	12	10	0
His acceptance at three months' date	30	0	0
Sold to B. Fowler: Tallow	163	18	0
Sold to P. Michael: Essential Oils	181	13	0
Received of B. Fowler:—Cash	163	18	0
Bought of P. Clowes: Essential Oils	84	15	0
Sold to J. Sim: Petroleum	143	15	3
Bought of J. Arnold: Tallow	654	0	0
Consigned to J. Hannay & Co., of Melbourne: Essential Oils, invoiced at 250*l.*, but which cost, together with shipping and other charges	187	10	0
Sold for Ready-money during the month:—			
Tallow	154	16	2
Petroleum	65	14	3
Essential Oils	23	8	1
A. Wylam drew out Cash for private expenses	35	0	0
Paid Clerk's Salary	12	10	0
„ Warehousemen's Wages	12	10	0
„ Petty Expenses	10	0	0
„ Interest to J. Wylam	8	6	8

Stock was taken at the end of the month, and was found to amount to 1,400*l.* 17*s.* 2*d.*, thus:—

	£	s.	d.
Stock of Petroleum	189	2	7
„ Tallow	779	16	2
„ Essential Oils	431	18	5

EXAMINATION IN GEOLOGY.

Maximum Number of Marks, 100. Pass Number, 50.

Friday, April 17*th, from* 2 *p.m. till* 5 *p.m.*

1. Give the general geographical position in England of the three great divisions of stratified rocks.

2. State the characters by which the Aqueous and Iqueous-formed rocks are distinguished from each other.

3. Mention the sub-divisions of the Cretaceous rocks; state their mineral characters, and the agricultural features of the districts situated upon them.

4. Name the chief mineral substances used as fertilizers, and state the geological position of the rocks from which they are obtained in England.

5. State what you know of the geological age, physical features, and agricultural characters of the Wealden formation.

6. Name the different kinds of granite, and give the general characters of their constituent minerals.

7. Mention the agencies by which granite and limestone are disintegrated. State the results.

☞ 8. Give the geological position of the Old red sandstone and the New red sandstone, and state the mineral and palæontological characters by which they are distinguished.

9. What is the boulder clay? Describe its extent and origin. How does it differ from the clays of earlier geological age?

10. Give the geological position of the different kinds of soil fuel in Britain.

11. Name some fossils by which you distinguish the strata older than the Carboniferous period.

12. Name the rocks and fossils on the table.

EXAMINATION IN BOTANY.

[It is expected that Eight Questions at least will be answered.]

Maximum Number of Marks, 100. Pass Number, 50.

Saturday, April 20th, from 10 *a.m. till* 1 *p.m.*

1. What are the different functions of the root?

2. Define and give examples of the different kinds of underground stems.

3. Define the structure and functions of stomata.

4. What plants are without epidermis, and why?

5. State the chemical composition of cellulose, and explain where and how the elements composing it are obtained.

6. When and how is the ovule of a phanerogam fertilised?

7. State what is known of the potato-fungus.

8. How would you treat a field of clover attacked by dodder, so as to prevent its spreading and to exterminate the parasite; and give the reasons for your treatment.

9. What are the fundamental differences between the Natural system of Jussieu and the Artificial system of Linnæus?

10. Give the leading characteristics of one of the following Natural Orders:—*Cruciferæ*, *Leguminosæ*, *Rosaceæ*, or *Gramineæ*.

11. What plants of the Order *Cruciferæ* are cultivated in Britain?

12. Describe in a systematic method the plants marked A, B, and C.

EXAMINATION IN ANATOMY AND ANIMAL PHYSIOLOGY.

Maximum Number of Marks, 100. Pass Number, 50.

Saturday, April 18th, from 2 *p.m. till* 5 *p.m.*

1. Describe in general terms the physiology of digestion and assimilation of the food. Name the chief fluids employed in the processes, and their special action upon the several constituents of vegetable alimentary substances; also the means by which nutritive matter is carried into and appropriated by the system.

2. Name the region of the abdomen in which the liver is situated. State the chief differences which exist in the arrangement of the bile ducts in the horse and ox, and describe the particular source of its secretion as compared with other glands.

MEMORANDA.

ADDRESS OF LETTERS.—The Society's office being situated in the postal district designated by the letter W, members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

GENERAL MEETING in London, December, 1874.

GENERAL MEETING in London, May 22, 1875, at 12 o'clock.

MEETING at Taunton, July, 1875.

MONTHLY COUNCIL (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

OFFICE HOURS.—10 to 4. On Saturdays, from the Council Meeting in August until the Council Meeting in April, 10 to 2.

DISEASES of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society, and of sending animals to the Royal Veterinary College on the same terms as if they were subscribers to the College.—(A statement of these privileges will be found in this Appendix.)

CHEMICAL ANALYSIS.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in this Appendix.

BOTANICAL PRIVILEGES.—The Botanical Privileges enjoyed by Members of the Society will be found stated in this Appendix.

SUBSCRIPTIONS.—1. Annual.—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June. 2. For Life.—Governors may compound for their subscription for future years by paying at once the sum of £50, and Members by paying £10. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose subscriptions are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member.

PAYMENTS.—Subscriptions may be paid to the Secretary, in the most direct and satisfactory manner, either at the Office of the Society, No. 12, Hanover Square, London, W., or by means of post-office orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable to him at the Vere Street Office, London, W.; but any cheque on a banker's or any other house of business in London will be equally available, if made payable on demand. In obtaining post-office orders care should be taken to give the postmaster the correct initials and surname of the Secretary of the Society (H. M. Jenkins), otherwise the payment will be refused to him at the post-office on which such order has been obtained; and when remitting the money-orders it should be stated by whom, and on whose account, they are sent. Cheques should be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and should be drawn on a London (not on a local country) banker. When payment is made to the London and Westminster Bank, St. James's Square Branch, as the bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the banker's book may be at once identified, and the amount posted to the credit of the proper party. No coin can be remitted by post, unless the letter be registered.

NEW MEMBERS.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary. Forms of Proposal may be obtained on application to the Secretary.

*** Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of the General Objects, &c., of the Society, of Chemical, Botanical, and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Members' Veterinary Privileges.

I.—Serious or Extensive Diseases.

No. 1. Any Member of the Society who may desire professional attendance and special advice in cases of serious or extensive disease among his cattle, sheep, or pigs, and will address a letter to the Secretary, will, by return of post, receive a reply stating whether it be considered necessary that Professor Simonds, the Society's Veterinary Inspector, should visit the place where the disease prevails.

No. 2. The remuneration of the Inspector will be 2*l.* 2*s.* each day as a professional fee, and 1*l.* 1*s.* each day for personal expenses; and he will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. The fees will be paid by the Society, but the travelling expenses will be a charge against the applicant. This charge may, however, be reduced or remitted altogether at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

No. 3. The Inspector, on his return from visiting the diseased stock, will report to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

No. 4. When contingencies arise to prevent a personal discharge of the duties confided to the Inspector, he may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—Ordinary or Other Cases of Disease.

Members may obtain the attendance of the Veterinary Inspector on any case of disease by paying the cost of his visit, which will be at the following rate, viz., 2*l.* 2*s.* per diem, and travelling expenses.

III.—Consultations without Visit.

Personal consultation with Veterinary Inspector	5*s.*
Consultation by letter	5*s.*
Consultation necessitating the writing of three or more letters	10*s.*
Post-mortem examination, and report thereon	10*s.*

A return of the number of applications during each half-year being required from the Veterinary Inspector.

IV.—Admission of Diseased Animals to the Veterinary College Investigations; Lectures, and Reports.

No. 1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the same terms as if they were Members of the College; viz., by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs "a small proportionate charge to be fixed by the Principal according to circumstances."

No. 2. The College has also undertaken to investigate such particular classes of disease, or special subjects connected with the application of the Veterinary art to cattle, sheep, and pigs, as may be directed by the Council.

No. 3. In addition to the increased number of lectures now given by Professor Simonds—the Lecturer on Cattle Pathology—to the pupils in the Royal Veterinary College, he will also deliver such lectures before the Members of the Society, at their house in Hanover Square, as the Council shall decide.

No. 4. The Royal Veterinary College will from time to time furnish to the Council a detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary.

By Order of the Council,

H. M. JENKINS, *Secretary.*

Members' Privileges of Chemical Analysis.

The Council have fixed the following rates of Charge for Analyses to be made by the Consulting Chemist for the *bonâ fide* use of Members of the Society; who (to avoid all unnecessary correspondence) are particularly requested, when applying to him, to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens, must be paid to him by members at the time of their application.

No. 1.—An opinion of the genuineness of Peruvian guano, bone-dust, or oil-cake (each sample)	5*s.*
„ 2.—An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts, and ammonia	10*s.*
„ 3.—An estimate of the value (relatively to the average of samples in the market) of sulphate and muriate of ammonia, and of the nitrates of potash and soda	10*s.*
„ 4.—An analysis of superphosphate of lime for soluble phosphates only	10*s.*
„ 5.—An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia ..	£1.
„ 6.—An analysis (sufficient for the determination of its agricultural value) of any ordinary artificial manure	£1.
„ 7.—Limestone:—the proportion of lime, 7*s.* 6*d.*; the proportion of magnesia, 10*s.*; the proportion of lime and magnesia	15*s.*
„ 8.—Limestone or marls, including carbonate, phosphate, and sulphate of lime, and magnesia with sand and clay ..	£1.
„ 9.—Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1.
„ 10.—Complete analysis of a soil	£3.
„ 11.—An analysis of oil-cake, or other substance used for feeding purposes; showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre; as well as of starch, gum, and sugar, in the aggregate	£1.
„ 12.—Analyses of any vegetable product	£1.
„ 13.—Analyses of animal products, refuse substances used for manure, &c.	from 10*s.* to 30*s.*
„ 14.—Determination of the "hardness" of a sample of water before and after boiling	10*s.*
„ 15.—Analysis of water of land drainage, and of water used for irrigation	£2.
„ 16.—Determination of nitric acid in a sample of water	£1.

N.B.—*The above Scale of Charges is not applicable to the case of persons commercially engaged in the Manufacture or Sale of any Substance sent for Analysis.*

The Address of the Consulting Chemist of the Society is, Dr. Augustus Voelcker, F.R.S., 11, Salisbury Square, London, E.C., to which he requests that all letters and parcels (postage and carriage paid) should be directed.

By Order of the Council,

H. M. JENKINS, *Secretary.*

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

ARTIFICIAL MANURES.—Take a large handful of the manure from three or four bags, mix the whole on a large sheet of paper, breaking down with the hand any lumps present, and fold up in tinfoil, or in oil silk, about 3 ozs. of the well-mixed sample, and send it to 11, SALISBURY SQUARE, FLEET STREET, E.C., by post: or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a larger boxful, weighing from 10 to 12 ozs., should be sent either by post or railway.

Samples not exceeding 4 ozs. in weight may be sent by post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 ozs., for three postage stamps.

Samples not exceeding 12 ozs., for four postage stamps.

The parcels should be addressed: DR. AUGUSTUS VOELCKER, 11, SALISBURY SQUARE, FLEET STREET, LONDON, E.C., and the address of the sender or the number or mark of the article be stated on parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials. No parcel sent by post must exceed 12 ozs. in weight, 1 foot 6 inches in length, 9 inches in width, and 6 inches in depth.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil from 9 to 12 inches deep; trim this block or plan of the field to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid and send it by goods or parcel to the laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—Two gallons of water are required for analysis. The water, if possible, should be sent in glass-stoppered Winchester half-gallon bottles, which are readily obtained in any chemist and druggist's shop. If Winchester bottles cannot be procured, the water may be sent in perfectly clean new stoneware spirit-jars surrounded by wickerwork. For the determination of the degree of hardness before and after boiling, only one quart wine-bottle full of water is required.

LIMESTONES, MARLS, IRONSTONES, AND OTHER MINERALS.—Whole pieces, weighing from 3 to 4 ozs., should be sent enclosed in small linen bags, or wrapped in paper. Postage *2d.*, if under 4 ozs.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, leaving the ends open, and send parcel by post. The piece should weigh from 10 to 12 ozs. Postage, *4d.* If sent by railway, one quarter or half a cake should be forwarded.

FEEDING MEALS.—About 3 ozs. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

Members' Botanical Privileges.

The Council have provisionally fixed the following Rates of Charge for the examination of Plants and Seeds for the *bonâ fide* use of Members of the Society, who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined Schedule. The charge for examination must be paid to the Consulting Botanist at the time of application, and the carriage of all parcels must be prepaid.

No. 1.—A general opinion as to the genuineness and age of a sample of clover-seed (each sample)	5*s*.
,, 2.—A detailed examination of a sample of dirty or impure clover-seed, with a report on its admixture with seeds of dodder or other weeds (each sample)	10*s*.
,, 3.—A test examination of turnip or other cruciferous seed, with a report on its germinating power, or its adulteration with 000 seed (each sample)	10*s*.
,, 4.—A test examination of any other kind of seed, or corn, with a report on its germinating power (each sample) ..	10*s*.
,, 5.—Determination of the species of any indigenous British plant (not parasitic), with a report on its habits (each species)	5*s*.
,, 6.—Determination of the species of any epiphyte or vegetable parasite, on any farm-crop grown by the Member, with a report on its habits, and suggestions (where possible) as to its extermination or prevention (each species) ..	10*s*.
,, 7.—Report on any other form of plant-disease not caused by insects	10*s*.
,, 8.—Determination of the species of a collection of natural grasses indigenous to any district on one kind of soil (each collection)	10*s*.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. If anything supposed to be injurious or useless exists in the corn or seed, selected samples should also be sent.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tin-foil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

N.B.—*The above Scale of Charges is not applicable in the case of Seedsmen requiring the services of the Consulting Botanist.*

Parcels or letters (Carriage or Postage prepaid) to be addressed to Mr. W. Carruthers, F.R.S., 25, Wellington Street, Islington, London.

H. M. JENKINS, *Secretary.*

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