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THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

SECOND SERIES.

VOLUME THE SIXTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1870.

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.

VON THAER. *Principles of Agriculture.*

LONDON: PRINTED BY WILLIAM CLOWES AND SONS, DUKE STREET, STAMFORD STREET, AND CHARING CROSS.

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SECOND SERIES.

APPENDIX.

DIRECTIONS TO THE BINDER.

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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.

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VITAL STATISTICS:—POPULATION; BIRTHS; DEATHS; EMIGRATION; METEOROLOGY; IMPORTATIONS OF GRAIN; SALES OF BRITISH WHEAT; PRICES OF CORN AND OTHER PRODUCE; AND PAUPERISM, &c.

[*The facts are derived chiefly from the Reports of the* REGISTRAR-GENERAL; *the Meteorological Reports of* MR. GLAISHER; *the Returns of the* BOARD OF TRADE, *and of the* INSPECTOR-GENERAL OF IMPORTS AND EXPORTS.]

POPULATION of the UNITED KINGDOM, estimated to the middle of the year 1869 (exclusive of islands in the British seas):—

Males	14,727,427
Females	15,894,004
Total	30,621,431

	England.	Scotland.	Ireland.
Males	10,546,829	1,511,203	2,669,395
Females	11,322,778	1,694,278	2,876,948
Total ..	21,869,607	3,205,481	5,546,343

ENGLAND AND WALES.

BIRTHS and DEATHS in the LAST SIX MONTHS of 1869.

Summer Quarter (July, August, September).—Births registered were 190,132. The annual birth-rate of the season to 1000 persons living was 34·45; the average derived from ten corresponding summers of 1859—68 was 34·04.

Deaths registered were 114,654. The annual death-rate of the season per 1000 of population was 20·77; the average derived from ten corresponding summers of 1859-68 was 20·63.

The mortality of the quarter experienced by the people inhabiting the chief towns was, at the annual rate, per 1000 of population, of 23·32, the average being 22·90. In districts that comprise small towns, villages, and open country, it was 17·36, the average being 17·79.

The people married during the quarter at the annual rate of 15·88 per 1000 of population, while the average of ten preceding quarters was 16·37. The marriage-rate, therefore, was slightly below the average, but while circumstances of an exceptional character caused a marked decrease in some counties of England, yet, in others, there was a notable increase. The births, after allowing for increase of population, were slightly above the average. The death-rate was a little in excess of the average of the season. Scarlet-fever was widely diffused over the country, and was the chief cause from which the increase of mortality sprang; the skill and energy of the Medical Profession, and more particularly of the Officers of Health, were taxed to the utmost in endeavouring to arrest the ravages of this epidemic.

Potatoes were lower in price than in the summer of 1868; but both beef and mutton were about a halfpenny per lb. dearer than in the summer quarter of 1868.

In the quarter under review emigration proceeded with increased activity. The greatest proportional increase, as regards nationality, was among the English and Scotch emigrating to the United States and to British North America. The number of emigrants who left ports of the United Kingdom for foreign and colonial settlements was 70,734, of whom 30,114 were English, 7873 of Scotch, and 18,855 of Irish origin, while 13,892 were foreigners. In the total number there was an increase, over the summer quarter of 1868, of 18,109.

Autumn Quarter (October, November, December).—Births registered were 190,231. The annual birth-rate of the season per 1000 of population was 34·38; the average of ten autumns (1859-68) was 33·79.

Deaths registered were 128,146. The annual death-rate of the season per 1000 of population was 23·16; the average of ten autumns (1859-68) was 21·90.

The birth-rate was slightly above the average. The high birth-rate maintained in England is partly attributable to the rapid rate of increase among married women at ages above 15 and under 55, viz., 1·6 per cent. per annum, while the female population at all ages increases at the rate of 1·3 per cent. per annum. The death-rate was considerably in excess of the average.

Potatoes were cheaper than they were in the autumn of 1868; but both beef and mutton were dearer.

The number of emigrants who left ports of the United Kingdom in the last quarter of the year was 38,481, of whom 16,762 were of English, 4123 of Scotch, and 10,305 of Irish origin; while 7291 were foreigners. 31,695 were bound for the United States; 1989 for the North American Colonies; 3826 for the Australian Colonies; and 971 for other places. The emigration was greater than it had been in any autumn quarter since 1865.

BIRTHS and DEATHS in 1869 in England.

	Births in 1869.	Annual Birth-rate to 1000 persons living (1869).	Average Birth-rate to 1000 persons living (1859-68).
First Quarter: Jan., Feb., March ..	204,055	37·98	36·85
Second Quarter: April, May, June ..	188,459	34·61	36·65
Third Quarter: July, Aug., Sept. ..	190,132	34·45	34·04
Fourth Quarter: Oct., Nov., Dec. ..	190,231	34·38	33·79
Year	772,857	35·34	35·34

	Deaths in 1869.	Annual Death-rate to 1000 persons living (1869).	Average Death-rate to 1000 persons living (1859-68).
First Quarter: Jan., Feb., March ..	133,437	24·84	25·36
Second Quarter: April, May, June ..	118,849	21·83	22·03
Third Quarter: July, Aug., Sept. ..	114,654	20·77	20·63
Fourth Quarter: Oct., Nov., Dec. ..	128,146	23·16	21·90
Year	495,086	22·64	22·48

The death-roll for the last quarter of the year 1869 shows that the public health was far from being in a satisfactory state. The mortality was much higher than it had been in any of the corresponding quarters that have intervened since 1864. Scarlet-fever spread with destructive force amongst the young; in London alone, in the last 92 days of the year, it destroyed 2710 souls. It has been shown that the countless myriads of motes that are seen to dance in every sunbeam are organic particles, and among them are zymotic bodies which are said to be germs of disease. These bodies are in concentrated force in the rooms occupied by persons suffering from, or who have died of, scarlet-fever; hence the absolute necessity of isolating the sick as much as possible, and of adopting the precautions for the hygienic management of the invalid chamber, which have been drawn up by medical authorities. While all the efforts that medical skill can devise should be employed to mitigate the intensity, and arrest the progress of this highly contagious disease, it should be borne in mind that the prevention of its further extension is often, in the first instance, a mere question of expense. Unwhitewashed ceilings, uncleansed rooms, and unpurified bedding, are fruitful sources of infection; the clothing that has been worn by scarlatina patients should be destroyed, and children who have suffered from the epidemic should be kept away from school until some considerable time has elapsed from the period of their recovery.

Of 11 of the greatest cities and towns in England, Sheffield shows the highest death-rate; the mortality of the quarter was at the annual rate of 30·79 per 1000 living. Manchester followed with a rate of 30·59; Salford, 29·12; Liverpool 28·88; Leeds, 27·86. Birmingham had the lowest mortality, 25·73; Hull, 25·95; Bradford, 26·02. Newcastle-on-Tyne indicates a considerable improvement; its death-rate was 26·36.

THE YEAR 1869.

In the United Kingdom 1,032,177 births and 660,966 deaths were registered in the twelve months, thus making the natural increase 371,211, or, after correction, 1056 daily. The recorded number of emigrants of home origin was 190,782, or 522 daily. The difference between the emigrants and the corrected natural increase was 534 daily.

The birth-rate per 1000 of the year was 35·34, the death-rate 22·74 for the United Kingdom, after a correction for the defective registration of Ireland.

The birth-rate per 1000 of England was 35·34, the death-rate 22·64; the numbers for the previous year (1868) are 36·35 and 22·20.

In the year 1869, 92,667 of the English people, 23,083 of the Scotch, 75,032 of the Irish people, and 67,275 foreigners, left ports of the United Kingdom for foreign and colonial settlements; 5975 persons, whose origin was not distinguished, have been proportionately distributed. Of the total number of British emigrants, 150,371 went to the United States, 20,955 to the North American Colonies, 14,457 to the Australian Colonies, and 4,999 to other places.

METEOROLOGY.

Third Quarter (*July, August, September*).—The remarkably cold period which set in on the 10th of June lasted until the 3rd of July, after which a warm period, with a little rain, prevailed until the end of the month. On 1st August the weather suddenly changed, and for 21 days there was an average daily deficiency in the temperature of 2°·8. This was followed by a week of very warm weather with brilliant sunshine, and on the 28th August the excess of temperature was as much as 12°. From the 29th August to the 3rd September it was cloudy, bleak, and cold; but on the 4th the temperature again rose above the average, and continued generally warm until the end of the quarter, with frequent heavy gales and storms. The mean excess of temperature for the 92 days averaged 1°·9 daily.

In July the mean reading of the barometer was remarkably high, being 29·928 in. Only two instances in the preceding 20 years are recorded when such high readings in July were observed, viz. in 1859 and 1863, on which occasions 29·937 in. and 29·961 in. were registered. In August the mean reading was still higher, being 29·968 in.; only one reading approximated to it during the preceding 20 years, viz. in 1864, when it was 29·918 in. In September the reading was very low, viz. 29·642 in., and during the preceding 20 years the only instances when the mean readings for September were about the same, were in 1841 and 1866, viz. 29·624 in. and 29·575 in. respectively. During the periods of great barometric depression in September, violent gales raged from the south-west, which caused great destruction of life and property.

The mean temperature of the quarter was 61°·4, or 1°·9 above the average of 98 years. In July it was 3°·1 higher than the average; in August 0°·1 higher; while in September it was 2°·5 higher. The rainfall for the quarter amounted to 4·9 in. or 2·5 in. below the average of the season; in September it was 0·7 in. in excess of the average.

Harvest-work began in the South of England early in August, and became general towards the end of the month; by the end of September it was completed except in the North-west of Ireland, and in the Scottish Highlands. Opinions as to yield and quantity were very conflicting; the barley crop was said to be the best, while the wheat and oat crops were spoken of as being below the average. Beans and peas were both short crops.

Wheat was cut on the 22nd of July at Guernsey and Weybridge; on the 24th at Streatly; on the 27th at Worthing and Over Court; on the 28th at Hawarden; on the 29th at Eastbourne and Oxford; and on the 31st at Osborne. On the 2nd of August at Strathfield Turgiss and Cardington; on the 3rd at Helston; on the 9th at Llandudno; on the 10th at Little Wratting and Boston; on the 14th at Somerleyton and Hull; and on the 18th at Miltown.

Barley was cut on the 2nd of August at Llandudno; on the 7th at Weybridge; on the 9th at Strathfield Turgiss and Cardington; on the 10th at Helston; on the 14th at Culloden; and on the 19th at Somerleyton.

Oats were cut on the 22nd of July at Weybridge; on the 23rd at Worthing; on the 24th at Streatly and Hawarden; on the 26th at Boston; and on the 28th at Over Court. On the 2nd of August at Strathfield Turgiss; on the 10th at Helston and Culloden; on the 11th at Eastbourne; on the 16th at Llandudno: on the 25th at Miltown; and on the 27th at Hull.

From observations collected from about 50 meteorological stations,

METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE LAST SIX MONTHS OF THE YEAR 1869.

1869. MONTHS.	Temperature of Air. Mean.	Air. Diff. from average of 98 years.	Air. Diff. from average of 28 years.	Evaporation. Mean.	Evaporation. Diff. from average of 28 years.	Dew Point. Mean.	Dew Point. Diff. from average of 28 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 28 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 28 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 28 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
July	64·5	+3·1	+2·7	59·9	+2·5	56·2	+2·6	22·5	+1·5	64·3	0·453	+0·040	5·0	+0·4
August ..	60·8	+0·1	−0·5	56·1	−1·3	52·1	−1·7	19·9	+0·3	62·5	0·389	−0·029	4·4	−0·2
September ..	59·0	+2·5	+1·7	55·1	+1·0	51·6	+0·4	16·2	−2·3	58·3	0·382	+0·001	4·3	+0·1
Mean ..	61·4	+1·9	+1·3	57·0	+0·7	53·3	+0·4	19·5	−0·2	61·7	0·408	+0·004	4·6	+0·1
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
October ..	48·9	−0·8	−1·5	46·6	−1·9	44·2	−2·1	15·5	+0·8	53·0	0·290	−0·026	4·2	−0·5
November	43·0	+0·6	−0·9	40·8	−0·8	38·2	−1·6	11·7	0·0	43·9	0·231	−0·019	2·7	−0·1
December ..	37·9	−1·3	−2·7	36·2	−2·9	33·9	−3·4	8·6	−1·0	38·2	0·195	−0·030	2·3	−0·3
Mean ..	43·3	−0·5	−1·7	41·2	−1·9	38·8	−2·4	11·9	−0·1	45·0	0·239	−0·025	2·7	−0·3

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 1869.

1869. 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				
	Mean.	Diff. from average of 28 years.	Mean.	Diff. from average of 28 years.	Mean.	Diff. from average of 28 years.	Amount.	Diff. from average of 54 years.		At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
July	75	0	29·928	+0·126	527	− 1	0·6	−2·0	213	0	0	31	42·2	57·8
August ..	73	− 4	29·968	+0·183	532	+ 3	1·2	−1·2	224	1	3	27	29·5	57·8
September ..	77	− 4	29·642	−0·175	528	− 6	3·1	+0·7	349	0	5	25	30·4	56·5
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Mean ..	75	− 3	29·846	+0·045	529	− 1	4·9	−2·5	262	1	8	83	29·5	57·8
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
October ..	84	− 3	29·867	+0·166	544	+ 5	1·8	−1·0	255	11	10	10	18·8	48·2
November ..	83	− 5	29·766	0·000	549	+ 1	2·4	0·0	336	17	10	3	19·3	46·3
December ..	86	− 2	29·619	−0·196	552	0	2·8	+0·9	361	12	18	1	14·3	40·1
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Mean ..	84	− 3	29·751	−0·010	548	+ 2	7·0	−0·1	317	40	38	14	14·3	48·2

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.

it appears that the highest temperatures of the air were at Leeds, 94°·0; Cardington, 93°·4; Royston, 92°·4; Marylebone, 92°·2; Wilton, 91°·5; and Camden Town, 91°·0. The lowest temperatures of the air were at Carlisle, 28°·5; Lampeter, 30°·2; Marlborough College, 31°·9; Hull, 32°·0; and Strathfield Turgiss, Gloucester, and Miltown, 33°·0. The greatest daily ranges of the air were at Wilton, 25°·0; Streatley Vicarage, 24°·3; Lampeter, 23°·2; Strathfield Turgiss, 22°·3; Aldershot Camp, 22°·1; and Gloucester and Cardington, 21°·2. The least daily ranges of the air were at Guernsey, 10°·5; Hawarden, 11°·6; Otley, 12°·6; Worthing, 13°·0; North Shields, 14°·0; and Llandudno, 14°·2. The greatest number of rainy days were at Allenheads, 57; Culloden, 56; Stonyhurst, 54; Eccles, 48; York and Bywell, 44; Truro, Barnstaple, and Cockermouth, 43; and Carlisle, 40. The least number of rainy days were at Cardington, 24; Osborne, 25; Aldershot, Royal Observatory, and Norwich, 26; and Strathfield Turgiss, 27. The heaviest falls of rain were at Stonyhurst, 14·4 in.; Lampeter, 11·9 in.; Allenheads, 11·7 in.; Cockermouth, 11·1 in.; Eccles, 10·4 in.; and West Harptree, 10·0 in. The least falls of rain were at Cardington, 3·4 in.; Guernsey, 3·7 in.; Sidmouth, 3·8 in.; Taunton, 4·3 in.; Royston, 4·4 in.; and Eastbourne, 4·8 in.

Fourth Quarter (*October, November, December*).—The warm period, which set in on 4th September, continued till 16th October, the average excess of mean daily temperature for the whole period of 43 days was 3°·4, and of the first 16 days in October was 3°·7. On 17th October the weather suddenly changed and became cold and of a wintry character, with sleet, hail, frost, and snow, with strong north winds; this severe cold weather continued with but slight variation to the end of the month. At the beginning of November the weather was mild for a few days, then cold again, and thus alternated above and below the average for two or three days together, those of low temperature predominating. During the month of November a remarkable change of temperature took place, the 10th, 11th, and 12th days were of a wintry character, with very low temperatures, whilst those of 13th, 14th, 15th and 16th were of very high temperatures with heavy gales of wind. Cold weather again set in on the 17th; from this time, with the exception of the period from December 10th to 20th, which was warm, the weather was generally cold to the end of the year. The average deficiency of mean temperature from 17th October to 9th December was 3°·3 daily; and from 21st December to the end of the year was 3°·3; the excess of temperature from 10th December to the 20th was 4° daily. Upon the whole quarter of 92 days, the temperature was below the average to the amount of 1°·15 daily.

During the month of October the readings of the barometer were generally high. From the 4th to the 14th they were remarkably steady, scarcely varying one-fifth of an inch throughout the period, and constantly above the average; on the 14th a decrease set in and lasted till the 16th, the minimum at that time, at the height of 160 feet above the mean level of the sea, was 29·13 in.; from the 20th to the end of the month the readings were with but two exceptions above the average. During the early part of November low readings generally were recorded, followed by an increase on the 10th, and the readings then continued above the average till the 21st, when a very rapid fall took place, from 30·18 in. to 29·03 in. on the 22nd; this was followed by a gradual increase, but with one exception the mean daily values remained in defect of the average till the end of the month. The mean pressure of the air for the month was that of the average. The oscillations of the barometer during December were very large, and succeeded each other rapidly, especially between the 8th and 28th. The principal movements were as follow:—A decrease from 30·40 in. on the 6th to 29·02 in. on the 13th, an increase to 29·57 in., and a decrease to 29·18 in. on the same day; several small movements then occurred, and 29·65 in. was reached on the 16th; a rapid fall then ensued, and 28·77 in. was registered at 10h. P.M. on the 16th; the readings then increased to 29·75 in. by 9h. P.M. on the 17th, and again decreased to 29·17 in. on the 19th; between this date and the 31st several increasing and decreasing readings took place. The range of readings during the month amounted to 1·62 in.

There were several very heavy gales of wind during the quarter, and pressures to the amount of 30 lbs. on the square foot took place, on October 16th and 19th, November 2nd and 4th, December 13th, 16th, 17th, 18th, 19th, and 30th, generally with the wind from S.W., W.S.W., or S.S.W.

The highest temperatures of the air were at Lampeter, 81°·8; Hawarden, 81°·0; Marylebone, 78°·7; Osborne, 77°·7; Barnstaple, 77°·5; Strathfield Turgiss, 77°·0; Wilton, 76°·7; and Bristol, 76°·6. The lowest temperatures of the air were at Lampeter, 0°·0; Carlisle, 0°·8; Cockermouth, 4°·9; Allenheads, 9°·5; Truro, 10°·0; Miltown, 11°·0; and Nottingham, 11°·8. The greatest daily ranges of the air were at Wilton, 16°·5; Nottingham, 15°·3; Marlborough College, 14°·6; West Harptree, Lampeter, and York, 14°·2; Aldershot and Gloucester, 13°·7; and Strathfield Turgiss and Carlisle, 13°·5. The least daily ranges of the air were at Guernsey, 7°·7; Otley, 8°·0; Hawarden, 8°·1; Llandudno, 8°·8; Liverpool, 9°·3; Helston, 9°·5; Hawsker, 9°·6; and Little Wratting, 9°·9. The greatest number of rainy days were at Allenheads, 77; Stonyhurst, 76; Bywell, 66;

Hawarden, 63; Truro, Eccles, and Hull, 62; and Helston, Manchester, and York, 61. The least number of rainy days were at Strathfield Turgiss, 30; Osborne and Otley, 31; Royal Observatory, and Bradford, 37; Weybridge, Marylebone, and Wisbech, 38; and Cardington, 39. The heaviest falls of rain were at Stonyhurst, 17·8 in.; Allenheads, 16·6 in.; Cockermouth, 16·0 in.; Lampeter, 14·9 in.; Barnstaple, 14·1 in.; Truro, 12·7 in.; and West Harptree, 12·3 in. The least falls of rain were at Cardington, 5·9 in.; Bradford, 6·0 in.; Leeds, 6·2 in.; Weybridge and Royston, 6·8 in.; and Oxford, 6·9 in.

CORN: Importations, Sales, and Prices.

Quantities of Wheat, Wheatmeal and Flour, Barley, Oats, Peas and Beans, Imported into the United Kingdom in the Year 1869; and in each of the Last Six Months of the Year 1869.

1869.	Wheat.	Wheatmeal and Flour.	Barley.	Oats.	Peas.	Beans.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
In first Six Months	12,194,021	1,817,580	4,686,894	2,368,099	372,233	961,066
July	4,109,746	531,965	400,192	829,415	89,857	133,991
August ..	3,885,794	637,938	188,430	498,567	57,542	104,793
September	3,387,239	504,307	324,107	651,575	50,862	118,035
October ..	4,558,048	606,316	695,462	917,230	91,417	157,641
November	4,513,203	553,167	773,900	1,085,906	135,388	187,938
December	5,047,777	750,282	984,675	1,566,078	257,088	233,756
In last Six Months	25,501,807	3,583,975	3,366,766	5,548,771	682,154	936,154
Year ..	37,695,828	5,401,555	8,053,660	7,916,870	1,054,387	1,897,220

Note.—The average weights *per quarter* of corn, as adopted in the office of the Inspector-General of Imports and Exports, are as follow:—For wheat, 485⅓ lbs., or 4⅓ cwts.; for barley, 400 lbs., or 34/7 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 the Four Years, 1866-7-8-9.

	1866.	1867.	1868.	1869.
	£.	£.	£.	£.
Wheat	12,983,090	24,985,096	22,069,353	19,515,758
Barley	3,745,944	2,832,515	3,799,527	3,379,775
Oats	3,632,385	4,319,908	3,875,929	3,340,494
Maize	4,530,503	3,834,734	4,838,012	5,935,665
Other kinds	1,321,069	1,778,954	1,981,553	1,376,087
Wheat Flour	3,796,911	3,519,577	2,832,077	3,792,939
Other kinds of Flour	36,082	93,350	23,839	6,640
Total of Corn ..	30,045,984	41,364,134	39,420,290	37,347,358

QUANTITIES of BRITISH WHEAT SOLD in the Towns from which Returns are received under the Act of the 27th and 28th VICTORIA, cap. 87, and their AVERAGE PRICES, in each of the LAST SIX MONTHS of the Years 1864-69.

	Quantities in Quarters.					
	1864.	1865.	1866.	1867.	1868.	1869.
	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.
Seventh month	257,510	222,961	127,836	109,829	106,812	166,485
Eighth month	264,939	201,953	191,057	102,303	174,633	174,904
Ninth month (five weeks)	322,292	318,893	325,056	265,668	444,296	255,286
Tenth month	311,169	304,054	320,674	349,788	284,810	256,984
Eleventh month	302,446	295,632	284,530	265,622	268,848	220,876
Twelfth month (five weeks)	399,358	391,941	332,934	301,558	307,386	244,933

	Average Prices per Quarter.											
	1864.		1865.		1866.		1867.		1868.		1869.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Seventh month	42	0	42	10	54	1	65	1	65	6	49	5
Eighth month	43	7	43	3	50	7	68	0	57	9	52	1
Ninth month (five weeks)	42	0	44	0	49	0	63	5	55	1	51	4
Tenth month ..	38	9	41	10	52	4	66	7	53	11	47	8
Eleventh month	38	10	45	7	56	6	69	9	52	2	46	8
Twelfth month (five weeks)	38	3	46	8	60	3	67	7	50	2	44	2

AVERAGE PRICES of BRITISH WHEAT, BARLEY, and OATS per Quarter (Imperial Measure) as received from the INSPECTORS and OFFICERS of EXCISE according to the Act of 27th and 28th VICTORIA, cap. 87, in each of the last TWENTY-SIX WEEKS of the Year 1869.

Week ending	Wheat.		Barley.		Oats.		Week ending	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
July 3	47	9	35	8	26	2	October 2 ..	49	8	37	8	24	7
July 10 ..	48	11	30	6	27	0	October 9 ..	48	1	38	0	24	8
July 17 ..	50	2	32	0	26	0	October 16	47	0	38	1	24	1
July 24 ..	50	11	30	3	27	3	October 23	46	1	38	6	24	2
July 31 ..	51	9	31	4	27	9	October 30	46	2	38	3	23	0
August 7 ..	51	6	32	4	26	4	November 6	47	1	38	5	22	10
August 14 ..	52	0	30	10	27	11	November 13	46	11	38	9	23	11
August 21 ..	53	1	33	7	26	3	November 20	46	8	38	8	23	5
August 28 ..	54	2	32	7	28	2	November 27	45	6	38	1	23	5
September 4	51	11	36	8	26	8	December 4	44	3	37	0	22	6
September 11	49	10	37	10	25	11	December 11	43	8	36	2	22	5
September 18	50	5	38	3	25	5	December 18	43	10	36	0	22	3
September 25	50	6	37	3	25	6	December 25	43	5	35	11	21	6
Average of Summer Quarter	50	11	33	9	26	7	Average of Autumn Quarter	46	0	37	7	23	3

ACREAGE under each Description of Crop, Fallow, and
Great Britain and

Description of Crops and Live Stock.	Great Britain. 1867.	Great Britain. 1868.	Great Britain. 1869.
Corn Crops:—	Acres.	Acres.	Acres.
Wheat	3,367,876	3,652,125	3,688,357
Barley or Bere	2,259,164	2,151,324	2,251,480
Oats	2,750,487	2,757,053	2,782,720
Rye	52,865	46,896	64,099
Beans	536,298	529,900	575,204
Peas	318,090	296,234	396,177
Total Corn Crops	9,284,780	9,433,532	9,758,037
Green Crops:—			
Potatoes	492,217	541,543	585,211
Turnips and Swedes	2,173,850	2,165,142	2,171,526
Mangold	258,126	249,041	292,742
Carrots	15,923	13,265	14,344
Cabbage, kohl-rabi, and rape	133,692	115,083	145,251
Vetches, Lucerne, and any other crop (except clover or grass)	424,355	301,792	365,993
Total Green Crops.. ..	3,498,163	3,385,866	3,575,067
Other Crops, Grass, &c.:—			
Flax	*..	17,543	20,923
Hops	64,284	64,488	61,792
Bare fallow or uncropped arable land	922,558	958,221	738,836
Clover and artificial and other grasses under rotation	3,989,974	3,960,008	3,448,726
Permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land)	11,967,288	12,136,036	12,735,897
Live Stock:—	No.	No.	No.
Cattle	4,993,034	5,423,981	5,313,473
Sheep	28,919,101	30,711,396	29,538,141
Pigs	2,966,979	2,308,539	1,930,452
Total number of horses returned by occupiers of land only in Great Britain	..	..	1,461,061

* In this year Flax was returned in Great

GRASS, and NUMBER of CATTLE, SHEEP, and PIGS, in IRELAND in 1867-8-9.

Ireland.			United Kingdom, including the Islands.		
1867.	1868.	1869.	1867.	1868.	1869.
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
261,034	286,790	281,117	3,640,051	3,951,018	3,981,989
172,932	188,252	223,338	2,440,242	2,348,068	2,483,277
1,660,511	1,699,919	1,684,788	4,423,097	4,469,387	4,480,125
7,671	7,854	8,770	60,616	54,827	72,986
11,180	8,813	8,833	547,782	538,943	584,251
2,372	1,157	1,124	320,715	297,612	397,483
2,115,700	2,192,785	2,207,970	11,432,503	11,659,855	12,000,111
1,001,781	1,034,853	1,041,837	1,500,860	1,584,213	1,635,347
335,728	320,066	321,880	2,519,437	2,495,536	2,502,512
18,739	19,067	21,029	277,886	268,780	314,421
3,397	3,789	3,702	20,687	17,815	18,831
35,453	42,268	42,237	169,473	157,525	187,667
37,254	36,264	38,210	463,553	341,188	407,155
1,432,352	1,456,307	1,468,895	4,951,896	4,865,057	5,065,933
253,257	206,446	229,178	*..	223,997	250,112
..	..	..	64,284	64,488	61,792
26,191	24,017	20,981	953,998	984,246	761,369
1,658,451	1,691,797	1,669,800	5,679,433	5,690,318	5,149,552
10,057,072	10,003,918	10,046,877	22,052,510	22,164,584	22,811,284
No.	No.	No.	No.	No.	No.
3,702,378	3,620,352	3,727,794	8,731,473	9,083,416	9,078,282
4,826,015	4,822,444	4,648,158	33,817,951	35,607,812	34,250,272
1,233,893	862,443	1,079,793	4,221,100	3,189,167	3,028,394
..	..	527,248	..	..	..

Britain with the unenumerated Green Crops.

QUANTITIES of WHEAT, BARLEY, OATS, PEAS, BEANS, INDIAN CORN or MAIZE, WHEATMEAL and FLOUR, IMPORTED in the THREE YEARS 1867-8-9; also the COUNTRIES from which the WHEAT, WHEATMEAL, and FLOUR were obtained.

	1867.	1868.	1869.
Wheat from—	cwts.	cwts.	cwts.
Russia	14,025,236	10,053,617	9,158,331
Denmark	418,012	654,419	549,811
Prussia	5,572,263	4,584,742	4,635,111
Schleswig, Holstein, and Lauenburg	127,222	45,412	57,454
Mecklenburg	651,884	647,205	690,147
Hanse Towns	700,935	756,654	736,134
France	597,405	56,414	468,274
Illyria, Croatia, and Dalmatia ..	542,635	1,004,701	1,030,563
Turkey and Wallachia and Moldavia	2,446,638	3,066,597	2,379,906
Egypt	1,451,774	3,219,536	1,004,479
United States	4,188,013	5,908,149	13,181,507
Chili	1,946,227	1,309,575	567,107
British North America	683,127	557,443	2,723,053
Other countries	1,294,198	775,304	513,951
Total Wheat	34,645,569	32,639,768	37,695,828
Barley	5,683,721	7,476,224	8,053,660
Oats	9,407,136	8,112,563	7,916,870
Peas	1,586,129	1,116,246	1,054,387
Beans	1,982,615	2,647,390	1,897,220
Indian Corn, or Maize	8,540,429	11,472,226	17,664,113
Wheatmeal and Flour from—			
Hanse Towns	444,710	615,756	647,430
France	1,234,742	632,359	1,348,061
United States	722,976	676,192	1,711,000
British North America	121,503	192,850	538,766
Other countries	1,069,038	975,865	1,156,298
Total Wheatmeal and Flour	3,592,969	3,093,022	5,401,555

COMPUTED REAL VALUE of CORN IMPORTED in the YEAR 1869.

The value of wheat imported in the year 1869 was 19,515,758*l.*, which is 2,553,595*l.* below the value of the quantity imported in the year 1868, and 5,469,338*l.* below the value in 1867, when it was 24,985,096*l.*

The value of wheat-meal and flour was 3,792,939*l.*, which is 960,862*l.* above the value imported in the year 1868, and 273,362*l.* more than that of 1867.

The value of barley imported in the year 1869 was 3,379,775*l.*, against 3,799,527*l.* in 1868, and 2,832,515*l.* in 1867.

The value of oats was 3,340,494*l.*, against 3,875,929*l.* in 1868, and 4,319,908*l.* in 1867.

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 Eleven Quarters ending December 31st, 1869.

Quarters ending	AVERAGE PRICES.						PAUPERISM.		Mean Temperature.
	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 Leadenhall and Newgate Markets (by the Carcase).		Best Potatoes per Ton at Waterside Market, Southwark.	Quarterly Average of the Number of Paupers relieved on the *last day* of each week.		
				Beef.	Mutton.		In-door.	Out-door.	
1867	£.		*s.* *d.*						°
June 30	$92\frac{4}{8}$	2·8	63 11	$4\frac{3}{4}d.$—$6\frac{3}{4}d.$ Mean $5\frac{3}{4}d.$	$5\frac{1}{4}d$—$7\frac{1}{4}d.$ Mean $6\frac{1}{4}d.$	135*s.*—175*s.* Mean 155*s.*	134,233	779,158	53·5
Sept. 30	$94\frac{4}{8}$	2·2	65 4	$4\frac{3}{4}d.$—$6\frac{3}{4}d.$ Mean $5\frac{3}{4}d.$	$5d.$—$7d.$ Mean $6d.$	100*s.*—155*s.* Mean 127*s.* 6*d.*	129,860	743,965	59·7
Dec. 31	$94\frac{3}{8}$	2·0	67 11	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$4\frac{1}{2}d.$—$6\frac{1}{2}d.$ Mean $5\frac{1}{2}d.$	110*s.*—155*s.* Mean 132*s.* 6*d.*	145,886	771,754	42·5
1868 Mar. 31	93	2·0	72 2	$4\frac{1}{4}d.$—$6\frac{1}{2}d.$ Mean $5\frac{3}{8}d.$	$4\frac{1}{4}d.$—$6\frac{1}{2}d.$ Mean $5\frac{3}{8}d.$	125*s.*—170*s.* Mean 147*s.* 6*d.*	159,716	860,165	41·4
June 30	$94\frac{3}{8}$	2·0	71 10	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$4\frac{3}{4}d.$—$7d.$ Mean $5\frac{7}{8}d.$	130*s.*—170*s.* Mean 150*s.*	142,588	800,944	55·8
Sept. 30	$94\frac{2}{8}$	2·0	59 1	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$4\frac{3}{4}d.$—$6\frac{3}{4}d.$ Mean $5\frac{3}{4}d.$	120*s.*—175*s.* Mean 147*s.* 6*d.*	138,284	778,804	63·9
Dec. 31	$94\frac{3}{8}$	2·4	51 11	$4\frac{1}{2}d.$—$7d.$† Mean $5\frac{3}{4}d.$	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$† Mean $5\frac{5}{8}d.$	70*s.*—140*s.* Mean 105*s.*	152,733	797,546	45·1
1869 Mar. 31	$92\frac{7}{8}$	3·0	50 2	$4\frac{3}{4}d.$—$7\frac{1}{4}d.$ Mean $6d.$	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	70*s.*—140*s.* Mean 105*s.*	162,308	850,883	41·3
June 30	$93\frac{1}{8}$	4·2	45 7	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5d.$—$7\frac{3}{4}d.$ Mean $6\frac{3}{8}d.$	60*s.*—130*s.* Mean 95*s.*	145,094	816,260	52·0
Sept. 30	93	2·9	50 11	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5\frac{1}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{3}{8}d.$	95*s.*—125*s.* Mean 110*s.*	137,406	781,382	61·4
Dec. 31	$93\frac{4}{8}$	2·8	46 0	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{4}d.$	75*s.*—100*s.* Mean 87*s.* 6*d.*	151,996‡	818,315‡	43·3

* The average bank minimum rate of discount has been supplied by Mr. G. Forbes, Chief Cashier of the Bank of England.

† For the last four weeks of the quarter ending December 31st, 1868, and subsequently, the prices, from which the quarterly average is derived, are those quoted at the Smithfield Meat Market.

‡ These figures include an estimate for December, the returns not being complete for that month.

Average Prices of British Wheat, Barley, and Oats, per Imperial Quarter, in each of the Sixteen Years 1854-69.

Year.	Wheat.	Barley.	Oats.	Year.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
1854	72 5	36 0	27 11	1862	55 5	35 1	22 7
1855	74 8	34 9	27 5	1863	44 9	33 11	21 2
1856	69 2	41 1	25 2	1864	40 2	29 11	20 1
1857	56 4	42 1	25 0	1865	41 10	29 9	21 10
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

Certain Articles of Foreign and Colonial Production Imported in the Years 1866-9; and their Quantities.

		1866.	1867.	1868.	1869.
Animals, Living:					
Oxen, Bulls, and Cows	number	209,171	156,335	114,869	190,674
Calves	,,	28,568	21,613	21,819	29,516
Sheep	,,	777,174	532,316	323,447	691,472
Lambs	,,	13,706	7,400	17,708	18,371
Swine and Hogs	,,	73,873	48,079	33,721	69,067
Bones (burnt or not, or as animal charcoal)	tons	80,316	83,814	75,851	95,979
Cotton, Raw	cwts.	12,295,803	11,272,651	11,857,893	10,903,313
Flax	,,	1,547,598	1,440,669	1,816,669	1,535,322
Guano:—From Peru	tons	109,142	164,112	155,776	199,122
Other parts ..	,,	26,555	28,196	26,567	10,888
Total Guano	,,	135,697	192,308	182,343	210,010
Hemp	cwts.	1,001,098	878,374	1,076,198	1,055,769
Hops	,,	85,687	296,117	231,720	322,485
Hides untanned: Dry ..	,,	270,644	280,063	305,318	340,449
,, ,, Wet ..	,,	785,999	615,822	635,794	524,899
Petroleum	tuns	30,866	22,494	17,160	21,315
Oilseed Cakes	tons	129,023	121,832	162,339	159,295
Potatoes	cwts.	738,193	1,374,223	2,041,474	1,660,189
Butter	,,	1,165,081	1,142,262	1,097,539	1,259,089
Cheese	,,	872,342	905,476	873,377	979,189
Eggs	number	438,878,880	397,934,520	383,969,040	442,165,080
Lard	cwts.	228,459	246,839	237,260	255,964
Bacon and Hams	,,	635,782	537,114	638,127	740,194
Salt Beef	,,	178,362	195,797	240,577	214,903
Salt Pork	,,	178,548	142,831	144,378	165,944
Clover Seeds	,,	226,014	150,968	264,878	231,433
Flax-seed and Linseed ..	qrs.	1,158,736	1,095,360	1,635,528	1,387,573
Rape	,,	474,667	620,782	356,884	260,755
Sheep and Lambs' Wool ..	lbs.	235,741,101	230,224,467	250,928,854	255,161,343

CERTAIN ARTICLES of FOREIGN and COLONIAL PRODUCTION IMPORTED in the FOUR YEARS 1865-68; and their AVERAGE PRICES, exclusive of Duty.

Articles.	Principal Countries whence Imported.	1865.	1866.	1867.	1868.
		£. s. d.	£. s. d.	£. s. d.	£. s. d.
...EN AND BULLS ..	Schleswig Holstein and Holland .. .. each	18 14 5	17 19 0	17 16 0	16 16 0
...WS	Schleswig Holstein and Holland .. .. each	16 6 3	17 16 3	17 3 0	14 13 0
...LVES	Holland .. .. ,,	4 6 4	5 5 1	4 14 0	4 7 8
...EEP	Holland .. .. ,,	2 10 0	2 10 0	2 1 5	1 13 10
...MBS	Holland .. .. ,,	0 17 0	1 0 0	1 5 0	1 3 8
...NES OF ANIMALS AND FISH FOR MANURE	Various countries in Europe and South America .. .. per ton	5 10 6	4 17 11	5 0 9	5 8 2
...TTON, RAW	Egypt .. .. .. per cwt.	8 16 1	8 14 3	6 7 9	5 9 4
	United States .. ,,	9 18 6	7 10 8	5 9 1	5 5 4
	Brazil .. .. .. ,,	8 16 10	7 17 1	5 6 3	5 1 8
	British India .. ,,	6 5 7	4 12 0	3 2 10	3 12 8
...AX, rough or un-...ressed	Russia and Prussia ,,	2 11 10	2 15 4	2 14 9	2 12 4
	Holland .. .. ,,	3 13 5	3 19 9	3 14 11	3 15 0
	Belgium .. .. ,,	3 19 1	4 0 0	4 0 0	4 0 0
...ANO	Peru .. .. .. per ton	12 0 0	12 0 0	12 0 0	12 3 0
...MP, rough or un-...ressed	Russia .. .. .. per cwt.	1 11 1	1 11 1	1 15 2	1 17 1
	Austrian Italy .. ,,	1 17 5	1 18 10	1 17 1	1 17 10
	Philippine Islands ,,	1 11 6	2 6 2	2 10 6	2 7 5
	British India .. ,,	1 0 9	1 0 11	1 2 3	1 7 11
...S	Hanse Towns .. ,,	5 12 4	6 14 10	5 6 3	3 1 6
	Holland and Belgium ,,	5 1 6	6 3 6	5 4 8	2 16 2
	United States .. ,,	5 14 2	7 15 3	8 18 10	3 19 0
...ES (untanned) dry	British India .. ,,	3 14 0	3 9 0	3 12 3	4 0 10
,, wet	Argentine Confederacy and Uruguay .. per cwt.	2 8 3	2 8 9	2 12 4	2 16 3
	Brazil . .. .. ,,	2 7 10	2 9 1	2 12 6	2 16 6
	Australia .. .. ,,	1 15 3	1 17 0	1 19 7	2 8 5
...ROLEUM, refined ..	United States .. per gall.	0 2 11¾	0 1 10¾	0 1 3⅞	0 1 5½
,, unrefined	United States .. per tun	21 7 2	17 7 3	11 14 5	11 4 0
...EED CAKES ..	Russia, Denmark, Prussia and Hamburg .. per ton	8 2 3	8 4 1	8 3 4	8 12 0
	France .. .. ,,	8 19 6	9 2 4	9 13 6	10 9 4
	United States .. ,,	9 16 11	10 10 3	10 18 0	11 7 9

CERTAIN ARTICLES of FOREIGN and COLONIAL PRODUCTION IMPORTED in the FOUR YEARS 1865-68; and their AVERAGE PRICES, exclusive of Duty—*continued.*

Articles.	Principal Countries whence Imported.	1865.			1866.			1867.			1868.		
		£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
POTATOES	Holland .. .. per cwt.	0	5	$1\frac{3}{4}$	0	6	$4\frac{3}{4}$	0	5	$11\frac{1}{2}$	0	5	8
	France .. .. .. ,,	0	3	$7\frac{1}{2}$	0	4	$3\frac{3}{4}$	0	5	6	0	4	7
BUTTER	Hanse Towns .. ,,	5	18	2	5	10	3	5	13	9	6	9	6
	Holland and Belgium ,,	5	11	7	5	4	7	5	8	4	5	15	11
	France .. .. .. ,,	5	6	0	5	0	8	5	0	6	5	9	7
	United States .. ,,	5	5	2	4	16	10	*2	18	1	5	4	9
CHEESE	Holland .. .. ,,	2	16	10	3	1	9	2	17	10	2	18	3
	United States .. ,,	2	18	6	3	6	8	2	15	10	2	18	10
EGGS	France .. .. per 120	0	6	$1\frac{1}{16}$	0	6	$0\frac{3}{4}$	0	5	11	0	6	3
LARD	United States .. per cwt.	3	3	4	3	9	0	2	10	3	3	3	10
HAMS	Hanse Towns .. ,,	3	2	7	3	1	6	3	5	5	3	8	5
	United States .. ,,	2	11	4	2	17	4	2	7	0	2	15	0
BACON	Hanse Towns .. ,,	3	7	7	3	6	1	3	4	0	2	8	6
	United States .. ,,	2	14	10	2	14	2	2	4	7	2	9	10
BEEF, SALTED	Hanse Towns .. ,,	2	4	2	2	10	0	2	10	1	2	3	9
	United States .. ,,	1	13	0	2	5	3	2	7	2	2	5	2
PORK, SALTED (except hams)	Hanse Towns .. ,,	2	11	11	2	15	8	2	8	6	2	15	3
	United States .. ,,	2	1	6	2	9	11	2	1	6	2	5	10
CLOVER SEEDS	Hamburg, France and United States .. per cwt.	3	7	5	3	4	3	3	6	10	3	2	5
LINSEED	Russia, Baltic .. per. qr.	2	7	10	2	11	4	2	16	4	2	8	10
	Russia, Black Sea ,,	2	14	6	2	19	10	3	1	0	2	13	0
	British India .. ,,	3	0	5	3	8	11	3	6	9	3	1	8
RAPE	Prussia .. .. ,,	3	0	5	2	13	10	2	13	11	2	12	5
	British India .. ,,	3	5	7	2	17	11	2	12	6	2	11	4
SHEEP AND LAMBS' WOOL	Russia .. .. .. per lb.	0	1	$0\frac{1}{2}$	0	0	$11\frac{7}{8}$	0	0	$11\frac{3}{8}$	0	0	9
	Hanse Towns .. ,,	0	1	$10\frac{5}{8}$	0	1	$11\frac{3}{8}$	0	1	$10\frac{3}{8}$	0	1	$4\frac{7}{8}$
	Argentine Confederacy ,,	0	0	$7\frac{5}{8}$	0	0	$7\frac{1}{8}$	0	0	$6\frac{1}{2}$	0	0	$6\frac{1}{4}$
	British Possessions in South Africa .. .. per lb.	0	1	$3\frac{1}{16}$	0	1	$5\frac{7}{8}$	0	1	$2\frac{3}{4}$	0	1	$2\frac{9}{16}$
	British India .. ,,	0	0	$11\frac{3}{8}$	0	0	$9\frac{15}{16}$	0	0	$7\frac{7}{8}$	0	0	$7\frac{5}{8}$
	Australia .. .. ,,	0	1	$7\frac{3}{8}$	0	1	$8\frac{13}{16}$	0	1	$7\frac{1}{2}$	0	1	$3\frac{15}{16}$

* Imports generally of inferior quality.

STATISTICS OF DAIRY PRODUCE.

(*The following Quotations, &c., are extracted from* 'The Grocer.' *See Nos. for Jan.* 2, 1869, *and Jan.* 1, 1870):

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

	1870.	1869.	1868.
Butter:	Per cwt.	Per cwt.	Per cwt.
Carlow, finest F.O.B. ..	124s. to 128s.	128s. to 136s.	Nominal.
Landed	122 ,, 130	126 ,, 140	96s. to 107s.
Cork, 1sts	132 ,, 137	136 ,, 145	110 ,, 113
,, 2nds	123 ,, 126	133 ,, 140	100 ,, 102
,, 3rds, new	109 ,, 112	125 ,, 128	86 ,, 88
,, 4ths ,, ...	102 ,, 106	117 ,, 120	74 ,, 76
Limerick	116 ,, 120	.. ..	88 ,, 92
Tralee and Kilrush	.. ..	.. ..	74 ,, 86
Foreign:			
Friesland	104 ,, 130	120 ,, 134	94 ,, 111
Jersey, &c.	72 ,, 128	100 ,, 130	62 ,, 122
Kiel	104 ,, 136	.. ..	.. ..
Normandy	90 ,, 148	112 ,, 145	70 ,, 122
American	100 ,, 112	112 ,, 120	62 ,, 88
Cheese:			
English Cheddar, fine, new	90 ,, 94	86 ,, 94	78 ,, 88
,, good ,,	74 ,, 86	74 ,, 82	62 ,, 76
Red Somerset Loaf	72 ,, 84	.. ..	.. ..
White or yellow Cheddar Loaf	76 ,, 84	.. ..	.. ..
Scotch Cheddar	70 ,, 80	64 ,, 74	56 ,, 68
Cheshire, new	84 ,, 90	80 ,, 90	76 ,, 84
,, good ditto ..	66 ,, 78	64 ,, 76	52 ,, 70
Wiltshire, new ..	72 ,, 80	68 ,, 78	64 ,, 68
,, good ditto ..	62 ,, 68	62 ,, 64	52 ,, 62
North Wilts, Loaf, new ..	76 ,, 84	66 ,, 78	66 ,, 76
Derby ,,	72 ,, 86	70 ,, 86	58 ,, 74
Foreign:			
American, fine	72 ,, 75	66 ,, 74	60 ,, 64
,, good	66 ,, 70	60 ,, 64	46 ,, 58
Gouda	46 ,, 62	50 ,, 62	48 ,, 54
Kanter	.. ..	.. ..	.. ..
Edam, new	54 ,, 65	54 ,, 68	50 ,, 60

"The total quantity of butter received into the Cork market for the century (1769-1868) amounts to nearly twenty-five million packages; the actual number being upwards of 24,500,000, or over a million tons, a quantity more easily spoken of than conceived. In the season of 1769-70 the supply was 105,809 packages, consisting of firkins and kegs. From 1772 to 1809 the butter was also sent in casks. In 1775 it had increased to 221,298 packages. It did not reach 300,000 till the year 1829, when the number received was 306,670, the other 100,000 being arrived at in 1856, when the supply had increased to 400,509 firkins—the make of kegs having been almost discontinued since 1853. The Cork butter market is held daily, with the exception of about fifteen days' interval in March or April between the old and the new seasons, and a few holidays. There are, therefore, about 290 markets held in the year. The average supply is now 1400 firkins per day, or 400,000 firkins annually, the exporting of which is divided among about forty merchants, one eminent firm—that of Messrs. C. and J. O'Sullivan—shipping about one-eighth of the whole quantity. Within the last dozen years the exports to the colonies, which used to be large, have fallen off, owing to various causes, principally the increase of their own produce. The foreign trade is now small, the great bulk of the supply of Cork butter coming to the English markets. As the prices for those twelve years have been influenced only by the home demand, we give the highest and lowest prices for each of those years for first quality Corks, which may be taken as the standard of value of the finest Irish butter:—

Season of	Lowest Price.		Highest Price.		Advance.
1857–8 ..	June 12	95s.	March 2	126s.	31s.
1858–9 ..	June 7	96	February 4 ..	130	34
1859–60..	July 8	99	February 18 ..	130	31
1860–1 ..	August 30.. ..	103	November 26 ..	117	14
1861–2 ..	May 30	94	January 27 ..	116	22
1862–3 ..	June 24	91	March 7	120	29
1863–4 ..	June 11	84	January 6	117	33
1864–5 ..	June 2	89	December 19 ..	126	37
1865–6 ..	May 31	94	February 19 ..	136	42
1866–7 ..	May 30	101	January 3 ..	123	22
1867–8 ..	May 20	96	March 31	127	31

The lowest price this season was also on May 20, 96s.

Year 1868.—Cheese.

"The make of which must have been lessened by the same cause that lessened the make of butter — the long-continued drought—has varied less in price than almost any article in the provision market; and if the reports of the small stocks now held by the makers and the factors be correct, and we have no reason to doubt it, there seems a reasonable prospect of choice goods going shillings dearer before the close of the present season. In referring to the range of prices for the past year (1868), as our space will not allow us to quote all kinds, we have taken Cheshire cheese as the representative of English, and American of the foreign; in giving these quotations they are the prices of the best qualities. Cheshire from January to April ranged from 76*s.* to 86*s.* May 76*s.* to 84*s.* June 78*s.* to 86*s.* July to the second week in August 76*s.* to 84*s.*, then to the end of August 76*s.* to 80*s.* September 76*s.* to 84*s.* The range throughout almost the entire of October and November was 76*s.* to 86*s.* A few choice parcels in December realised 90*s.* American from January to March 60*s.* to 64*s.* April 64*s.* to 70*s.* May and early part of June 56*s.* to 62*s.*; end of June 56*s.* to 66*s.* July 56*s.* to 62*s.* August and September 60*s.* to 66*s.* October 60*s.* to 70*s.* November and December 64*s.* to 74*s.*: thus showing, whilst butter has advanced considerably over 30*s.* per cwt. on Irish, and over 40*s.* on foreign, Cheshire cheese shows an advance of only 10*s.* per cwt., and American 12*s.*

Year 1869.—Butter.

"Not a very long time since the import of Irish butter into England exceeded that of foreign. The quantity of Irish has since increased, but not in the same proportion as foreign, and the former is now but a fraction compared with the latter. It also implies that the condition of the English workman must have greatly improved, for the increase of population will not account for the immensely increased consumption.

"The season in the Cork market nominally begins in April, when the cows begin to be fed on the grass, and that butter-tainting food, the turnip, is no longer needed. 1868 had an unusually dry summer, and very high prices prevailed in consequence, the make of butter being deficient; the season 1869, therefore, found stocks used up, and the opening prices were at the extraordinary rates of 140*s.* for firsts and seconds, and 113*s.* for thirds; but, with fine weather, and everything promising well, these figures could not hold, and the 1st of May saw them at 122*s.*, 108*s.*, and 91*s.* They continued to slide down, and on May 13, 101*s.*, 96*s.*, and 87*s.*, were the quotations. This was about the lowest point, and the prices continued through May, June, and July, almost unchanged at 104*s.*, 100*s.*, and 92*s.* The summer and autumn came very favourable. Grass was abundant, and there was unquestionably a large make of butter; but it is rarely that August passes without a stir in prices, and, as it drew near its close, 113*s.*, 106*s.*, and 98*s.*, were obtained. Since then there has been a gradual and steady advance up to the present, when the stiff figures of 132*s.*, 120*s.*, and 105*s.*, have to be paid, with every prospect of a further advance. That the summer was favourable for the production of butter in Ireland will be apparent from the fact that about 390,000 firkins have been sold up to Christmas, 1869, against 335,000 the previous year, being an increase in money-value of about 200,000*l.*

"The Cork market is conducted by two classes of traders, one, the broker, who acts for the farmer, and gets his butter inspected and weighed, and sells it to the other class, and the exporter, who supplies the English buyer. As the world goes the market is well managed, but the exporters have too little voice in the management, and all the arrangements are in the interest of the farmer. The exporter represents the English buyer, and certainly has as much right to have his voice heard. The butter in general is over-qualitied, and this will be so while the farmer's agent is allowed to stand by the inspector, urging him almost continually to put a higher quality on. The inspector is sworn to act impartially, and he should be left alone while inspecting it, without promptings or suggestions from any one."

STATEMENT of the QUANTITY and VALUE of BUTTER imported from the UNITED STATES and BELGIUM; and of CHEESE imported from the UNITED STATES, 1864-68.

Years.	BUTTER.—UNITED STATES.		CHEESE.—UNITED STATES.		BUTTER.—BELGIUM.	
	Quantities.	Computed Real Value.	Quantities.	Computed Real Value.	Quantities.	Computed Real Value.
	Cwts.	£.	Cwts.	£.	Cwts.	£.
1864 ..	142,672	780,024	466,988	1,213,890	81,575	470,167
1865 ..	83,216	437,703	442,913	1,296,204	70,619	433,179
1866 ..	16,059	77,754	415,726	1,386,447	76,667	426,712
1867 ..	39,035	113,290	526,740	1,470,017	80,754	470,464
1868 ..	7,117	37,279	489,117	1,439,380	70,456	405,987

PAUPERISM.

The total number of paupers in England on the 1st July, 1869, was 978,120, being 1 in 20, or 4·9 per cent. on the actual population. The details which follow do not absolutely agree with the above statement, owing to 420 paupers having been in receipt of both in-door and out-door relief. Comparing the numbers returned on 1st July, 1869, with those at the same date in 1868, there was an increase of 6132, or 0·6 per cent., in 1869. The in-door paupers on 1st July, 1869, were 143,622, the out-door 833,897. Of the 978,120 paupers, 199,774 were men, 422,194 were women, and 348,945 were children under 16. Of 417,806 able-bodied, 37,250 were men, 117,725 were women, and 262,831 children under 16; of 508,153 not able-bodied, 143,049 were men, 279,897 were women, and 85,207 children under 16. Of the 44,954 insane, 19,475 were men, 24,572 were women, and 907 were children under 16 years. The vagrants numbered 6692. The number of adult able-bodied paupers relieved was 154,965, a decrease of 243, or 0·2 per cent. on the number on the 1st July, 1868.

VITAL STATISTICS:—POPULATION; BIRTHS; DEATHS; EMIGRATION; METEOROLOGY; IMPORTATIONS OF GRAIN; SALES OF BRITISH WHEAT; PRICES OF CORN AND OTHER PRODUCE; AND PAUPERISM, &c.

[*The facts are derived chiefly from the Reports of the* REGISTRAR-GENERAL; *the Meteorological Reports of* MR. GLAISHER; *the Returns of the* BOARD OF TRADE, *and of the* INSPECTOR-GENERAL OF IMPORTS AND EXPORTS.]

POPULATION of the UNITED KINGDOM, estimated to the middle of the year 1870 (exclusive of islands in the British seas):—

Males	14,805,183
Females	16,033,027
	30,838,210

	England.	Scotland.	Ireland.
Males	10,635,905	1,518,640	2,650,638
Females	11,454,258	1,704,197	2,874,572
Total ..	22,090,163	3,222,837	5,525,210

ENGLAND AND WALES.

BIRTHS and DEATHS in the FIRST SIX MONTHS of 1870.

Winter Quarter (January, February, March).—Births registered were 206,441. The annual birth-rate of the season to 1000 persons living was 38·05; the average derived from ten corresponding winters of 1860-69 was 37·02. Deaths registered were 143,991. The annual death-rate of the season per 1000 of population was 26·54; the average derived from ten corresponding winters of 1860-69 was 25·32.

The deaths in the first quarter of the year exceeded by more than 10,000 the deaths in the previous winter, and by more than 24,000 the deaths in the milder winter of 1868; such was the effect of cold. The weather of February, 1868, was more like spring than winter, and at the end of the month trees and shrubs were budding. A difference of 3° in lowness of temperature for 90 days was the chief cause of a difference of 4 per 1000 in the death-rate. Of the 143,991 deaths, 32,607 were infants under one year of age. Small-pox was only fatal to 405 persons; but measles, scarlet-fever, diphtheria, whooping-cough, fever in its various forms, and diarrhœa slew nearly twice 10,000 victims in the first 90 days of the year.

The excess of mortality occurred almost entirely in the small town and country districts, where the death-rate rose from an average of 22·9 to 24·9. In the town districts it rose from an average of 27·2 to 27·8. In the following towns and cities the mortality greatly exceeded the average; it was 31·7 per 1000 of population in Bristol, 32·7 in Manchester, 31·6 in Edinburgh, and 36·6 in Glasgow. The marriage-rate of England, which had been depressed for some time, was unusually low; a severe winter and the continued stagnation of trade cast a shadow over the prospects of the people.

The average price of wheat, which was 72*s.* 2*d.* in the winter of 1868, and 50*s.* 2*d.* in the same period of 1869, fell to 42*s.* 3*d.* per quarter in the winter of 1870. This marked reduction represents a fall of 41 per cent. in the eight seasons, and of 16 per cent. in the last four seasons. Potatoes were cheaper; the best quality at the Waterside Market, Southwark, sold on an average at 102*s.* 6*d.* per ton (5*s.* 1½*d.* per cwt.); this was lower by 45*s.* per ton or 2*s.* 3*d.* per cwt. than in the winter of 1868, and somewhat lower than the price in the same season of 1869.

The wholesale price of meat at Smithfield Market has varied little since the winter of last year. The average price of beef in the two winters of 1869 and 1870 was 6*d.* per lb. and 5¾*d.* respectively; of mutton 6½*d.* per lb. and 6¼*d.* per lb.

Emigration carried off 32,627 people from the ports of the United Kingdom, at which there are emigration offices, in the 90 days; and of them about 14,296 were of English origin. On an average a shipload of about 159 English emigrants sailed daily to the Australian Colonies, British North America, the United States, and other places. 11,754 of the emigrants sailed to the United States, 1933 to the Australian Colonies.

Of the Irish 11,757, of the Scotch 2846 emigrated; about 3728 of the emigrants from the ports were foreigners. To show the migratory force of the several populations of the United Kingdom, the emigrants must be compared with the population; and if this is done, the annual rates of emigration run in the following order:—England 2·6, Scotland 3·5, Ireland 8·5 to 1000 inhabitants. The emigrating force is feeblest in England, strongest in Ireland.

Spring Quarter (*April, May, June*).—Births registered were 203,484. The annual birth-rate of the season per 1000 of population was 37·00; the average of ten springs (1860-69) was 36·52. Deaths registered were 121,246. The annual death-rate of the season per 1000 of population was 22·05; the average of ten springs (1860-69) was also 22·05.

The mortality which had been so high in the severe winter of

1870 fell to the average rate of the season in the hot, dry, and rainless spring of 1870. The prevailing epidemics were diarrhœa and scarlatina; from the latter disease 5973 deaths were registered in England, and in London alone it destroyed 1076 lives, or 567 in excess of the average of the last ten years. In the districts comprising the chief towns of England the mortality was below the average; in the districts comprising the small towns and country parishes the mortality was above the average of the season. Of twenty large towns in the United Kingdom the annual death-rate of the season was highest in Glasgow, 27·9 per 1000 of population; Bradford, 27·7; Bristol, 26·1; Manchester, 25·7; Edinburgh, 24·9; and Leeds, 24·7.

The average price of wheat was 44*s.* 8*d.* per quarter, slightly lower than it was in the same three months of last year, and 27*s.* 2*d.* less than it was in the spring of 1868. It is a fall of 38 per cent. The average price of beef ranged from 4½*d.* to 6¾*d.* per lb. The price is somewhat lower than that of last year. The prices of mutton have ranged from 5¼*d.* to 7½*d.* per lb. The price of the higher qualities is less, the price of the lower qualities higher than in the spring of 1869.

Best potatoes were 6*s.* 3*d.* per cwt. at the Waterside Market, Southwark; dearer than in the spring of 1869; cheaper than in the spring of 1868.

The number of emigrants from ports in the United Kingdom was 111,842, of whom about 41,373 were English by origin, 9429 were Scotch, 37,878 were Irish, and 23,162 were foreigners. Of the total number 84,651 chose the United States for their destination, 21,471 the Australian Colonies. Of the 37,878 Irish emigrants, 35,564 went to the United States. In the total number of emigrants in the quarter there was a decrease of 2032, as compared with the three months ending 30th June, 1869. The migratory force of the several parts of the kingdom may be shown thus:—To every 1000 inhabitants of each division the annual rate of emigration of the season was 7·5 in England, 11·7 in Scotland, and 27·4 in Ireland.

METEOROLOGY.

First Quarter (*January, February, March*).—The weather at Greenwich, at the beginning of the year, was very mild, with frequent rain; the wind for the first few days was moderate from the west; it blew very strongly on the 7th and 8th of January, mostly from the south-west. This mild weather continued till the 17th, the average excess of temperature for this period being 6¼° daily. On the 18th there was a change, and from this date the predominating

METEOROLOGICAL OBSERVATIONS RECORDED AT THE ROYAL OBSERVATORY, GREENWICH, IN THE FIRST SIX MONTHS OF THE YEAR 1870.

1870. MONTHS.	Temperature of: Air. Mean.	Air. Diff. from average of 99 years.	Air. Diff. from average of 29 years.	Evaporation. Mean.	Evaporation. Diff. from average of 29 years.	Dew Point. Mean.	Dew Point. Diff. from average of 29 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 29 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 29 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 29 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
January ..	38·3	+2·0	+0·1	36·5	−0·4	34·1	−0·9	8·6	−1·1	39·2	0·196	−0·006	2·3	−0·1
February ..	36·2	−2·3	−3·1	33·6	−4·0	29·7	−5·4	9·6	−1·9	35·7	0·165	−0·042	1·9	−0·5
March ..	39·6	−1·3	−1·9	37·5	−1·7	34·7	−1·5	12·9	−1·6	41·3	0·201	−0·014	2·3	−0·2
Mean	38·0	−0·5	−1·6	35·9	−2·0	32·8	−2·6	10·4	−1·5	38·7	0·187	−0·021	2·2	−0·3
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	grs.
April	48·9	+2·9	+1·8	44·2	+0·2	39·2	−1·4	23·6	+5·2	43·4	0·239	−0·016	2·8	+0·1
May	53·4	+0·8	+0·4	49·2	−0·1	45·1	−0·5	24.9	+4·6	..	0·301	−0·003	3·4	−0·1
June	60·9	+2·7	+1·9	55·4	+0·8	50·6	−0·1	24·1	+3·1	..	0·369	−0.003	4·1	−0·1
Mean ..	54·4	+2·1	+1·4	49·6	+0·3	45·0	−0·7	24·2	+4·3	..	0·303	−0·007	3·4	0·0

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 1870.

1870. 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 29 years.	Mean.	Diff. from average of 29 years.	Mean.	Diff. from average of 29 years.	Amount.	Diff. from average of 55 years.		At or below 30°	Between 30° and 40°.	Above 40°.		
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
January ..	85	− 3	29·823	+0.073	555	+ 1	1·5	−0·4	296	15	14	2	14·5	41·5
February ..	78	− 7	29·693	−0·106	555	+ 2	0·5	−1·1	364	16	12	0	17·2	40·0
March ..	83	+ 1	29·864	+0·122	554	+ 4	2·1	+0·5	304	17	11	3	18·2	44·2
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Mean	82	− 3	29·793	+0·030	555	+ 2	4·1	−1·0	321	48	37	5	14·5	44·2
			in.	in.	grs.	grs.	in.	in.	Miles				°	°
April	69	−10	29·984	+0·218	546	+ 3	0·3	−1·4	244	12	17	1	18·3	40·7
May	73	− 3	29·896	+0·124	539	− 3	0·5	−1·7	254	10	13	8	21·3	45·5
June	68	− 6	29.947	+0·136	532	0	0·4	−1·5	242	0	6	24	31·7	52·5
							Sum	Sum	Mean	Sum	Sum	Sum	Lowest	Highest
Mean ..	70	− 6	29·942	+0·159	539	0	1·2	−4·6	247	22	36	33	18.3	52·5

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.

winds were easterly and northerly, but generally light, and very little rain fell. From the 18th to the 30th the air was mostly dry and frequently very cold, the average deficiency of daily temperature being 5°. At the beginning of February there was a marked change, frosts disappeared, and till the 8th day the weather was mild, with an average excess of temperature of 4° daily. On the 9th, however, a complete change took place; and for five or six days the cold was excessively severe; this period of low temperature prevailed to the 25th, during which time the average deficiency of daily temperature was as large as 7¼°. Six warm days now followed with an average excess of daily temperature to the amount of 8¼°. From the 4th of March, with the exception of the three days, March 16th, 17th, and 18th, the temperature was low, and the weather very cold for the season; the deficiency of temperature daily from March 4th to 15th was 3½°; the excess for the three days, 16th, 17th, and 18th, was 6¼°, and the deficiency to the end of the quarter from the 19th was 5½° daily. Upon the whole quarter of 90 days the deficiency of temperature averaged 1° daily. The frequent alternations in the temperature from mild to cold,—the periods of low temperature being longer than those of high,—together with the bleak east and north-east winds, and very harsh weather generally, have been unfavourable to the progress of agricultural work, and vegetation has been arrested and kept very backward.

At Greenwich the mean temperature of January was 38°·3, being 2°·0 higher than the average of 99 years, lower than the corresponding temperature of 1869 by 2°·8. In February the mean temperature was 36°·2, being 2°·3 lower than the average of 99 years, and lower than the corresponding temperatures in any year since 1864. The mean temperature of March was 39°·6, being 1°·3 lower than the average of 99 years, and higher than in 1869 by 2°·1. The fall of rain was 0·4 inch and 1·1 inch respectively in defect in January and February, and 0·5 inch in excess in March.

Wheat first appeared above ground on February 15, at Culloden.

Second Quarter (*April, May, June*).—The bleak and cold weather at the end of March continued to the 5th day of April. On the 6th the weather underwent a favourable change, and the temperature of the air till the 26th was high. The average excess was 5¾° daily. On two of these days, the 20th and 21st, the excess was as large as 16° and 13° respectively. On the 27th the weather became changeable; the wind was mostly north-westerly. Rain fell in small quantities in different parts of the country, and this continued till May 11th. The average deficiency of temperature in this interval was 5° daily. This cloudy, cold, and harsh weather, changed on the 12th May to very fine and warm with an abundance of sunshine, and the weather continued summer-like, with very little rain till June 22nd. The temperature of these 41 days was in excess of the average to the amount of 3¾° daily. On the 23rd June the weather became cold and changeable. Rain fell in some parts of Scotland and Ireland, but very little in England. The average daily deficiency of temperature from June 23rd to June 30th was 3½°.

Upon the whole quarter of 90 days, the periods of warm weather being of longer duration than those of cold, there was an excess of temperature amounting to 1·4° daily. The temperature in June rose to 90·2° on 22nd. In June 1846 the highest observed was 91·1°, in 1857 the highest was 92·7°, and in 1858, 94·5.°

The mean temperature of April was 48·9°, being 2·9° higher than the average of 99 years. In May the mean temperature was 53·4°, or 0·8° higher than the average of 99 years; that of June was 60·9°, being 2·7° higher than the average.

The fall of rain in April was 0·27 in.; back to the year 1815 there were three instances only in which the fall this month was less than this, viz., in 1817, 1840, and 1855, in each of which the fall was 0·1 in. only.

In May it was 0·47 in., in the same month, in the year 1833, it was 0·2 in.; in 1844 it was 0·4 in., and in 1848 it was 0·4 in., and there are no other instances of less falls back to 1815.

In June the fall was 0·39 in., and there is only one instance of a smaller fall, viz., in 1849, when it was 0·3 in.

In the three months ending June the fall was 1·13 in., and there is no instance on record of so small a fall of rain in these three months; the nearest approach was in 1844 and 1855, in both of which the fall was 2·6 in.; in 1834 it was 3 in.; in 1837 it was 3·3 in.; and in 1842 it was 3·5 in.

The fall from January to June was 5·21 in.; the average fall in the first half of the year is 10·88 in., therefore the fall this year was less than one-half of the average. The previous instances of small falls in the first six months of the year are 1855, when it was 6·5 in., in the years 1842 and 1847, when the amount was 7·5 in. in each year, and in the year 1840, when it was 7·6 in.; so that the fall of rain at Greenwich in the first six months ending June, 1870, is smaller than in the first half of any year comprised between the years 1815 to 1869.

At the end of the preceding quarter vegetation was considered to be three or four weeks behind what it was in the last year at the same period. At the end of April vegetation was very backward, the pastures were bare and brown, and there was a general want of warmth and moisture for the growing crops.

During May, rain appeared only in passing showers, but the fine and warm weather which set in on the 12th caused vegetation to advance rapidly. At the end of this month the prospects of the hay crop were bad.

The prolonged drought continued through June; the temperature till towards the end of the month was generally high. On heavy soils the crops were promising; forage was scarce and dear; hay-making began in the middle of June, but the crop was the lightest for many years past. The potato crop was spoken of satisfactorily.

The mean temperature of the air in the three months ending May, constituting the three spring months, was 47·3°, being 0·8° higher than the average of 99 years.

Wheat was in ear on the 4th of June at Hull; on the 5th at Strathfield Turgiss; on the 6th at Cardington; on the 8th at Weybridge Heath; on the 12th at Helston; on the 15th at Hawarden; on the 16th at Miltown; and on the 20th at Llandudno.

Wheat was in flower on the 12th of June at Taunton and Weybridge Heath; on the 17th at Helston; on the 19th at Cardington; on the 20th at Boston; and on the 21st at Hawarden.

Barley was in ear on the 6th of June at Cardington; on the 7th at Weybridge Heath; on the 18th at Helston; on the 25th at Llandudno; on the 26th at Hull; and on the 29th at North Shields.

Barley was in flower on the 20th of June at Taunton and Llandudno; and on the 23rd at Cardington.

Oats were in ear on the 16th of June at Helston; on the 19th at Hull; on the 27th at Llandudno; on the 29th at North Shields; and on the 30th at Miltown.

Quantities of Wheat, Wheatmeal and Flour, Barley, Oats, Peas and Beans, Imported into the United Kingdom in each of the first Six Months of the Year 1870.

1870.	Wheat.	Wheatmeal and Flour.	Barley.	Oats.	Peas.	Beans.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
January	2,910,167	502,520	649,838	713,218	126,616	134,568
February ..	2,273,080	264,574	636,788	301,270	16,979	92,651
March ..	2,291,368	428,110	566,634	298,931	38,092	162,160
April	1,853,755	429,800	865,809	692,516	97,069	123,971
May	2,570,455	465,096	652,479	1,257,520	297,697	122,821
June	1,944,299	386,092	452,674	1,204,178	302,972	131,831
Total in Six Months	13,843,124	2,476,192	3,824,222	4,467,633	879,425	768,002

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 3⅐ cwts.; for oats, 308 lbs., or 2¾ cwts. Corn has been entered and charged with duty by *weight* instead of *measure* since September 1864.

QUANTITIES of WHEAT, BARLEY, OATS, PEAS, BEANS, INDIAN CORN or MAIZE, WHEATMEAL and FLOUR, IMPORTED in the SIX MONTHS ended 30th JUNE in the THREE YEARS 1868-9-70; also the COUNTRIES from which the WHEAT and WHEATMEAL were obtained.

	1868.	1869.	1870.
Wheat from—	cwts.	cwts.	cwts.
Russia	4,489,880	3,316,375	4,563,334
Denmark	249,385	201,479	221,187
Prussia	2,213,473	2,104,509	1,215,653
Schleswig, Holstein, and Lauenburg .	32,270	27,609	10,511
Mecklenburg	371,446	323,492	313,567
Hanse Towns	382,837	301,679	152,196
France	12,984	155,200	17,377
Illyria, Croatia, and Dalmatia	711,169	496,494	42,327
Turkey and Wallachia and Moldavia .	1,915,656	768,763	220,032
Egypt	2,294,011	353,107	95,550
United States	3,817,082	3,657,308	6,081,277
Chili	476,159	193,385	187,020
British North America	154,376	105,227	580,655
Other Countries	575,775	189,394	142,438
Total Wheat	17,696,503	12,194,021	13,843,124
Barley	2,586,529	4,686,894	3,824,222
Oats	3,486,392	2,368,099	4,467,633
Peas	396,801	372,233	879,425
Beans	1,097,691	961,066	768,002
Indian Corn, or Maize	4,913,715	6,618,574	6,498,538
Wheatmeal and Flour from—			
Hanse Towns	281,407	268,351	424,954
France	227,498	692,271	555,968
United States	338,092	340,478	1,105,782
British North America	64,126	37,519	62,357
Other Countries	515,899	478,961	327,131
Total Wheatmeal and Flour	1,427,022	1,817,580	2,476,192

QUANTITIES of BRITISH WHEAT SOLD in the Towns from which Returns are received under the Act of the 27th and 28th VICTORIA, cap. 87, and their AVERAGE PRICES, in each of the SIX MONTHS of the YEARS 1865-70.

	Quantities in Quarters.					
	1865.	1866.	1867.	1868.	1869.	1870.
	quarters.	quarters.	quarters.	quarters.	quarters.	quarters.
First month ..	300,816	212,713	221,791	193,077	248,047	187,027
Second month ..	298,271	259,999	203,900	201,325	258,883	231,428
Third month (five weeks)	373,069	331,295	280,878	235,402	278,086	314,040
Fourth month ..	261,501	250,159	205,231	173,120	204,519	242,457
Fifth month ..	327,694	250,890	221,067	162,030	238,483	281,620
Sixth month (five weeks)	283,528	245,393	196,985	128,142	268,599	296,028

	Average Prices per Quarter.											
	1865.		1866.		1867.		1868.		1869.		1870.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
First month ..	38	6	45	10	61	5	70	4	51	10	43	11
Second month ..	38	3	45	7	60	11	72	11	50	10	41	10
Third month five weeks)	38	6	45	4	59	9	73	1	48	5	41	3
Fourth month ..	39	8	44	10	61	7	73	4	46	4	42	7
Fifth month ..	41	0	46	3	64	8	74	3	44	8	43	10
Sixth month five weeks)	41	5	48	3	65	5	68	9	45	10	47	0

AVERAGE PRICES of BRITISH CORN per Quarter (imperial measure) as received from the INSPECTORS and OFFICERS of EXCISE according to the Act of 27th and 28th VICTORIA, cap. 87, in each of the first TWENTY-SIX WEEKS of the Year 1870.

Week ending.	Wheat.		Barley.		Oats.		Week ending.	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.		s.	d.	s.	d.	s.	d.
January 1 ..	43	8	35	9	20	10	April 2 ..	42	5	35	0	21	5
January 8 ..	44	5	35	11	20	1	April 9 ..	42	8	34	11	20	9
January 15 ..	44	1	36	4	21	4	April 16 ..	42	10	35	2	21	5
January 22 ..	43	6	36	2	20	10	April 23 ..	42	7	34	11	20	8
January 29 ..	42	8	35	7	20	4	April 30 ..	42	7	33	1	21	7
February 5	42	2	35	3	20	8	May 7 ..	43	3	34	2	23	1
February 12 ..	41	9	34	6	19	10	May 14 ..	44	5	33	9	23	1
February 19 ..	40	8	34	2	19	10	May 21 ..	45	3	32	5	22	0
February 26 ..	40	7	33	9	20	7	May 28 ..	45	4	32	11	23	10
March 5 ..	41	0	33	7	20	8	June 4 ..	45	3	32	0	23	0
March 12 ..	40	9	33	10	20	10	June 11 ..	46	1	33	1	22	0
March 19 ..	41	9	34	4	21	1	June 18 ..	48	0	32	5	25	0
March 26 ..	42	5	34	5	21	2	June 25 ..	50	5	33	5	25	1
Average of Winter Quarter	42	3	34	10	20	7	Average of Spring Quarter	44	8	33	7	22	6

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 Ten Quarters ending June 30th, 1870.

Quarters ending.	Average Prices.						Pauperism.		Mean Temperature.
	Consols (for Money).	Average 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.	Meat per lb. at the Metropolitan Meat Market (by the Carcase). Mutton.	Best Potatoes per Ton, at Waterside Market Southwark.	Quarterly Average of the Number of Paupers relieved on the *last day* of each week. In-door.	Quarterly Average of the Number of Paupers relieved on the *last day* of each week. Out-door.	
1868:	£.		s. d.						°
Mar. 31	93	2·0	72 2	$4\frac{1}{4}d.$—$6\frac{1}{2}d.$ Mean $5\frac{3}{8}d.$	$4\frac{1}{4}d.$—$6\frac{1}{2}d.$ Mean $5\frac{3}{8}d.$	125*s.*—170*s.* Mean 147*s.* 6*d.*	159,720	861,044	41·4
June 30	$94\frac{3}{8}$	2·0	71 10	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$4\frac{3}{4}d.$—$7d.$ Mean $5\frac{7}{8}d.$	130*s.*—170*s.* Mean 150*s.*	142,588	800,944	55·8
Sept. 30	$94\frac{3}{8}$	2·0	59 1	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$4\frac{3}{4}d.$—$6\frac{3}{4}d.$ Mean $5\frac{3}{4}d.$	120*s.*—175*s.* Mean 147*s.* 6*d.*	138,284	778,804	63·9
Dec. 31	$94\frac{3}{8}$	2·4	51 11	$4\frac{1}{2}d.$—$7d.$ Mean $5\frac{3}{4}$d.	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	70*s.*—140*s.* Mean 105*s.*	152,733	797,546	45·1
1869:									
Mar. 31	$92\frac{7}{8}$	3·0	50 2	$4\frac{3}{4}d.$—$7\frac{1}{4}d.$ Mean 6*d.*	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	70*s.*—140*s.* Mean 105*s.*	162,308	850,883	41·3
June 30	$93\frac{1}{8}$	4·2	45 7	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5d.$—$7\frac{3}{4}d.$ Mean $6\frac{3}{8}d.$	60*s.*—130*s.* Mean 95*s.*	145·094	816,260	52·0
Sept. 30	93	2·9	50 11	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5\frac{1}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{3}{8}d.$	95*s.*—125*s.* Mean 110*s.*	137,406	781,382	61·4
Dec. 31	$93\frac{4}{8}$	2·8	46 0	$4\frac{3}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{8}d.$	$5d.$—$7\frac{1}{2}d.$ Mean $6\frac{1}{4}d.$	75*s.*—100*s.* Mean 87*s.* 6*d.*	152,021	813,753	43·3
1870:									
Mar. 31	$92\frac{5}{8}$	3·0	42 3	$4\frac{1}{2}d.$—$7d.$ Mean $5\frac{3}{4}d.$	$5\frac{1}{4}d.$—$7\frac{1}{4}d.$ Mean $6\frac{1}{4}d.$	95*s.*—110*s.* Mean 102*s.* 6*d.*	164,387	892,822	38·0
June 30	94	3·0	44 8	$4\frac{1}{2}d.$—$6\frac{3}{4}d.$ Mean $5\frac{5}{8}d.$	$5\frac{1}{4}d.$—$7\frac{1}{2}d.$ Mean $6\frac{3}{8}d.$	115*s.*—135*s.* Mean 125*s.*	144,226	825,337	54·4

STATISTICS OF DAIRY PRODUCE.

(The following quotations are extracted from '*The Grocer.*' See Number for July 2nd, 1870.)

Butter and Cheese.

London, 1*st July*, 1870.

"Our pastures are in a worse state than at any period this season, and we think we may safely add at any corresponding period for many, very many years past. It now behoves us to look to our prospects for the future of this season. All who have given the subject any attention will admit that our hay crop in this district must be considered a failure; and thus far we are without any appearance of plants of mangold wurzel or turnip to take its place for winter use for cattle. The general usage is, that after the hay crop is secured the pastures are reserved for the remainder of the season for grazing purposes; but this summer, should rain immediately set in, it is more than probable that fully one-third of our meadow land will be preserved for the chance that it may afford of a second hay crop, in the hope of partially filling up the gap that our rick-yards now show. All this is just now but conjecture; we, however, think it a natural one, and therefore place it before our subscribers. Should it prove correct, the result must be lessened make of butter. Whether or not this want of supplies will any way be equalised by the want of employment giving the labouring classes less money to spend, remains to be seen.

"*Irish Butter.*—The demand since our last has not been an active one; with only a moderate quantity on offer, the little change that has taken place is slightly in favour of buyers. Should any demand spring up, we have not enough lying here on offer to keep the market in check.

"*Foreign Butter.*—In our last we stated we thought our supplies would fall short of those of the corresponding period last year. Thus far in the week such has been the case. Although the demand has not been what can be termed active, it has been sufficient to clear off the fine qualities fast as to hand, and at prices much the same as those last advised. Extra fine Normandys may be quoted 126*s.* to 134*s.*; useful kinds, from 110*s.* to 120*s.*; common, downwards to 92*s.*; Jerseys, best, 100*s.* to 110*s.*; other kinds, according to quality, downwards to 80*s.* Holders of Dutch have shown more firmness.

"*Cheese.*—Although but little change can be made in quotations, the demand for English since our last has been far from cheerful. Fine old is now, no doubt, in a narrow compass, but there are still some parcels of second-rate things, that is now time they were cleared off. With holders willing to submit to any reasonable offers supplies of new are coming forward more freely, but no doubt seems to be entertained of the make thus far being less than usual. For American the demand for all good qualities has, to this time, been equal to the supplies; the quantity now on passage is far from being overpowering. The prices at which it is offered here are from 4*s.* to 8*s.* below those of the corresponding period last year."

Prices Current on 2nd July, 1870, and on corresponding date of 1869, from actual Market Sales.

	1869.	1870.
Butter:	per cwt.	per cwt.
Carlow, finest F.O.B.	104s. to 106s.	116s. to 118s.
Landed	104 ,, 108	114 ,, 120
Cork, 1sts	107 ,, 109	116 ,, 117
„ 2nds	104 ,, 106	113 ,, 114
„ 3rds, new	96 ,, 98	107 ,, 108
„ 4ths „	92 ,, 94	102 ,, 104
Limerick	.. ..	114 ,, 116
Tralee and Kilrush	.. ..	.. ..
Foreign:		
Friesland	90 ,, 102	90 ,, 112
Jersey, &c.	80 ,, 100	80 ,, 110
Kiel	90 ,, 112	105 ,, 118
Normandy	84 ,, 112	90 ,, 134
American	.. ..	.. ..
Cheese:		
English Cheddar, fine	76 ,, 82	90 ,, 94
„ good	72 ,, 74	70 ,, 86
Red Somerset Loaf	.. ..	.. ..
White or yellow Cheddar Loaf ..	72 ,, 76	.. ..
Scotch Cheddar	72 ,, 80	65 ,, 80
Cheshire, fine	76 ,, 82	84 ,, 90
„ good ditto new	64 ,, 72	58 ,, 76
Wiltshire, fine	74 ,, 80	76 ,, 84
„ good	60 ,, 70	60 ,, 70
North Wilts. Loaf	75 ,, 80	76 ,, 86
Derby „	70 ,, 80	68 ,, 86
Foreign:		
American, fine	70 ,, 74	68 ,, 70
„ good	66 ,, 68	60 ,, 65
Gouda	50 ,, 56	42 ,, 56
Kanter	.. ..	.. ..
Edam	50 ,, 58	46 ,, 62

Cork, June 29th, 1870.

" *Butter.*—The weather has recently been all that could be desired for butter-making. Copious showers have had the effect of increasing supplies considerably, and receipts for past week show an excess of 1165 firkins over corresponding week last year. Demand, notwithstanding the large make, continues quite brisk, and prices have been well sustained throughout the week. On Friday 1*s.* advance on 1sts and 2nds was freely given. However, on Monday bidding was not so animated, and a similar decline on both qualities is to be noted. A continuance of the present mild weather will bring forward large supplies, and purchasers who have not yet secured some months' stock would do well in laying by some of the dairies that are now coming to market whilst they can procure cool-made, good-keeping butter, and at reasonable prices. The present lull in the market is said to be, in the opinion of many who are experienced in the trade, but temporary, as, should warm weather set in, supplies will fall off and a reaction is sure to follow. The mild-cured department continues to be fairly supplied, and quotations have varied little during the week.

	firkins.
Total receipts for week ending June 29, 1870	12,518
,, ,, June 30, 1869	11,353
Excess for week ending June 29, 1870	1,165

Qualities inspected to-day—1sts, 828; 2nds, 934; 3rds, 324; 4ths, 25; 5ths, 2. This day's prices—1sts, 112*s.*; 2nds, 109*s.*; 3rds, 102*s.*; 4ths, 99*s.*; 5ths, 75*s.* Mild—1sts, 116*s.*; 2nds, 113*s*; 3rds, 105*s.*"

PAUPERISM.

The annual return of the number of paupers in England on 1st January, 1870, shows that at that date the number was 1,085,198, being 1 in 18, or 5·4 per cent. of the actual population, and an increase—including 3 new unions—of 38,629, or 4 per cent., over the number at the corresponding date in 1869. The indoor paupers on the 1st January, 1870, were 169,471; the outdoor, 915,727. 234,769 were men, 452,434 women, 392,126 children; 496,615 were able-bodied, 536,370 not able-bodied, 46,344 insane, and 5430 vagrants. Of the able-bodied 57,234 were men, and 136,855 women; and 302,526 children were relieved with their parents classed among the able-bodied adults. Of the not able-bodied, 157,452 were men, 290,244 women, 88,674 children; and of the insane, 20,083 were men, 25,335 women, 926 children. The number of able-bodied adult paupers relieved was 194,089, an increase—including 3 new unions—of 10,927, or 6 per cent., over the number on the 1st January, 1869.


MAP
OF THE
SOILS OF BELGIUM
SHEWING THE CONTOUR OF THE SURFACE
Compiled by H.M. Jenkins F.G.S.
Campine sand
Hesbayan loam
Polders & Alluvium
Strong plateau land
Contour lines in feet
Miles
M&N Hanhart, lith.
HOLLAND
River Scheldt
Flushing
Bergen op zoom
Helmond
Eindhoven
Venlo
Turnhout
ANTWERP
ANTWERP
Ostend
Bruges
St. Nicholas
Lierre
Herenthals
Gheel
Weert
Neder Weert
Viersen
Ruremonde
Stevensweert
WEST
FLANDERS
Thourout
Dixmude
Ghent
Lokeren
Termonde
Malines
LIMBOURG
Maeseyck
Sittard
Heinsberg
EAST
FLANDERS
Roulers
Poperinghe
Ypres
Cassel
Menin
Courtray
Oudenarde
Ninove
Alost
BRUSSELS
BRABANT
Louvain
Diest
Hasselt
Bilsen
St. Trond
Tirlemont
MAASTRICHT
Wyck
Tongres
Juliers
Aix la Chapelle
Hazebrouck
Tourcoin
Roubaix
Armentieres
LILLE
Tournay
Grammont
Ath
Leuze
Wavre
Nivelles
Gembloux
LIEGE
Eupen
HAINAULT
Fleurus
NAMUR
Charleroi
Mons
Binche
Condé
St. Amand
Valenciennes
Douai
Bouchain
Arras
Bethune
FRANCE
Maubeuge
Le Quesnoy
Cambrai
Landrecy
R. Sambre
Thuin
Dinant
Charlemont
Givet
Chimay
Rocroy
Charleville
Mezieres
Sedan
R. Meuse
Malmedy
BELGIAN LUXEMBOURG
Bastogne
Montmedy
Longwy
LUXEMBURG
PRUSSIA

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*Report on the Agriculture of Belgium: the Result of a Journey made at the request of the Council by* Dr. Augustus Voelcker, *and* H. M. Jenkins, F.G.S. (Reporter.)

Contents:

The agriculture of Belgium already possesses a considerable literature. So often has it formed the subject-matter of a book or an essay, that a tolerably accurate report might be produced from those sources by an industrious compiler. But the following pages contain only descriptions of what we actually saw, information which we gathered, and conclusions to which we were led. We have rarely quoted previous works, except where an old book might be called forth as a witness to the antiquity of a practice, or where a simple reference on points of detail answered our purpose as well as pages of description, or, lastly, in cases where our views are at variance with those advanced by some previous writers.

The agriculture of a whole kingdom necessarily involves so many questions that we are conscious of having omitted some of them, in the endeavour to keep our Report within readable limits; but we have tried to give a tolerably complete picture of the essential points in Belgian farming, and especially to bring into relief those features which are now of most interest. We hope that this consideration will be held to justify our having given to *la petite culture* more space than its practical importance would seem to require.

Writers of such Reports as the following are always largely indebted to the assistance they have received in the country in which their investigations have been made. It is our duty to express the obligations under which we rest to several gentlemen who rendered us services of great value, in forwarding the object of our journey. The Director of the Department of Agriculture, M. Ronnberg, by giving us letters of introduction to several leading agriculturists, removed at once great difficulties from our path, for those gentlemen materially assisted us in our inquiries, often at great personal inconvenience. We must particularly mention M. le Baron Peers, of Oostcamp; M. le Baron de la Fontaine, of Waremme; M. Parrin, of St. Nicholas; M. van Meldert, Burgomaster of Haeltert; and M. Dumont, of Chassart. To M. Fouquet, the genial and talented Sub-Director of the State Agricultural College at Gembloux, we are greatly indebted; and we have to thank M. von Schepdael of Brussels, an enterprising importer of English agricultural machinery, for several letters of introduction and much information. To M. Jacquemyns, the polite and accomplished President, and M. Tydgadt, the courteous and energetic Secretary, of the Agricultural Society of East Flanders, our warmest thanks are due, both for generous hospitality and prompt and accurate information on all subjects connected with *la petite culture;* throughout our journey we found them always ready to give us the most efficient help.*

I.—Soil and Climate.

In Belgium there are four descriptions of soil and as many kinds of farming, each soil having a culture peculiar to it. The distribution of the soils is shown on our map by colours, which roughly represent by their hue the relative strength of the land in the different regions. Each of these regions is characterised not only by its soil, subsoil, and mode of cultivation, but also by a variation in climate and a difference in the form of its surface, with the exception of the recently formed Polder-land, which has the same climate and surface-configuration as the adjoining districts. We may, therefore, regard these divisions as natural, and as affording a most interesting example of the dependence of modes of culture on natural attributes.

The map illustrating this Report is compiled chiefly from M. Dumont's 'Carte Géologique de la Belgique' and M. Houzeau's 'Carte Hypsométrique de la Belgique,' supplemented by

* Since this report has been in type, Mr. J. Howard, M.P., has kindly placed at our disposal some valuable information sent him by M. Leclere, Chief Inspector of Agriculture in Belgium. We have added M. Leclere's remarks as footnotes to those portions of our report to which they relate, more especially to the section treating of Rural Economy.

personal observations. It is not a geological map, but merely a map of the soils, with lines showing in a general way the configuration of the surface. Although boundary-lines have been drawn between the regions, in reality the various classes of soil pass into one another; and thus the loamy district of Central Belgium exhibits much lighter land near its junction with the sandy tract of Northern Belgium than it does where it joins the heavier land of the Polders, or the still stronger land on the south. Our four divisions are the following: — (1) The sandy district of Northern Belgium; (2) The loamy district of Central Belgium; (3) The Polders and River-valleys; and (4) The plateau-region of Southern Belgium. The tract of country at the extreme south of Belgium, viz. the Bas Luxembourg might have been distinguished by another colour; but as its extent is small, and its agriculture has more connexion with that of the Grand Duchy than with the rest of Belgium, besides being of very little importance, we do not propose to notice it as a separate province of agricultural Belgium.

1. *The Sandy District of Northern Belgium.*—To the traveller this region presents the appearance of a dead flat; but in reality it attains at the extreme eastern boundary of the Campine, beyond Hasselt, an elevation of 250 feet. With the exception of the eastern Campine, however, the maximum elevation is 80 feet, from which height the surface-line gradually descends to the sea-level at the coast. This otherwise perfect inclined plane is interrupted, near its summit, by the wide depressions which form the valleys of the Escaut and its tributaries, and which are so deep that although the town of Ghent is only 16 feet above the sea-level, and Termonde is barely 10, the line of 75 feet elevation is not more than 6 miles distant.

This district comprises the long strip coloured yellow on our map, and therefore includes nearly the whole of Northern Belgium. Its soil is naturally the almost pure blowing sand which forms the subsoil, and which is known to geologists as the "Campine sands."

With a sandy soil, an abundance of moisture, a sheltered position, and a coast-line washed by a sea warmed by the Gulf-stream, the climate of Northern Belgium is naturally favourable for the practice most characteristic of its agriculture, namely, the growth of two crops in one year. Like the greater portion of England, the kingdom of Belgium lies within the zone of 50° Fahr. mean annual temperature; but neither this nor the mean annual rainfall have much bearing on the agriculture of the countries, for it is the *distribution* of the moisture and the temperature which, as we shall see, really influences differences in agricultural practice. The mean summer temperature and summer rainfall affect the farming to a considerable extent, and the mean winter temperature and winter rainfall have a comparatively slight influence.

The mean summer temperature of England is about 61° Fahr., that of Flanders is about 63° Fahr. ; in winter these relations are reversed, being 39° in England and 37° in Flanders. The rainfall of Flanders is greater than that of England, being about 30 inches per annum, one-fifth of which is summer rain ; but in the greater portion of England the quantity of summer rain is larger. The average number of rainy days in England is between 150 and 160 per annum ; in Flanders, according to M. Houzeau, it rains, on the average, on 190 days in every year. One other fact in the climatology of Flanders is also favourable to the catch-crop system, viz. the greater amount of summer heat than we obtain in England. This condition, and the length of the solar day, combine to advance the ripening of the corn-crops, and thus leave the land vacant a little earlier. This fact is tolerably well known, but it may be useful here to state its cause. All seeds require, to enable them to ripen, a certain definite amount of heat in the concrete, as it were—such as might theoretically be produced, for instance, by burning so many pounds of coal. Therefore, the more intense the heat, or the longer the sun has power during the day, the sooner will the corn ripen. Again, in Flanders frost is rare in October, and equally rare after the middle of April. In England we generally get frost much earlier, and rarely part with it completely until after the third week in May. In Flanders it freezes on about 50 days in the year, in the south-east of England on about 70. These facts appear to show that in this division of Belgium a longer period of the year is what may be called "a growing time" than is the case in England. Add to this the possession of a very light soil, a warm and moist climate, and it will be easily understood how the growth of "catch crops" has become so prominent a feature of Flemish husbandry.

2. *The Loamy District of Central Belgium.*—This region, coloured red on the map, is that of the Hesbayan loam, which is covered by a good deep soil of moderate strength, about comparable in most parishes to our best turnip and barley soils, but becoming lighter towards the sandy land of the district just described and heavier towards those which remain to be noticed. Speaking broadly, the land is of better quality in the central and eastern portions of the district than in the western. Its surface is pleasantly diversified in the west—where it is studded with isolated eminences (see map), the hills attaining a height of between 400 and 500 feet—and becomes simplified in the east, where it forms broad and flat undulations, which are a rolling

continuation of the "inclined plane" of Northern Belgium, and rise to a height of nearly 600 feet on the verge of the Meuse valley.

The climate varies more than that of Flanders, the mean summer temperature being as high as 65° Fahr., and the mean winter temperature as low as 35° Fahr. The rainfall is less in amount and is spread over a smaller number of days, but snow usually falls on from twenty to twenty-five days in the year. These peculiarities, added to the additional strength of the land, have doubtless caused those differences in agricultural practice which we shall have to notice.

3. *The Polders and River-valleys.*—The soil of this division (ruled blue on the map) consists of what is usually termed alluvium, namely, an argillaceous soil, containing a varying proportion of sand and a little lime. Generally, it is extremely fertile, especially when first reclaimed. The term "Polders" is properly applied to alluvial flats reclaimed from the sea or the mouths of rivers, and protected by dykes against high tides, floods, and storms. The whole of the Dutch and Belgian coast-line consists of this description of land, and a large portion of the kingdom of Holland comes under the same title. With this land we have classed the alluvium of the river-valleys, which has been formed by the deposition of mud by the rivers, especially during floods, in those portions of their course where the velocity of the stream is not sufficient to transport the mud brought down from the higher country.* This alluvium differs very slightly from the Polders in actual composition, but very materially in agricultural use; for the former, especially when irrigated, forms extremely rich feeding and meadow land, while the latter is almost exclusively devoted to the growth of corn. In climate, the Polder-region resembles the adjoining portion of Flanders, differing only to such an extent as may be caused by the influence of the soil on temperature and humidity. Physically, the Polders form a nearly plane surface, the undulations being scarcely visible, and rarely attaining a greater height than 4 or 5 feet.

4. *The Plateau-region of Southern Belgium.*—A glance at our map will show that south of the Meuse the surface rapidly rises to a height of nearly 800 feet, between which elevation and the line of 1000 feet it forms a somewhat triangular plateau. Still further south the same phenomena are repeated; the surface rises even more rapidly than before from the 1000 feet line to a mean height of about 1500 feet, and then a plateau of more broken character is reached. The former of these mountain-plains is known as the Condroz, and the latter as the Ardennes.

* Owing to the small scale of the map we have not been able to show these river-deposits, except where they have a great breadth, but in reality they border most of the streams in Northern and Central Belgium.

The plateau of the Ardennes is studded with mountain-crests, where the climate is more severe than in the remainder of the region; but otherwise, while the mean summer temperature is the same as in Flanders, viz. 63° Fahr., the mean winter temperature is not less than 7° lower, being 30° Fahr. Snow falls generally on 30 days every year, or just twice as many as in Northern Belgium; it freezes on no less than 80 days every year, or 30 more than in the sandy zone; but it does not rain on more than 150 days in the year, or 40 *less* than in Flanders, although the quantity is more considerable, reaching as much as 40 inches per annum. The geology of the country south of the Meuse is highly interesting to the student of science, but for agricultural purposes it is sufficient to state that the surface consists of very strong land, having a varying depth, frequently as much as 2 feet, and resting upon highly contorted beds of limestone or schist, belonging to the Carboniferous, Devonian, and Silurian periods.

II. The Sandy District of Northern Belgium:— La Petite Culture.

1. *The Land.*—Although the soil of this district consists almost entirely of sand, it nevertheless possesses differences of quality which have determined the comparative prosperity of the localities in which they occur. The best land occurs in the Pays de Waes, and the worst, probably, in the extreme eastern part of the Campine. Naturally, cultivation was commenced where the soil was most promising; and hence, in the Pays de Waes, the population is most dense, the farms and the properties are most divided, and the rents are the highest. To bring the remainder of the region into cultivation, all of it being naturally more or less barren, required time, money, and, more than all, labour. The process adopted was recorded forty years ago by M. Van Aelbroeck, in his work, 'L'Agriculture pratique de la Flandre,' and is nearly identical with what we saw actually in progress near Hasselt in the Campine, where M. Van Vinkeroy has brought under cultivation about 550 acres in the midst of a region of pure white blowing sand, growing nothing but heather.

To enable our readers to understand the process, it is necessary to dig a little beneath the surface. The strata are not more than a few inches each in thickness, and consist of the following beds in descending order:—

1. Nearly pure white sand, from 6 to 7 inches.
2. Blackish sand ,, 7 to 8 inches.
3. Ochreous sand thickness unknown.

The following analyses and explanation of the properties of these soils by Dr. Voelcker will probably be found interesting:—

Composition of three Belgian Campine soils from the neighbourhood of Hasselt. Proprietor M. Van Vinkeroy.

Soils dried at 212° Fahr.

	Top layer.	Intermediate layer.	Third layer.
Organic matter	1·690	2·890	1·771
Oxide of iron	·160	·690	1·010
Alumina	·040	·417	·727
Lime	·078	·059	·095
Magnesia	·110	·180	·459
Potash	·027	·050	·088
Soda	·003	·015	—
Phosphoric acid	·012	·058	·083
Sulphuric acid	·034	·058	·092
Silica (white sand)	98·010	95·790	95·861
	100·164	100·207	100·186

The top soil contained a little organic matter in the shape of small roots of plants, readily distinguishable by their form and dark colour. The soil apart from the rootlets was nearly white, and on heating in an open platinum capsule appeared to be a whitish sand tinged very faintly yellow by a trace of oxide of iron. It contained in round numbers 98 per cent. of pure white sand, mere traces of potash and phosphoric acid, and only fractions per cent. of lime, alumina, oxide of iron, magnesia, soda, and sulphuric acid. Adding the organic matter (1·69) to the sand, we have 99·70 per cent., which leaves only 3 parts in 1000 for all the other soil-constituents.

It need hardly be mentioned that this is a soil of extreme poverty. Manure applied to it, we were told, produces little effect; a fact which finds a ready explanation in the absence of any appreciable quantity of alumina, oxide of iron, and other soil-constituents possessing the power of absorbing and retaining the fertilising substances contained in yard-manure.

The intermediate or second layer of soil had a dark brown colour, which is due to organic substances of the nature of ulmic and humic acid. Heated in an open platinum capsule, this portion of the soil burned bright red, showing that mixed, or more probably combined, with the organic acids, there was oxide of iron in sufficient quantity to colour the sand, after burning, bright red. The second layer, it will be seen, contained four-times as much oxide of iron and ten times as much alumina as the top-layer. It likewise contained considerably more phosphoric acid and potash than the top-soil, and altogether is better adapted to sustain vegetable life than the extremely sterile top-soil.

Casting a glance at the analytical results in the third column, the reader will not fail to discern that the lowest layer of this Campine soil contrasts most favourably in all particulars with the top-soil, and that it likewise shows a decided superiority over the intermediate layer. The proportion of oxide of iron, it will be seen, rises in the third layer to 1 per cent., and that of alumina to nearly $\frac{3}{4}$ per cent.; and with this rise we find an increasing amount of phosphoric acid and potash. In its natural state the third layer had a reddish colour, due to oxide of iron. The differences in the amounts of organic matter in the three layers of soil are greater than they appear in the preceding tabular statement; for, in the case of the third-soil layer, the organic matter given in the analysis includes a considerable proportion of water of combination, which, together with the organic matter, is dissipated on heating the soil with a view of determining the amount of the latter, whilst in the top and intermediate layer the organic matter includes scarcely any combined water.

The preceding analyses are interesting, for they clearly demonstrate the propriety of bringing up the lowest layer, which is by far the most fertile of the three; and mixing it with the second layer, and turning the all but completely barren top-soil to the bottom.

The poverty of all the three layers in lime is very marked. Lime performs important functions in the vegetable economy, and is itself a constituent which enters largely into the composition of the mineral portion of all our agricultural crops. It cannot therefore be doubted that an abundant supply of chalk or lime, or better still clay-marl, would greatly improve the productive power of these Campine soils. Indeed lime, in some form or the other, should be freely incorporated with these lands if it is desired to effect a radical improvement in its agricultural capabilities. The propriety of freely applying lime to this kind of land receives an additional support in the fact that the intermediate-soil layer is full of organic acids, or so-called sour humus, which require to be neutralised by a base, such as lime, before they can become plant-food.—AUGUSTUS VOELCKER.

The autumn before the land is to be brought into cultivation the heath is cut, and, preferably, used during the winter as litter for stock, otherwise it is left to rot on the compost-heap. While the weather permits, the land is dug with the long Flemish spade to the depth of about 2 feet, the top layer being completely buried, and about 15 inches of the two lower beds mixed and brought to the surface. The cost of this operation ranges from 5*l.* or 6*l.* per acre up to a much larger amount, but it bears no proportion to the thereby increased value of the land; for the rental immediately after reclamation may be placed at 30*s.* per acre, while the land was previously worthless for farming purposes.

In this manner, especially in the Pays de Waes and the district reaching westward to the Polders, the land was originally brought into cultivation; but in many parts of the Campine the soil is still a pure white blowing sand, and is still in its primitive barrenness. For thousands of acres together the country consists of a vast plain of heather, relieved only by patches of pine-forest. Comparing this picture with the artificial productiveness of the region between Antwerp and Bruges, it is almost impossible to believe that what we now see in the one province was, a century ago, equally characteristic of large portions of the other; but what now prevails in Flanders—what has excited the admiration of agricultural travellers for the last half-century—is unquestionably the result of incessant labour combined with marvellous frugality.

The reclamation of a sandy heath was not, however, the only, and perhaps not the chief, source of the reputation which the farming of Flanders has so long enjoyed. There was, in addition, this striking peculiarity—that the farms were exceptionally small, and that this once barren district produced the largest crops, and sustained, in apparent comfort and independence, the densest agricultural population in Europe. Forty years ago the concurrent testimony of numerous writers pointed out the farming of Flanders as the most productive and the most advanced in Europe. But while, in the interval, English agriculture has made enormous strides, the farming of Flanders has remained stationary; and it is now as accurately described in the old books as it was in the last generation, in the days when they were written.

Rents in Belgium are generally high; in some parts of Flanders they are remarkably so, considering the quality of the land; but this consideration, although it would have weight in determining the relative value of two farms in one parish or district, furnishes absolutely no test of the value of a farm in the Campine, for instance, as compared with that of one in the Pays de Waes. In such cases we must judge by the law of supply and demand. The Pays de Waes may be termed the metropolis of *la petite culture;* and there, therefore, the competition for land is most keen; there also, singularly enough, is one of the worst systems of land-tenure in the world. Near Termonde, where a farm of 20 acres is accounted large, the light sandy land of this division of Belgium easily lets at from 48*s.* to 60*s.* per acre.* In the Campine, however, where the soil is similar, but

* The meadow land in this neighbourhood is much dearer, and will be described under its proper heading. Our statements of rents indicate the ranges which we ourselves observed. Government averages do not give a practically truthful idea,

where the country is not so densely populated, and where small farms are associated with considerable farms belonging to large proprietors, as well as with extensive tracts of pine-forest and heather, rents vary from 10*s.* to 35*s.* per acre, neither extreme being the rule. In districts where farms ranging from 5 acres to a maximum of 50 or 60 are to be found in one parish, rents generally range from 28*s.* to 45*s.* per acre, the smaller farms being usually the most highly rented, because there is more demand for them. In the Pays de Waes (the district round Lokeren and St. Nicholas) a common rent is 48*s.* per acre, near the Dutch frontier of the Campine it is not more than 20*s.*, and in the Antwerp district 30*s.* per acre.

2. *The Farms.*—A report on the agriculture of Belgium without a description of a Flemish farm and homestead would not give a complete picture of *la petite culture.* The Englishman's dictum that his "house is his castle," becomes a literal fact if applied to the complete homestead of a Flemish farmer. The farmhouse, the barn, the cowhouse, and all other farm-buildings are built together in the form of a hollow square, furnished with a large gateway and a pair of solid doors at one side. At night the plough, the harrow, the roller, the cart, and all other moveables belonging to the farmer are brought within the precincts of the homestead, the large folding gates are shut and secured, and there is absolutely no access from the world without to the quadrangular court within. All the buildings, including the house itself, consist simply of a ground floor; all the windows look into the quadrangle; and generally there are in the outer walls but a few vertical loopholes, more for ventilation than for light. The buildings are nearly always of brick, and the roofs are usually tiled in the more modern steadings; but there is always a certain breadth of thatching on the ridge of the house-roof, and sometimes also the barn-roof is either partially or entirely thatched. This plan is adopted because the threshed corn is kept in a loft over the living and sleeping rooms, and it is thought that thatching prevents injury to it from damp, and keeps the whole house warmer. The bricks are usually red, but sometimes they are white-washed; and the outside shutters, with which all the windows are furnished, are painted a bright green. The court-yard is paved with bricks, and the whole "ménage" is kept scrupulously clean. The condition of the homestead reflects that of the farmer, in mind, body, and estate.

The farms also have their peculiarities. In the light-land districts the fields are little narrow strips, their surfaces frequently

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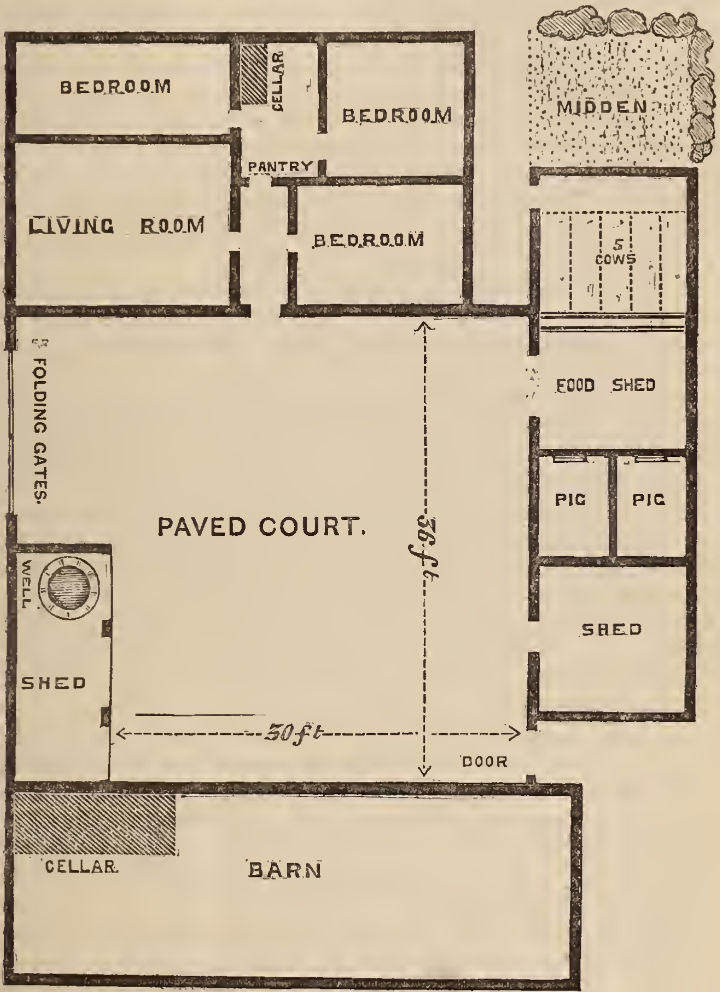
because they include so much unproductive land, as in the Campine, Hainault, and the Ardennes; and since the last statistics were collected (1856), rents and prices of land have risen from 30 to 40 per cent.

trimmed to a low arch like the beds in a well-kept flower-garden. They are divided by deep ditches, on each side of which is planted a row of alders. The roads are separated from the fields

Fig. 1.—*Plan of the Homestead of a Farm of* 10 *acres, near Haeltert.* (*See page* 31.)



by a wider ditch, or by a series of flax-pits, bordered on each side by a closely planted row of tall trees, frequently poplars, whose deleterious effect on the produce of the land is almost incredible. The alders are the property of the tenant, who cuts them once every seven or nine years; the large trees are the property of the landlord. Very often each field has a narrow strip of grass bordering the ditches, and these green lanes are frequently the only bits of pasture which the small farmer possesses. In the early morning, and towards sundown until dusk, one may generally see a cow, led by a woman or a child, nibbling this bit of green almost blade by blade. Sometimes there are two or three cows tethered together, similarly attended, and rigorously restricted, not only to the grass, but to a particular portion of it, which has been assigned to them for their morning or evening meal. The smallness of the fields, with their straight sides; the variety of crops grown, with their differences of colour; and the numerous seams of grass and alder, give to the face of the country an appearance which reminded us more forcibly of a homely patchwork quilt than the luxurious Turkey-carpet with which it has been so frequently compared.

There are degrees of littleness even amongst these very small farms; there are farms worked entirely by cows, and there are others in which a horse is kept; but a farm which supports a sufficient number of horses to do all the tillage and draught work would take us almost beyond the pale of *la petite culture.* We say almost, because in some cases a farmer can profitably employ more than one horse and some cows, while he has not sufficient land to induce him to keep two. In such cases he either hires a horse occasionally, or, being the possessor of two, he lets out one or both to neighbouring farmers who are deficient in horse-power. The most profitable size of a small farm is therefore considered to be that which will keep one horse constantly at work. This is estimated in various neighbourhoods at from 20 to 25 acres. In the Pays de Waes this is the maximum size of the farms, while 10 acres is about the most usual size of a holding when the farmer does no work except for himself.

But there are also other holdings of a lower grade, where neither horse nor cow is kept, and where the great object of the Flemish husbandman, viz. to obtain manure, is achieved by his keeping a pig or a few goats. Such plots are sometimes held by tradesmen, and the tillage-operations performed by contract, at a fixed price, or rarely for a certain proportion of the produce. Still smaller are those holdings, ranging up to an acre in extent, where the spade is the only agricultural implement, and where the tillers of the soil are the agricultural labourer's wife and children. But such "morsels" cannot alone yield enough to support the family, and must therefore be placed in a different class from true "farms."

3. *Implements.*—The Flemish spade is usually from 16 to 18 inches long in the blade, and about 8 or 9 inches wide at the bottom. It is always used for the root-crop (potatoes), for which

the land is dug as deeply as the soil will allow, down to 20 inches. This is not only a subsoiling, but it is a complete turning of the cultivated soil upside down. The frequency of the operation depends upon the shift, but it usually occurs about once in nine years. Another very important use is also made of the spade, in addition to this, and similar to the process of reclamation which we have already described. On all light-land farms, whatever their size, the land is cultivated in strips, about 6 or 7 feet wide, separated by trenches from a few inches to a foot in width. After a crop, when the stubble is ploughed, these trenches will be nearly obliterated; but after the seed for the next course has been sown and harrowed in, they will be dug out again, not exactly in the same position, but closely adjoining it. The earth dug out is thrown over the seed-beds, harrowed in, and rolled. If the farm has not long been under cultivation (a rare thing to see now-a-days except in the Campine), a little of the subsoil will also be dug out and spread on the surface, and in this way the whole area receives a gradual subsoiling in the course of years. The reason why these trenches are so common, even where the land has been under cultivation for generations, is that the farmers have no other means of drainage. Not that it is impossible to drain even so flat a country, but because the art of pipe-draining is not understood by the small farmer. Some large farms on strong land have been drained, but to these we shall refer more particularly hereafter.

The Flemish ploughs, harrows, and roller have been so frequently described, that it is unnecessary for us to say much about them except to record the fact that they are precisely the same now as they were thirty or forty years ago, when the old books on Flemish husbandry were written. Almost the smallest farmer possesses a plough, otherwise he borrows one. On the very small farms one or two cows are put into the plough, the harrow, or the cart; but occasionally the most grotesque "teams" may be seen. We saw also on a large farm, near the Pays de Waes, a very small plough, intended to be *pushed* by a man; but we never saw one actually in work, nor even in the collection of implements of a small farmer. The old wooden Flemish ploughs are still in use everywhere, even by men of otherwise advanced ideas; for a Flemish labourer, who lets this "machine" almost guide itself, would hardly like the work of an English ploughman.

Although the plough is a clumsy implement, the harrow and the roller are both worse. They are made of wood; the former is three-cornered usually, and the teeth (which are wooden spikes) are driven obliquely into holes in the frame. The roller is a wooden log, more or less trimmed into a cylindrical shape, sometimes very well, but sometimes very roughly. It is set in the midst of a heavy square frame, and usually requires at least two animals to draw it.

Rolling is a very favourite practice, and we shall have to revert to it again; but on small farms it frequently happens that such an implement as a roller does not exist. In this case the frame of an old harrow, or the harrow in use turned upside down, is laden with tree-stumps, stones, &c., and dragged across the field instead. This makeshift is evidently the origin of a special implement, peculiar to Belgium, called a "*traineau.*" The difference consists chiefly in the boards which fill up the triangular space enclosed by the harrow-frame.

One other implement deserves mention, namely, the weeding-iron. It is like a small hoe at one end, and a miniature rake at the other. It is not more than 15 inches long, and is held in the middle, so that either end may be used as required. This is the implement used by the weeders (chiefly women), who crawl with it against the wind, on their hands and knees, with their aprons held up to receive the weeds and thinned plants. The practice of sowing broadcast makes the operation, especially in the case of turnips, particularly laborious. The use of this weeding-iron takes the place of horse-hoeing and hand-hoeing, neither of which, as we understand them, is ever practised in *la petite culture.* A large heavy hoe is very much used instead of the spade or the plough, to break up stubbles previous to sowing turnips.

4. *Farmyard Manure.*—It would be almost impossible to infuse into a body of English agricultural labourers the same amount of interest in any subject as is displayed by all classes of Belgians in farmyard manure. Its collection, preservation, and application are all fruitful topics of conversation and subjects of debate. It is continually either "vett" in Flemish, or "fumier" in French, upon which the argument has turned; and as an actual fact it has a most important bearing at once on the greatest excellency and the greatest defect in Flemish farming. Throughout the light-land district it is carefully stored in a building similar to our old-fashion barns, but with a much lower roof, while the large and better farmers in the Polders and the heavy-land districts of West Flanders, prefer to have well-constructed buildings similar to the skeleton-barns of Cheshire. The latter plan seemed to us by far the more preferable: it is not so expensive; and as the manure is always trodden by calves and heifers, there is more ventilation for them, while the protection is not less effective. But in the district of *la petite culture*, the supposed superiority of the manure is more considered than the cost of its attainment, therefore a close building is preferred for storing

the manure, in spite of the injury done to the poor panting beasts who wearily tramp about in search of an exit from an atmosphere of ammonia*.

The drainings from the manure-house are carefully collected in tanks, as also are all other descriptions of liquid. The steading on one farm of sixty acres was furnished with the following tanks, each fitted with a separate pump :—

1. Receiving liquid refuse from the scullery.
2. Receiving liquid manure from the stables and cowsheds.
3. Receiving the drainings from the covered midden ; these are afterwards used for washing out the stables, &c., and then go into No. 2.
4. Receiving the overflow of the drainings, and any excess of water in rainy weather ; this is used on the meadows.

The above is a fair representative of the system adopted, and of the extraordinary anxiety with which the Flemish farmer attempts to save every particle of liquid manure ;† but we were heterodox enough to think that respecting some portion at least of these appliances "*le jeu n'en vaut pas la chandelle.*" The

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* I have shown in my paper on the 'Composition of Farmyard Manure,' and the changes it undergoes on keeping (see the 'Journal,' vol. xvii., part 1), that neither fresh nor rotten dung eontains an appreeiable amount of free ammonia; that *under good management*, dung loses none of its essential fertilising constituents; and that neither sun nor wind expels any volatile ammonia compounds from dung. It appears, therefore, quite unueeessary to keep dung in closed buildings. In localities where much rain falls, and a sufficient amount of litter cannot be used to absorb the liquid portion of the manure, it is advisable to have the manure-steading roofed in, and the sides open; but where sufficient litter can be spared in the making of the manure to retain, eveu in rainy weather, the liquid portion, it is even unnecessary to put a roof over the dung-pit. No loss in fertilising matter is experienced when dung is carted and spread upon the field as soon as it is possible to do so after it is produced.

The Belgian system of keeping farmyard-manure in closed buildings for a considerable length of time; the abundant use of water in its preparation, and the partial separation into liquid and solid dung, does not eommend itself to our view as worthy of imitation.

This system entails unnecessary expense in the eonstruetion of closed buildings, tanks, and labour for pumping, carting, and distributing separately the liquid and solid manure, and affords a far less effectual safeguard against loss in fertilising matter than the plau of carting and spreading the manure on the fields so soon as it can be done after it eomes from the stables or cowsheds; for, however well liquid-manure tanks may have been construeted, it is next to impossible to confine in them entirely large quantities of liquids; and it is by the draining away of the liquid, the most valuable portion of manure, and not by evaporating to the air or sun, that farmyard-manure sustains any loss in fertilising matter.—A. V.

† On farms where fattening stock is kept, the best plan of making and keeping manure unquestionably is to make it in boxes, a plan which is rarely seen in operation in Belgium. The Belgian farmer, as a rule, is anxious to obtain as mueh liquid manure as possible, and for this reason rather invites than prevents the rains, which fall from the unguttered roofs of the farm buildings to find their way into the midden.—A. V.

reason, however, why so much trouble is taken with both solid and liquid manure, and why so much time and labour are spent in its management, is simply that the small farmer has an excessive dislike to buying anything; and, mistaking bulk for quality, his argument is, "the more manure I can make, the less guano I shall want to buy."

Guano is used to a large extent, especially in the sandy districts; but throughout Belgium there seemed to be a prevailing ignorance of the value and uses of bones, superphosphates, nitrate of soda, and artificial manures generally. Speaking generally, the light soils of Belgium, like most sandy soils, are naturally very poor in phosphoric acid, so largely required for the formation of grain; and as phosphatic manures are rarely applied, and natural manure is made in the great majority of cases by ill-fed animals, we were not surprised to observe the comparative poverty of grain, and luxuriance of straw in the corn crops.

A farmer is regarded as good or bad precisely in proportion to the quantity of manure he can apply to his crops; and the money-value of natural fertilisers is placed very high, in consequence of the demand being so much in excess of the supply. Farmyard manure will sell readily at from 8*s.* to 10*s.* per ton; and one sagacious farmer, somewhat dubious as to the value of the liquid manure from his cowhouse, sold it to his neighbours at the rate of eight gallons for a penny. There is, however, no classification in this matter, and manure from cows fed on soup, clover, and grass, would sell for quite as much as that from feeding beasts, even if they were given a large quantity of linseed-cake.

The heaviest dressing of manure is habitually given for potatoes, generally 20 tons per acre, and sometimes the quantity is increased to 25 tons. The succeeding crop of wheat gets little or no manure. Both the rye and the oats which follow, one after the other, get a half-dressing (10 tons to the acre), and the clover is well watered with liquid manure. On light land, after clover, flax is not manured, the succeeding white crops get a half-dressing, and the buckwheat following is grown without manure. When farmyard manure runs short its place is supplied by guano, or by night-soil from the large towns.

5. *Rotation of Crops.*—The mode of culture pursued on all the farms of the light-land district is very much the same, although occasionlly, as in the Campine, they may range up to 50 or 60 acres. Therefore in the following remarks on the rotation of crops it must be remembered that they are applicable only to the zone coloured yellow on our map. Most writers on Flemish husbandry have given numerous examples of the rotation of crops, and some have attempted to explain the prin-

ciples on which they are based. The courses extend over several years, and some previous writers have found them very puzzling, more especially Mr. M'Lagan; while others, like Mr. Scott Burn, have been deeply impressed with the philosophy which they contain.

The last-mentioned writer observes * "There is, perhaps, no better way of studying what may be called the Philosophy of Flemish Farming, than by examining the system of its rotation —a system which is founded upon, and derived from, a long experience, and which affords a remarkable example of circumstances leading men to a mode of working which fully exemplifies the consistent theory, without the knowledge of the principles on which that theory is founded."

On the other hand Mr. M'Lagan writes † "I could perceive no fixed principle on which they founded their constantly varying rotations. The same farmer would give me one day one rotation, and the next another totally different from yesterday's, as the rotation he practised on his farm. * * * * With such conflicting statements, and with no prospect of unravelling the mystery, I began to solace myself with the thought that the Flemings had no such thing as a rotation, that they knew the value of a change of crops each year, and therefore they practised a succession rather than a rotation of crops. If they are rotations it is difficult to tell where they commence and where they end; and they are besides extremely long." He also states, "I have been enabled to trace out the few following facts :—That wheat and rye almost always succeed potatoes, and rye, potato wheat; the place of flax seems to be after oats and before wheat or rye. Clover is sown with any of the principal crops. Rape seems to succeed oats or rye."

We have now to propound an independent explanation, which has stood the test of repeated comparisons with our own "heterogeneous mass of rotations" obtained after an experience similar to that described so well by Mr. M'Lagan.

In the majority of cases it appeared to us that there was no regular course at all, the practice being to sow a certain number of crops which follow one another more or less irregularly. The ruling idea in the mind of a small farmer is to grow exactly what he wants for his own consumption, and for the nourishment of his stock; and to sow the remainder of his farm with what will pay him best to sell. He likes to sell as much and buy as little as possible. The crops for sale vary with the nature of the land, and with the quantity of manure available

* 'Quarterly Journal of Agriculture,' vol. xxii., p. 217. 1860.

† 'Quarterly Journal of Agriculture,' vol. xv., p. 106. 1845.

for them; but they are usually wheat or barley, flax, colza, and tobacco. The crops for home use are potatoes, rye (or a mixture of rye and wheat), oats, clover, and turnips and carrots as catch-crops.

Commencing, say, with potatoes, the small farmer will afterwards grow two or three white crops in succession, and get in addition a catch-crop of turnips after rye (invariably), sometimes sowing carrots in wheat or flax. After a certain number of these crops, varying generally with the quantity of manure he can obtain, but sometimes determined by a crop being exceptionally bad, the land has an "ameliorating" crop of clover sown in oats, wheat, or flax, or, in the Campine, frequently in colza. This clover remains one year, in which it is cut two or three times, sometimes four, and another similar succession of white crops is taken, when the *restorative* influence of potatoes is substituted for that of clover. One other practice is also observed, namely, the most valuable *selling* crops, such as wheat, flax, or colza, are always taken after the "ameliorating" crops of potatoes and clover.

Such a description of the rotation of crops on the small Flemish farms may not appear so symmetrical as a tabulated statement of several courses, each extending over 7, 8, or 9 years, and having the same essential characteristics of potatoes at each end and clover in the middle; but it is infinitely more true. Although it is impossible to give a more accurate idea of the course of cropping pursued by the generality of small farmers, there are large farmers who pursue a definite system of better character; but the practice of taking two or three white crops in succession is as much an integral part of the national system of husbandry as *la petite culture* itself. In the Pays de Waes, where the small farming is smaller than elsewhere, and the land is better, the mode of cropping is more continuous and systematic; and the following shift with its variations may almost be regarded as a local custom, differing only in this respect, that still another white crop (usually rye) may be taken in either or both series between potatoes and clover; but the best farmers are generally known by the shortness of their rotations, because that implies fewer corn crops taken in succession:—1, potatoes; 2, wheat and carrots; 3, rye, followed by turnips; 4, oats and clover; 5, clover; 6, flax and carrots; 7, barley or rye, followed by turnips; 8, buckwheat or rye; 9, potatoes again. But even here, although we have a regular succession of crops, its elements consist of one year potatoes, three years white crop, one year clover, three years white crop, and the ninth year returning again to potatoes. The succession of white crops is accompanied by a regular increase in the depth to which the land is ploughed; and the best farmers, therefore, prefer commencing with wheat, giving a ploughing of about 5 inches, following it with rye and ploughing an inch or two deeper, and again following with rye or oats and a still deeper ploughing. If they think there is no manure at a still greater depth, clover will be sown in this course, otherwise still another white crop will be taken, and a still deeper ploughing will be given,—or at least attempted. On stronger land (south of Alost) the course is frequently shorter, being clover, then 3 or 4 or 5 white crops, and at the end of five or six years returning again to clover. A part of each shift is either potatoes every year, or the potatoes are not included in the course at all, but grown on any convenient piece of land. In fact, on the small farms, there is no course devoted to mangolds, swedes, or turnips, as a fallow crop.

6. *Cultivation: Potatoes or Hemp.*—Commencing with potatoes, the stubble of the previous course, generally buckwheat, rye, or "mixture," is manured in the autumn with 20 or 25 tons to the acre of farmyard manure. This is ploughed in to the depth of about 6 inches, and left during the winter. In the spring the land is dug with a long-bladed spade to the depth of 15 or 16 inches, and the manure-sodden earth turned uppermost. The land is then generally planted with potatoes; but on some farms a great part of the course is sown with hemp. The culture of hemp is almost restricted to the Pays de Waes; it is not considered a paying crop, although the produce will frequently sell for 16*l.* per acre in the field. It is pulled up, dried, sheafed and stooked, remaining in the field from eight to ten days to get thoroughly dry. During the winter it is rotted in water-pits, in which it is sunk on rafts by means of grass-turf. It remains submerged from eight days to a fortnight, and is then taken up, dried, and broken by hand, each plant separately. This crop is thought to leave a good deal of manure in the ground, and is, therefore, always succeeded by wheat, with the addition of a very small dressing of dung. Potatoes are grown in this course to the extent which the farmer thinks he will require for his own use; if he does not want the whole of the shift, and the land is unsuitable for hemp, either flax or colza is substituted for it.

Wheat (or Rye) and Carrots.—The potatoes having been harvested, the tops and weeds are carted, or rather wheelbarrowed, to the compost heap as soon as possible, and the land ploughed about 5 inches deep, sown with about 8 pecks of rye or wheat per acre in October, and then harrowed. Some farmers, especially in some districts, sow their wheat in the spring; but most people prefer to get it in as early as possible in October. This anxiety is probably justified by the slight additional severity of the Flemish winter; and spring sowing is most in vogue on the large farms in the Ardennes, where the climate is too severe for any crop but spelt to resist the cold of winter and early spring. The catch-crop grown in the wheat is sown either at the same time as the corn, or in February, according to the fancy of the farmer; but in the last named month the seed *must* be sown; rain, hail, or even feet of snow will not prevent it, and the roots are said to flourish quite as well when the seed is sown under unpropitious meteorologic influences, as when it is got in during the finest weather. It may be as well to mention here that on the small Flemish farms everything is sown broadcast; only the most advanced proprietors possess a drill, while the majority of ordinary farmers are as ignorant of the implement as their language is oblivious of its name. This fact necessarily influences the after treatment of wheat and other crops; for instance, horse-hoes are all but unknown, and even hand-hoeing, as we understand it, is never practised. Weeding is done by troops of women, who crawl about the fields on their hands and knees, pulling up weeds and singling the useful plants. Top-dressings are also unknown. Harvesting is done in various ways: if carrots have been sown in the wheat or rye, the straw is pulled up by the roots, otherwise it is cut with either a scythe or hook. The yield of wheat obtained by the best small farmers in the Pays de Waes in a good year, such as 1868, is about 30 bushels per acre; but the ordinary "petit cultivateur" gets very much less. In 1868 the average yield of the wheat crop in the kingdom of Belgium was 24 bushels per acre; but the average of the Province of Hainault (a large farm district) was in the same year as much as 27 bushels per acre. These figures must not, however, be taken to represent what we should term "dressed corn," but the total yield previous to the very imperfect dressing which the grain receives. The quality is also very poor, the colour is high, smut and bunt are very prevalent,* and the weight rarely much exceeds 60 lbs. the Imperial bushel.

The wheat having been pulled up, the carrots remain, and, favoured by a climate remarkable for warm and prolonged autumns, they grow rapidly. They remain in the ground until frosts commence, when they are pulled, and stored indoors for winter use, both men and beasts being largely fed on them. A good crop of carrots in wheat will weigh about 8 tons per acre, but in flax they yield a larger crop. Where many carrots are grown, a few draft cows are fed off, as these roots are found more productive of fat than milk. They are used largely for pigs,

* The use of sulphate of copper, or other preparation for dressing wheat, is all but unknown in Belgium.

and, to a small extent, for horses; too large a quantity given to horses produces colic, and although they fatten, they do not keep draught animals in good condition. Throughout Belgium we noticed that the grain crops were not harvested soon enough. They are allowed to get dead ripe, so that a large quantity of grain is necessarily shed. In the month of September, the fields present a remarkably green aspect, due entirely to the sprouting of shed corn, and it was with difficulty that we understood the ordinary custom of the country to be identified with so wasteful a practice. Wheat is very subject to be laid; on sandy land the farmers say it is owing to the dryness of the summer climate, on heavier land it is attributed to other causes; but the consequence is that its place in the rotation is frequently supplied either by rye, which ripens before the dry season has fairly set in, or by a mixture of rye and wheat, in which the rye is supposed to hold up its weaker brother. We were inclined to attribute the liability of wheat to be laid to the excess of nitrogen and the deficiency of phosphates in the manures habitually used in Belgium, combined with the exhausting nature of the rotation of crops.

Rye followed by Turnips.—The preparation for rye is generally the same as for wheat; but we have seen the whole of the operations going on simultaneously in one field of two or three acres extent. The crop is harvested about the end of July, and yields about the same quantity per acre as wheat. The stubble is immediately ploughed to the depth of 6 or 7 inches, or hacked with a large hoe, and in a few days is harrowed and sown with turnips, which in good years will yield from 8 to 10 tons per acre. Of all modes of culture, that of turnips on the small Flemish farms seemed to us the most laborious. As soon as the seedlings appear, women are set to thin and weed them, and from this duty there is positively no respite until the roots get a tolerably large size; for owing to the practice of sowing broadcast, the plants must be weeded and thinned over and over again. If there is any liquid manure to spare, this is the crop to which it is applied; and the rude contrivances for its distribution entail an enormous loss of time and labour. Some small farmers do certainly possess a barrel, which, when mounted on a cart, and fitted with a tap, forms a rough manure-distributor, requiring little manual labour but great attention. The very small holders, however, take the liquid manure into the fields in tubs on wheelbarrows, and they distribute it with considerable deftness, by means of a ladle-like shovel. Turnips and other fodder-roots are, as a rule in Belgium, grown too close together.

White Crop and Clover.—For this course the land receives a half-dressing of manure, and is ploughed for oats much deeper than for wheat or rye. Sometimes the seed is sown in the winter; but otherwise, in the spring the land has a shallow ploughing, a harrowing, and a rolling. The clover (usually cow-grass) is either sown immediately after the corn, especially if both are sown in the winter, and the two harrowed in together, or the oats are harrowed in first, and the clover sown about a week or eight days afterwards. Oats are not generally harvested until late in August or the beginning of September; but owing to the warmth of the autumn it is frequently possible to get a cutting of clover two or three weeks after harvest, though this is not always done. In the following spring Dutch ashes or liquid manure is extensively applied to the clover crop, and generally a dressing is given the previous year soon after the white crop has shown above ground. It is especially necessary to notice this practice, as the luxuriance of clover in Flanders is one of the most remarkable facts we have to record. Some of the statements which we received respecting the yield of clover were so extraordinary that we cannot quote them; but a crop of 15 tons of green clover per acre yielded by three cuttings in one year, may be regarded as a moderate estimate. We shall, hereafter, have to refer more particularly to this subject, and to the causes of this luxuriance, therefore at present the bare record of the fact will be sufficient for our purpose.

Flax with Clover or Carrots.—Every small farmer grows a certain quantity of flax if his land is at all suitable for it, and great pains are taken to secure a fine tilth by winter and spring ploughings, as well as repeated harrowings and rollings. The flax seed (Riga) and the seed for the "simultaneous" crop are sown together in March, if possible; an enormous quantity of the former being used, as, when grown thickly, the quality of the fibre is finer. About the end of June or the beginning of July the flax is harvested by being pulled up, and dried in small sheaves. From that time the carrots have the ground to themselves, so that they yield a much better crop (about 10 tons per acre) when sown with flax than with wheat, the harvest of which is so much later. Other particulars connected with this crop will be more advantageously recorded hereafter.

Buckwheat.—This crop is very much grown in some parts of the light-land districts, and it furnishes an agricultural topic on which differences of opinion are held to be allowable. The advantages of the crop are said to be that it needs no manure, that owing to its not requiring to be sown until late in the spring the land can be thoroughly cleaned previously, and that any weeds still remaining will certainly be choked by the rapid growth of the buckwheat. The opponents of its culture hold that although no manure is given for this crop, it completely exhausts the land of what it previously contained; that the produce per acre is not more than one-half what would be yielded by wheat or rye, in money or grain, and that a good farmer ought not to require a course devoted to the purpose of killing weeds. As a rule, the land is ploughed in winter, and then left until spring, when it will receive about two more ploughings, harrowings, and rollings. The seed is sown late in the spring, after all danger from frosts has passed; and the crop is harvested in September, yielding about 16 bushels per acre on the average.

7. *Stock.*—Hitherto *la petite culture* has probably been even more celebrated amongst Englishmen for the number of head of cattle said to be kept on a given area, than for any other phase in its economy. We were told by an intelligent and well-read member of the Belgian Chamber of Representatives, that the small farmers keep a cow and one younger beast (either heifer, yearling, or calf) to every hectare ($2\frac{1}{2}$ acres) of land. As this was nearly double the number of head of cattle we had found on any farm in Belgium, we were particularly desirous of ascertaining under what circumstances and by what treatment the land could be rendered capable of sustaining so large a number of stock. Ultimately we found that the establishment was attached to a workhouse, which contained 14 old men, 10 old women, and 6 children. The stock consisted of 4 cows, 1 working ox, 1 heifer, and 3 calves, and the extent of ground was $4\frac{1}{2}$ hectares, making exactly 2 beasts to 1 hectare. Now it was of great importance to produce milk and butter for the use of the establishment, as well as a surplus for sale; and whatever deficiency occurred in the supply of food yielded by the farm, either for man or beast, was bought with money supplied by the commune, or earned by the women and children in working flax (the old men did the field work). No rent and no wages were paid. Under these circumstances it seemed to us equally just to say that two head of cattle were kept on each hectare of land, as to say that the thirty human beings were also fed by the produce of the farm. We quote this little episode to show that statements made in good faith, by even well-informed men, must, in the absence of positive proof, be frequently received with some caution.

The usual number of stock kept on the light-land farms is in the proportion of 2 cows, 1 heifer, and 1 yearling or calf to every 4 hectares (10 acres) of ground. When calves are sold off very young, and only cows in full milk are kept, the proportion is about 2 cows to 3 hectares ($7\frac{1}{2}$ acres). When a man is the proprietor of his farm, has a comparative abundance of capital to enable him to purchase food, &c., and is so situated that his milk and butter find a ready sale at good prices in the neighbouring towns, it pays him better to sell those products obtained by what amounts to an extension of his farm, than to keep the money thus employed lying idle until he can buy more land.

Again, where there is rich feeding land—irrigated meadow-land bordering a river—as is frequently the case (see p. 66), the proportion of cows kept becomes a little larger, on account of a custom which we shall presently mention. And under a combination of all these favourable circumstances a small farmer may even be bold enough to feed some of his own steers, and work them off as what he calls "fat" at 2 years old. No sheep are kept on the small farms proper; but in each commune there is generally at least one tenant-farmer or proprietor who finds himself called upon to fulfil the duty of keeping a small flock. The custom is that the sheep are allowed to run over everybody's stubbles, to feed in all the lanes, and in the winter even to trespass on other people's pastures; and in return their owner is obliged to keep one or more bulls to serve the cows belonging to any little farmer in the commune.

The custom relating to irrigated meadows, such as border the Escaut, is, that any person in certain communes has the right to turn his cattle into those fields during the months of September and October, that is, after the second hay-harvest. These meadows are very valuable, letting at from 80*s.* to 112*s.* per acre, so that the value of this privilege is considerable. Another point is, that the proprietors of these meadows have of late years found it more profitable to sell their hay by auction than to let the land; and the small farmers who can afford to keep many cows are keen competitors for the purchase of this fodder. Under such conditions we found one man who farmed 20 acres keeping 4 cows, 3 heifers and yearlings, and 5 steers to be fed off at 2 years old. This proportion is $1\frac{1}{2}$ per hectare, but it is impossible to ascertain what is the value of the hay purchased off the meadows close by, or of the common-right thereon during September and October. It is, however, only the most intelligent and thrifty men who have arrived at such a knowledge of the principles of their business; and not one small farmer in a hundred feeds off a single beast. Cows are kept until they are no longer profitable as milkers, or until they can be sold to the best advantage, or until money is wanted. They are then sold to large farmers, to beet-root sugar makers, or to distillers, in the districts of Brabant, Hainaut, Hesbaye, &c., and the usual process of beef-manufacture will therefore be more properly described as characteristic of *la grande culture.*

The cow-keeping of *la petite culture* may be truly described as arable land dairying, for the quantity of grass is generally not much more than sufficient for an exercise-ground, certainly not enough to have much influence on the system of feeding, or the method of farming. There are two systems of feeding milch-cows—the warm-food system, and the cold-food system. The former is practised chiefly in the Campine, and to some extent in the Pays de Waes; but the latter is the more general in the remainder of Flanders, except with the smallest farmers.

Warm-food system.—Before the farmer and his family go to bed, they hang a large cauldron over the wood-fire in the capacious fire-place. In this vessel they put turnip-tops, a few turnips, any weeds that may have been gathered, some cut grass, a little (very little) rye-meal, a small modicum of rape-cake, and a quantity of water, enough to give the cattle (large and small) a good drink each. This broth is given lukewarm at five o'clock in the morning, after which the cows are milked. In summer, at six o'clock, the cows are led about the pasture until eight or nine o'clock, when they return to the stables, and get some cut grass between that hour and noon. Another allowance of soup is then given, and the cows are milked a second time. At four o'clock they go into the pasture, having had a little more cut grass in the interim, and at seven o'clock they are brought in, get some more broth, are milked for the third time, and finish their day with more cut grass. On a farm of 60 acres, which was a good representative Campine farm, and where we saw 9 milch-cows, 2 heifers, and 4 calves (1 beast to 4 acres), the cauldron in which this soup was made held 55 gallons. In summer it was half-filled each time, and in winter it was quite filled, to make up for the deficiency in green food, so that each animal got about 2 gallons of soup three times a day in summer, and 4 gallons each time in winter.* The allowance of cake and meal to these 15 animals was 1½ gallons of rye-meal per day in summer, and double the quantity in winter, and a little more than 2 lbs. of rape-cake per day (not each, but for the whole of them). In winter the other ingredients of the soup are chiefly hay and turnips. About the middle of September the cows, when out, go on spergula instead of grass, and live as much as possible on that food and the soup until the appearance of frost, which destroys spurry immediately. Spergula is sown for this purpose as a catch-crop after rye, instead of turnips.

The arrangements for cooking the soup and conveying it *en masse*, while warm, into the cow-house, demand a brief description, not for their economic value, but because they form a characteristic feature of a large portion of the small-farm system. They also furnish another illustration of a peculiarity which struck us very forcibly—that primitive contrivances entailing continuous labour are often resorted to for the purpose of saving the first cost of more perfect machinery.

There are two plans in vogue in the Campine and some parts of Flanders, one known as the Old Campine system, and the

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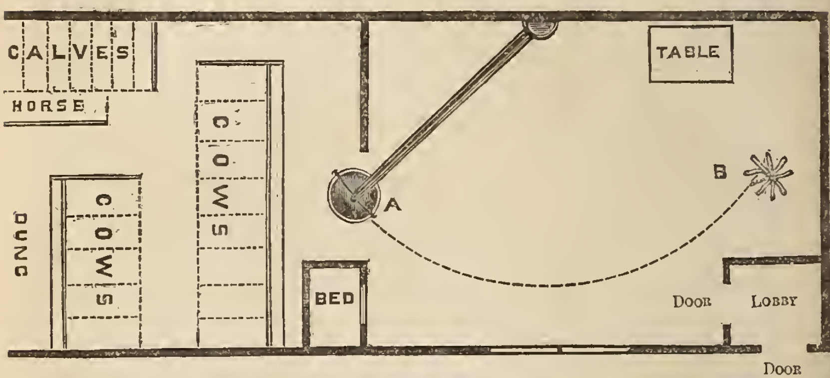
* It is necessary to remember the liquid nature of the food in estimating the quantity and quality of the milk.

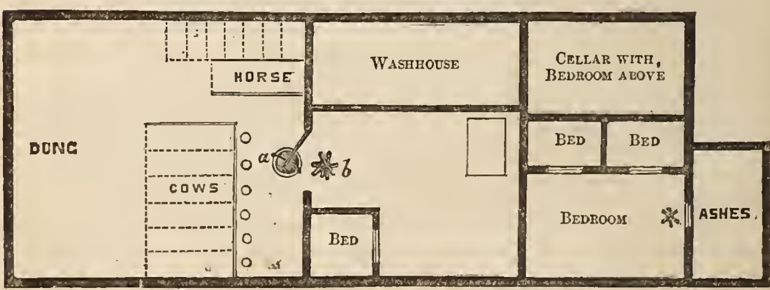
other as the New. The former is illustrated in Figs. 2 and 3, and the latter in Fig. 4, which also gives an idea of the arrangement

Fig. 2.—*Plan of part of a Campine Farm-steading, illustrating the old method of cooking Food for Cows.*



A—Cauldron suspended from arm of a crane. B—Fire.

Fig. 4.—*Plan of a Campine Farm-steading, illustrating the modern method of cooking Food for Cows.*

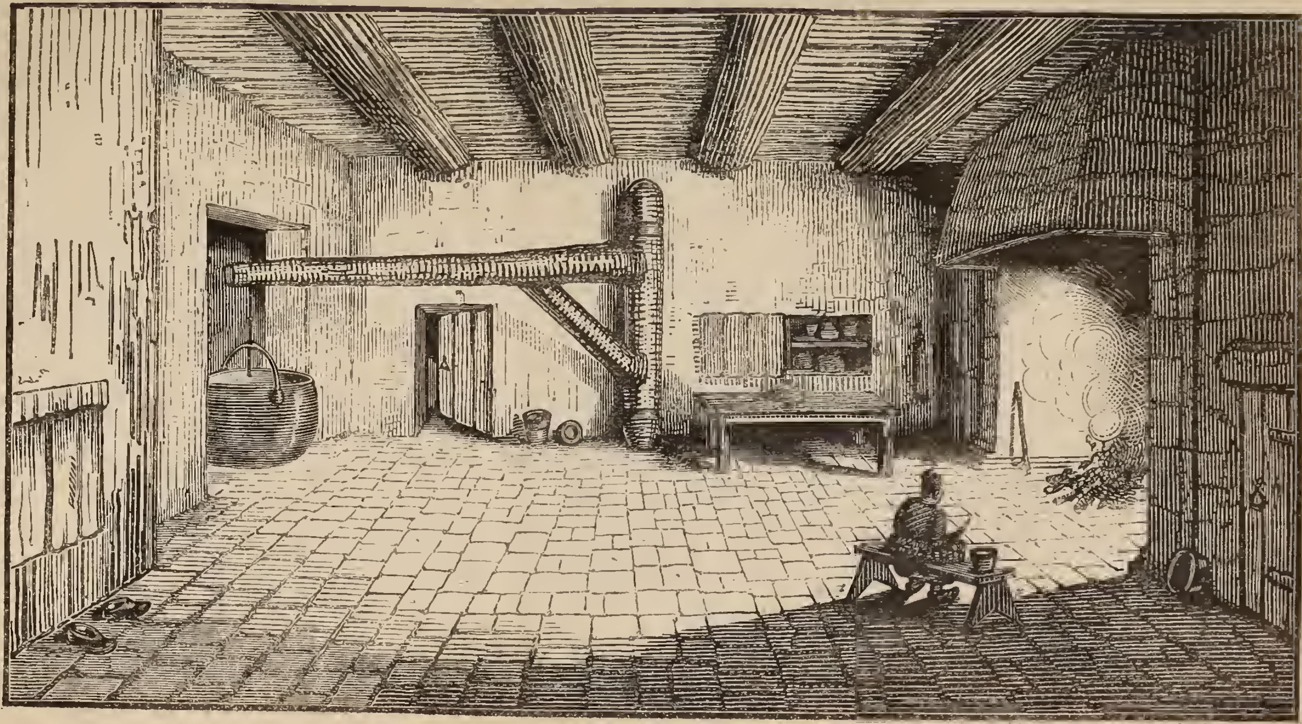


a—Cauldron. *b*—Fire o—Tubs for Cows' Food.

of the farm-house.* The cooking apparatus consists of a ponderous wooden crane, the shaft of which works in a socket in the

* The steadings in the Campine have not the quadrangular arrangement illustrated on p. 11; they consist of but two buildings, generally placed at a right angle to each other; one is shown in Figs. 2 and 4, and the other is simply a large barn and woodhouse. There is no separate midden or manure-house, the dung being simply thrown *behind the cows*, or sometimes carried to the far end of the cowhouse.

Fig. 3.—*Sketch of the Interior of the Living-room in a Campine Farm-steading, illustrating the old method of cooking Food for Cows (see plan, fig. 2).*



floor, and in an eye projecting from the back wall of the living-room; the position of the shaft is nearly equidistant between the fire-place and the door leading to the cow-house, but nearer the latter. The arm of the crane is made as long as possible, with a view of its carrying the cauldron into the cow-house, even at the expense of the necessity of "fending" it off from the projecting corner of the entrance-lobby near the fire-place. From the end of this arm the cauldron is suspended by a chain at the upper portion, attached to an iron screw-rod which works into a female screw in the centre of the cauldron-handle. By this arrangement the cauldron can be raised or lowered, as required, by turning it round a few times. In this system it will be seen that the fire-place is situated at the end of the living room opposite to the door leading into the cow-house.

In the Modern Campine system the fire-place is at the other end of the living room, and the entrance to the cow-house is through a small iron door at the back of it. Therefore, instead of the enormous crane just noticed, only a small but strong iron bracket is required; this is attached close to where the door opens, and is sufficient to swing the cauldron from the fire to the cow-house, or *vice versâ*. The only relative disadvantage possessed by this system is a real danger, namely, of fire; for with the least draught the incandescent wood-ashes, being very light, are liable to be blown on to the straw and other easily inflammable materials in the cow-house. The small farmers are convinced that the cooking consumes little or no fuel, because it is done immediately after the preparation of their own meals!

On what are termed "model" farms, where the account of "profit and loss" is omitted from the ledger, one frequently sees steaming and boiling apparatus of the most extensive and ingenious description; but in *la petite culture* cooking for cows is generally done in one of the two ways which we have described; while the labourer-farmers are, of course, reduced to the use of the simple saucepan.

The cold-food system is practised by some of the most intelligent of the small farmers, by many proprietors, and on most large farms. In illustration of it we shall describe the treatment of both cows and younger beasts, as well as feeding steers, as practised on one of the best farms in the Pays de Waes. This farm of 20 acres is the one to which we have referred as maintaining 4 cows, 3 heifers and calves, and 5 feeding beasts, assisted by hay bought off the water-meadows, and by the common-right to the aftermath during September and October. The cows are milked about five o'clock in the morning, and go out between five and six on to the little bit of pasture belonging to the farm;

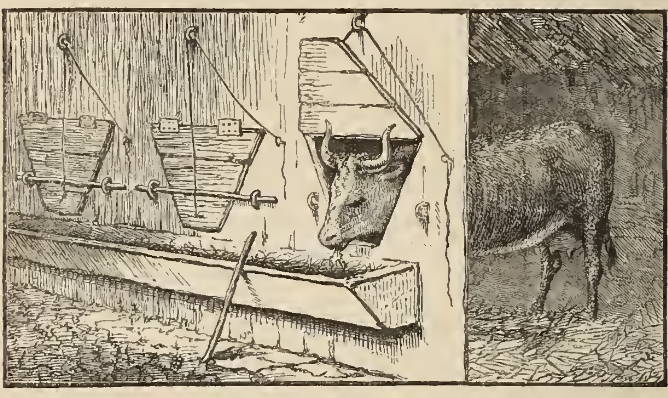
when the heat begins to be oppressive they are brought into the cow-house, and given clover and hay; about the middle of the day they are milked, and afterwards get more clover or cut grass. Towards sundown they are turned out again until dark, when they are brought in, milked the third time, and get some more clover the last thing. In the winter their food consists of cut turnips and carrots, turnip-tops, oat-straw, hay, and a little rye, or when there is no corn, some linseed-cake or cake-meal. In the autumn they live to a great extent on the aftermath of the water-meadows, but it is the prevailing practice, when a farmer has grass of his own, to cut it and give it green in the cow-house, in preference to allowing the cows to tramp about the pasture. Under this system no food is cooked, nor is any warm drink given; and those who practise it believe that the animals keep in better health than on the Campine plan. The 2-year old steers are given cake in September, beginning with about 3 lbs. each per diem, and gradually increasing to 9 lbs. or 10 lbs.;* and they are generally sold in November, weighing from 6 to 7 cwt.

As a further illustration of the principles of the "cold-food system," and especially to show the importance attached to "drinks," we shall give the practice pursued by another of the best farmers in the light-land region (in East Flanders) on a farm of 60 acres. In summer the cows get clover in the stables between five o'clock and half-past, and are led about the grass from six to ten. At noon they get a drink of cold water, mixed with an allowance of half a pint per head of rye-meal, oatmeal, or crushed linseed. From 5 to 8 o'clock in the evening in summer, and in the autumn from 3 o'clock until 6, they are again tethered on the pastures, and during the day are fed chiefly on clover. When they come in at night, they get another drink and some more clover. The great point is to keep the cows indoors during the heat of the day and at night, and to give them plenty of liquid food at milking times. In the autumn the evening allowance of clover is accompanied with plenty of straw, which is regarded as a preventive of the illness which would otherwise ensue from eating clover wet with autumn dew. The straw is given long, and the cows pick out the best of it. Another hygienic point is that linseed for *food* is always *crushed*, but as a a *medicine* it is always given *whole*. In the winter, on this farm, the cows got about half a hundredweight of turnips each three times daily, namely, between six and seven o'clock in the morning, at noon, and about six in the evening; they also get the drink with the two latter meals, and straw the last thing at night.

* This farmer fed more liberally than his neighbours, and kept his farm in that admirable condition which we read is general in *la petite culture,* but which we found exceptional.

Calves are fattened in some districts, the food consisting entirely of milk at first, then bread and milk, in large and gradually increasing quantities; but it is necessary to be careful not to give too much, otherwise they get diarrhœa. Should this occur the milk is withheld, and the diet altered to lukewarm soaked bread which has been boiled in water. The food is given at stated times with great regularity, generally in three meals per day.

Fig. 5.—*The Cattle-feeding of La Petite Culture.*



In all well-regulated farms it is considered essential to have the power of preventing beasts from obtaining access to the vessel in which their food is ordinarily given, whenever that may be deemed desirable. This is effected in two ways; either the food is given in a trough, separated from the animals by a screen furnished with trap-doors (see Fig. 5), or the prepared food is given in tubs (Fig. 4), which are placed in the troughs or on a bench, and can be taken away at pleasure. The object is to ensure the regular feeding of the animals; to ascertain, by a cow's appetite, the state of its health; and to enable the tubs and troughs to be kept thoroughly clean. The same principle is carried out in feeding calves by putting baskets over their noses; and also in the construction of pig-troughs by a swinging shutter which may be bolted to the front or back of the trough. The cattle are usually nearly pure Dutch; but a cross of "Durham" is very much prized.

In large towns the small farmer can sell his milk at the remunerative price of $2\frac{1}{2}d.$ per quart; but where such a market does not exist, the milk is made into butter, which at 1*s.* per lb. gives something less than half that return.

Fig. 6.—*On the milk-walk of La Petite Culture.*

Horses.—Very little need be said about horses in treating of *la petite culture.* No small farmer will keep one if he can possibly get on without, as he prefers keeping an ox or using his cows. The reason generally given is *that the horse eats;* but though that may be the usual mode of expressing the fact, the cause no doubt is that the horse *gives no milk*, and cannot be sold as beef. On the more extensive small farms, however, where horses are kept, they are fed on clover during the summer with an allowance of oats, or from 4 to 5 lbs. each of rye-bread per day. During winter their food consists entirely of hay, and a peck of oats each per day. All the horses have more or less Flemish blood in them, and are generally better than one could expect.

Pigs.—Small farmers generally buy pigs as young as possible, and fatten them for their own use, as they get no other meat than pork and bacon. The food consists almost entirely of potatoes and skim-milk or butter-milk; but occasionally a little meal is added. The pigs are large, coarse, flat-sided, long-eared animals, but of late years considerably "ameliorated" by crossing with English breeds.

III.—A Farm of Ten Acres.

The question has frequently been asked whether a farm of ten acres is sufficient to enable a man to keep his wife and family in comfort, and to occupy profitably and completely his own time, without having recourse to other means of earning money, or of filling up leisure hours. We propose, therefore, both with a view of giving an example of *la petite culture* on rather strong land, and for the purpose of showing what can be done with ten acres, to give a detailed account of a farm having, excluding buildings (represented in fig. 1, p. 11) and fences, as nearly as possible that area.

This little farm is situated in the commune of Haeltert, near Alost, and to a student of *la petite culture* it is almost worth making the journey to see.*

The farm belongs to the occupier, Madame Van Weyenberghe, a widow, who has three grown-up sons. Until recently this was the working staff, but now that one of the sons has gone into the world, his place is supplied by a hired man. The grass land is rather more than two acres in extent; about an acre is cultivated as a garden, and the remainder, about seven acres, is farmed on a seven-course system, different from that in vogue in the light-land district. The shift is (1) potatoes or flax, (2) wheat with clover, (3) clover, (4) mixture, (5) colza, followed by turnips, (6) mixture, (7) rye. In the garden about a quarter of an acre of tobacco is grown every year, besides green vegetables of every description; and the spare time of the two sons is profitably employed in budding roses, grafting fruit-trees, and other similar operations, all of which bring in their modest profit.

The land for potatoes is manured with farmyard and liquid manure, and also with guano. No manure is given for wheat, which is sown in October; and the clover (cow-grass) is sown on it in January or February. After the wheat is harvested, a little clover is sometimes got the same year, but not usually. The next year it is cut the first time in March, and immediately afterwards receives a dressing of either liquid manure or Dutch ashes, but the former is preferred. Two other cuttings are got the same year before September; but in that month there is a great prejudice against using it, as people say it has "spiders' webs," and hurts the cows. The succeeding crop (mixture of rye and wheat) receives no manure, but soon after harvest the stubble is well manured and prepared to receive the colza-plants for the next year's crop. The seed having been sown in the previous August, the seedlings are ready to be planted out in October and November. If the season is mild, each plant gets a dose of liquid manure; but if hard frosts are expected, this stimulant is carefully withheld, for fear that the water should freeze and kill the plants. The colza-harvest is got in June, when the land is immediately manured, ploughed, and sown with turnips. This catch-crop is got in October, the turnips being pulled and housed; and during the winter the land is sown with mixture. After that has been harvested the stubble

* The commune has the advantage of being under the sway of a most excellent burgomaster, M. van Meldert, to whom we are extremely indebted for much valuable information and kind assistance.

gets a heavy dressing of manure, and is sown with rye, which is followed after harvest by stubble-turnips. We thus return again to the potato-course, in the preparation of the land for which the spade is used as already described. One-tenth part of this course is sown with flax and carrots, the land being prepared for it with extreme care, so as to obtain a perfectly fine and even tilth. The flax (Riga) and carrot-seeds are sown together, from the beginning of March until the end of April, according to the weather, but the sooner they are got in the better. A few mangolds are also sown in this course.

The stock kept consists of three milch-cows,* and two pigs fattened for home use. In summer the cows are fed on clover and grass, mostly given cut in the stable ; they also have a drink which consists of nearly a quart of linseed, 4 or 5 lbs. of rye-meal, and 20 quarts of water boiled with a certain quantity of mangold-tops. This is enough for two drinks for three cows, so that each cow gets something less than a gallon each time. The first drink is given at 7 o'clock in the morning, and the other at 4 or 5 o'clock in the evening. When the cows are at work they get, in addition, three meals of rye-bread per day, the quantity given being 2 lbs. per head each time. In the winter they each get a daily allowance of nearly 4 bushels of turnips and 1 lb. of meal. One-half the turnips are boiled, the meal is mixed with water, and the whole, including the uncooked remainder of the turnips, is mixed together and given to the cows in two equal portions, one in the morning and one at night. If a cow has been an unsatisfactory milker during the summer, or when one gets beyond the most profitable limit of age, carrots are given instead of turnips in the autumn and winter, and with this simple alteration in the diet the cow is fattened for the butcher.

Pigs are usually bought at 4 weeks old, or thereabouts, at prices varying from 4*s.* to 16*s.* They are fed with boiled potatoes, rye or wheat-meal, and buttermilk mixed together, and they are given as much as they can eat. They are killed at 10 or 12 months old, weighing from 20 to 24 score, and the meat is kept for household use, butcher's meat not forming an item in the dietary of the family.

The grass-land is manured every March with either liquid manure or guano ; it is mown in July, and a great part of the aftermath is grazed, the remainder being soiled. Nearly a ton and a half of guano is bought yearly for this little farm. Of the garden culture we shall say nothing, except that it was

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* The proportion here is one cow to $3\frac{1}{3}$ acres ; but *no food* for them or the pigs is *bought ;* they are entirely fed on the produce of the farm.

remarkably well done. Every inch of ground was occupied; and from the number of successfully budded roses and fresh-grafted fruit-trees (all destined for sale), as well as from the abundance of healthy vegetables of such species as find a ready sale in the large towns, we inferred that this piece of ground, cultivated during "hours of repose" from the more arduous labours of the farm, added no inconsiderable sum to the family income. In this garden, and on a patch of ground in the farm, we found some of the finest tobacco-plants which we saw in Belgium. The young plants are bought at 1 franc per thousand, they are carefully planted in well-manured land by the two brothers, as soon as all danger from frost has ceased; and each plant is attentively watered with liquid manure from time to time. The produce will sell at the rate of 160*l.* to 200*l.* per hectare (4000 to 5000 kilos. at 1 franc), so that our modest area of a quarter of an acre (one-tenth of a hectare) will fetch the respectable sum of 16*l.* at the lowest estimate.

The yield of other crops was very large compared with that on the average run of small farms, namely, in 1868: Wheat, 35 bushels per acre; mixture, 40 bushels; rye, 45 bushels; colza, 1 ton per acre; potatoes, 8 tons.

This little farm, remarkable in many respects,* was in none more noteworthy than for two implements beyond the ordinary plough, harrow, and roller. One of these was a turnip-cutter—of primitive construction, certainly; but it was the only one we saw throughout Belgium on so small a farm. Its essential parts were—(1) an inclined grating, forming the lower side of the hopper which received the turnips; (2) a wooden roller beneath, fitted with a spiral of hoop-iron knives; and (3) the fly-wheel, which had wooden spokes and a hoop-iron rim. There was no handle; but the machine was put into action by turning round the fly-wheel by means of the rim in a "hand-over-hand" sort of way. Including the wooden frame on which it was set, it cost thirty shillings, and was made by the village blacksmith.

The other "implement" was a waggon. Ordinarily, on even large farms as well as small, one sees a heavy three-wheeled cart (tumbril) of the clumsiest description. The Belgian waggons are immensely long in the body, about one and a half times the length of an ordinary English waggon, and very narrow; the fore-wheels are often placed *in advance* of the head of the waggon, and the hind-wheels at the very extremity of the tail, just *not* projecting beyond it. The waggon on the little farm was designed by one of the brothers, and was built in the village

* The manure was kept in a water-tight midden, *out of doors*, under the shade of some trees; and it absorbed, therefore, the greater portion of the liquid.

under his direction. The general contour of the body was a modification of that usually seen in Flanders, but it was scarcely more than half the usual length, and was very much wider in proportion; then the wheels, instead of being placed as far apart as possible, were, *tout au contraire*, as near together as could well be. Throughout our tour it maintained its place in our minds as the best designed waggon we had seen in Belgium.

The question has been asked more than once, What is really the annual income of a holder of 10 acres, one year with another? Does he get, as labourer, the same wages which he pays for assistance; and does he get, in addition, any profit per acre in his character of a farmer? These questions are difficult to answer even approximately; but we venture to offer the following reply as regards the small farm which we have described. It must be borne in mind, however, that so favourable a statement could hardly be given for many small farms in Belgium.

Our calculations will be simplified by the following facts:—The cattle, the pigs, and three persons are fed by the produce of the farm; therefore, as our small farmer cannot eat his corn and sell it too, we shall not include either rye, "mixture," carrots, turnips, potatoes, or clover in his money receipts. We shall also assume that the pigs are invariably killed for home consumption. On the other hand we shall include no *purchases* in the expenditure, except guano and young pigs; and we shall also consider that when a cow is "fattened" off during the winter she will realise just enough to buy a milch-cow in her stead. We also think we are justified in considering that the wheat is sold,—that is, indeed, the almost invariable practice. Seven acres cultivated on a seven-course system give exactly one acre per course; but we have only the crops off two complete courses to sell, viz., wheat and colza. In addition, we have one-quarter of an acre of tobacco and one-tenth of an acre of flax (excluding the seed), which are prepared at home, and therefore yield the utmost possible amount. The crop of flax with a good farmer weighs about 725 kilos. per hectare when prepared; this will give about 30 kilos. for one-tenth of an acre, and in the following balance-sheet we have taken about the mean price paid in December, 1868, according to the return issued by the Courtrai Chamber of Commerce. The price of wheat after the harvest of 1868 is taken from the same source, and the amounts given for colza and tobacco were actually realised. The butter finds a very ready sale in the neighbouring towns, and the price given is about the mark. The wages, rates and taxes, and the price of guano, are at the current rates. The garden-produce will probably not be thought too highly rated at 10*l*.

Estimated Receipts (1868).	£	s.	d.
1 acre wheat, 35 bushels at 7*s.*	12	5	0
1 acre colza, 1 ton at 21*l.* 10*s.*	21	10	0
$\frac{1}{10}$ acre flax, 30 kils. at 4 *fr.*, say	5	0	0
$\frac{1}{4}$ acre, tobacco, 400 kils. at 1*s.*	16	0	0
Butter from 3 cows, say— 240 lbs. each = 720 lbs.* at 1*s.*	36	0	0
3 calves at 15*s.*	2	5	0
Garden produce	10	0	0
	103	0	0

Estimated Expenditure.

	£	s.	d.	£	s.	d.
Wages of 1 man, at 1 *fr.* per day, taking the average of the year	14	10	0			
1½ ton guano at 12*l.*	18	0	0			
Rates and taxes 3*s.* 3*d.* per acre	1	12	6			
2 pigs 4 weeks old at 7*s.* 6*d.*	0	15	0			
				34	17	6
Gross profit				68	2	6

Against this return we must put the wages of two men, on the same scale as if they were hired; but we think that nothing need be allowed for the wages of the proprietress, who is very old. A man gets 75 centimes per day and his food in summer, and 45 centimes in winter with nourishment. Taking the larger sum all the year round, on account of the additional labour which they perform in the garden, &c., the amount will be 22*l.* 16*s.* The rent is another item which should be deducted, and computing this at 45*s.* per acre, it would amount to 22*l.* 10*s.* We therefore have a remaining sum of 22*l.* 16*s.* 6*d.*, or 45*s.* 6*d.* per acre as the farmer's profit; while the actual income of such a peasant-proprietor, if unencumbered, would be 56*l.* 14*s.* 6*d.* after paying for his food. That a considerable sum of money is really saved, is shown by the fact that the existing farm buildings were erected only a few years ago at a cost of more than 200*l.*

Comparison with the condition of an English Agricultural Labourer.—To render such a comparison perfectly fair, we ought to assume that the capital of the farm is borrowed at five per cent. interest, and that one of the brothers is the farmer. The farmer's income is, then, as follows:—

	£	s.	d.
Wages	11	8	0
Profit	22	16	6
	34	4	6
Less interest on capital, say, 140*l.*† at 5 per cent.	7	0	0
	27	4	6

* We should have placed this item somewhat higher but for the fact that the cows are used for tillage and draught purposes.

† We compute the capital which would be required to take and work this farm

To this must be added house-rent and food, which consists of rye (or mixture) bread, potatoes, buttermilk, green vegetables, and sometimes pork or bacon. We presume that the better agricultural labourers in most English counties are in at least as good a position as this, taking into account their ordinary wages, their money at harvest-time and for other piece-work, their cottage and garden, their potato-ground, and other privileges. We need not give the figures in proof of such an inference, as every English farmer can supply them from his own experience.*

Summary.—Before leaving *la petite culture* we must point out one or two of its characteristic features and results. It will have been already understood that one prominent feature of the small farmers of Belgium is their dislike to buy anything. For this reason they content themselves with living on the produce of their farm, after selling the wheat, the butter, and the industrial crops; they are therefore enabled to save money under circumstances in which an English agricultural labourer would probably run into debt. The money that they save they hide. It is buried in the ground, built into the cottage, or otherwise mysteriously hoarded. Considering the population of the small-farm districts of Belgium, it can be easily understood that a propensity to hoard bullion must in time have a sensible effect on the resources of the country. The Government, therefore, were some years ago under the necessity of issuing bank-notes as legal tender. The peasant-farmers, by degrees, came to understand that notes could be exchanged, and used as money, quite as readily as gold and silver, while the paper was an infinitely more convenient medium. Thus, by degrees, the bullion was set free, and its place in the hoard supplied by bank-notes. A small farmer knows nothing of investments, and has but one idea of the value of money, viz., its purchasing power of land. The consequence is, that in the small-farm districts land will sell at fabulous prices. A man has saved so many hundred or so many thousand francs; the money is useless to him *as money;* but if he can exchange it for a bit of land, he can derive some good from it. Accordingly, land often sells at prices that would not yield more than one per cent. interest to the buyer; and even in the large-farm districts parcels of land commonly sell at more than forty years' purchase. In the Pays de Waes and surrounding districts, where the subdivision of property has been carried to an extreme, the man who has the most money generally becomes the pur-

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at 14*l.* per acre; and taking into account the conditions of Belgian land-tenure, into which subject we shall enter at more length presently, we do not think it too large a sum.

* *Vide* the payments made by Mr. Torr, of Aylesby, Lincolnshire, given in the last number of this Journal (vol. v. 2nd series, p. 437).

chaser of any land offered for sale. If we apply these facts to a particular example their importance will be still more clearly seen. Suppose that a little farmer saves 25*l.* per annum; at the end of ten years he buys an acre of ground, for which he gives 200*l.*, the rent value being about 40*s.* or 45*s.* per annum. The government-tax on his purchase is nearly 7 per cent., viz. 14*l.*, and the notary's fees for conveyance amount to 1 per cent., viz. 2*l.* He then has 34*l.* in hand, which enables him to cultivate his new property to the best advantage, besides forming the nucleus of a new store: and this is the net result of ten years' labour, accompanied by the most rigid frugality. One farm-house in the Pays de Waes was pointed out to us as an example. Its owner, an old man now, had bought during his life about 60 acres of land; his daily expenses were not more than fifteen pence, and a few days previously he had offered fifteen thousand francs for another piece of land!

IV.—Central Belgium—La Grande Culture.

1. *The Farms.*—In the greater portion of this division the farmhouses invariably present the fortress-like appearance, which we have already described and illustrated; but they are on a much larger scale, and the centre of the courtyard is occupied by a pool, which receives the draining from the manure-heap made around it. The practice is also very general to throw quantities of this liquid over the manure from time to time. In this respect the treatment of the manure differs essentially from that in vogue in the Campine and the Pays de Waes, where the precious material is carefully housed. On the Polder-verge of both districts, skeleton barns are preferred. The washings of the cowhouses and stables are, as usual, conveyed by drains into a liquid-manure tank. Some few farmers have a separate system of drainage to carry off the rain-water; but it is surprising how few steadings are spouted. In most cases there is no approach whatever to an attempt to carry off rain-water, which therefore runs all over the courtyard, and percolates through the manure-heap into the central pond. The farmer seems, indeed, in this district, to invite a thorough soaking for his manure.

Artificial manures are rarely used; throughout Belgium their properties are not understood, even superphosphate being almost unknown. All the farmers pin their faith on farmyard manure and guano, and everything else "costs too dear." Lime, however, is extensively used, especially on the heavier land. Quicklime is also used to mix with the compost-heap, which is generally turned out every autumn, and put on the land during the winter.

From the northern limit of this area to the southern, the agriculture varies progressively from the standard of the sandy land. Similarly the farms gradually increase in size and diminish in number. A large commune near Alost, having an extent of 2500 acres, and a population last year of 3212 persons, or 1·28 per acre, contained the following farms:—3 of between 90 and 100 acres each, 4 of between 70 and 80 acres, 5 of about 40, 10 of about 30, and 10 of about 20 acres, besides nearly 300 *petits cultivateurs*. The commune was therefore nearly equally divided between 32 holdings of from 20 to 100 acres each, and 300 small holdings averaging 4 acres each. The distribution of the 1250 acres between the 300 *petits cultivateurs* would be difficult to arrive at; but a general idea is conveyed by the fact that about half of them keep one or more cows.

From such a census at the northern margin of the district, there is every gradation to be met with, until at the extreme south one seldom sees a farm of less than 200 acres except in the immediate neighbourhood of large towns.

2. *The Rents.*—Bearing in mind what we have already said respecting the quality of the land in this district, the rents, although extremely high, are not so heavy a burden on the farmer, when compared with the productive power of the land, as they are in the sandy district previously described, especially as most of the farms on the Hesbayan loam comprise a good proportion of rich grass, which is a very precious commodity in Belgium. Exceptionally highly rented farms are found, on enquiry, to comprise several hectares of the rich feeding land which occurs in the valleys of the numerous tributaries of the Escaut, and which, if let separately, would fetch at least 4*l.* per English acre.

As a rule, rents in this district vary with the quality of the land. Where it is comparatively poor, as generally in the western division, they range from 30*s.* to 40*s.* per acre. In the central and eastern portions they are more generally from 40*s.* to 50*s.* per acre; but a farm on first-rate "sugar-beet land," especially if it includes some good grass, will be rented at 55*s.* per acre or even more. In some parishes, a farmer will have the option of taking a farm at a certain rent provided the root-course does not comprise sugar-beet, or at an advanced rent if he intends to grow that root, the difference in price being often 10*s.* per acre, and sometimes as much as 15*s.* No doubt, by the growth of sugar-beet, without the purchase of pulp or other feeding stuff, a farmer might "run out" the land to a most injurious extent by the expiration of his lease, and thus a "premium" is paid by those who do not consume their own roots.

Fences are rare in this district; and it is extremely difficult to infer, except sometimes by the culture, where one farm ends and another begins. Small properties are generally surrounded by quick hedges trimmed to a height of between 3 and 4 feet, with perfectly parallel vertical sides, and having a thickness of not more than 6 or 8 inches. Draining is generally done by the landlord; but it is most frequently imperfect in consequence of the smallness of the pipes, the internal diameter of which is not much more than an inch. These pipes are secured together by means of collars, which of course impede the already too sluggish drainage of the land.

3. *The Rotations.*—The native agriculture of this region is extensively associated with what accords more nearly with English notions of good farming. The rotation of crops is frequently much shorter than in Flanders, and it includes a fallow course of roots, chiefly sugar-beet, while on the best farms not more than two white crops are taken in succession. Catch-crops are for the most part limited to turnips after rye or flax in the western portion of the region, where also clover is sown with flax; in the eastern district, flax is grown alone and sometimes succeeded by turnips, the seeds being sown with oats or barley.

The details of the courses of cropping pursued by different farmers in the same or different districts of Central Belgium are rather puzzling; but the ruling idea, wherever long and complicated rotations are in vogue, is the same as we have already described in treating of *la petite culture.* The "root-course" generally consists of potatoes, mangolds, or sugar-beet, and a portion devoted to one or more crops which cannot come under the designation of roots, namely, colza,* flax, beans, or oats; but where these are extensively grown they come into their place in the rotation, which is therefore longer.

The "root-course" is frequently followed by the three-years succession of white crops usual in the sandy district, viz.: wheat, rye, and oats with clover; but on some farms either the oats or the rye is omitted, the clover in the former case being sown with rye. Thus they at last get a restorative crop of clover, after which is either a longer or a shorter succession of white crops before arriving again at the "root course." For some reason, clover is, in this district, seldom grown in the middle of the rotation, probably because wheat is best taken after it and after roots, the remainder of the course being made up by the usual succession of cereals after one of the courses of wheat. The old Hesbayan course will furnish an illustration; it is as follows:—(1) Potatoes and mangolds, or sugar-beets, (2) wheat, (3) rye,

* By Colza is meant rape-seed; but we have preferred using the French name to prevent its being confused with rape grown as it is in England as food for sheep. Colza is almost as exhaustive a crop as a cereal. In some descriptions of Belgian farming we read of "rape and turnips," the meaning being Colza followed by turnips.

(4) oats with clover, (5) clover, (6) wheat, returning again to roots. In some districts, especially near Courtrai, clover is sown with flax; and as that crop requires the land to be in very good condition, it is often sown immediately after roots. If the climate will not allow a "simultaneous" crop of carrots to yield a paying produce, of course nothing better than clover can be sown with it. But the Belgian farmer takes care to have his revenge afterwards. As an illustration, we give the following course, which is pursued on a farm that has been quoted as an exceedingly good one in two or three English works on Belgian Agriculture:—(1) Flax with clover, (2) clover, (3) wheat or barley, (4) rye, (5) colza, (6) wheat, (7) rye, (8) oats or barley, and (9) roots or oats!

The question will be asked, is this practice successful? The best answer is, that the most advanced farmers have abandoned it, and now farm either on the Norfolk four-course system,—the root-course consisting of sugar-beet,—or a five-course in which three white crops are grown (one before roots and two after), or a nine-course, consisting of the other two taken in succession.

The cause and effect of the ordinary practice are easily indicated. The cause is cupidity, and the consequence is complaint. The wheat is laid; there is an abundance of straw and comparatively little grain; and rye or mixture must therefore be grown instead of wheat. The best farmers have discovered that after clover or roots wheat is better than after another white crop; and as the cultivation of sugar-beet yields as large a profit as corn, they are at last reconciled to a fallow course of roots once in four or five years. The cultivation of sugar-beet has therefore completely altered the best farming of this division of Belgium; and the rapid increase recently noticeable in the number of sugar-factories shows that the improvement is being more widely extended.

4. *Grass-land.*—Under this head we include only the pastures and meadows of farms generally, excluding the feeding-land and flooded meadows in the river-valleys. The management of this grass depends very much upon whether the stock on the farm are dairy cows or feeding beasts. In the former case a portion of grass, consisting in the smaller farms of the border-strips of arable fields, will be reserved as a bite for the cows during their "outing"; the rest will be mown in July, and the aftermath "soiled." Great care is taken to keep such grass in good condition by the use of liquid manure, night-soil, guano, Dutch ashes, or farmyard manure; but the favourite fertilizers are Dutch ashes and liquid manure mixed with ground rape-cake; in default of these, the other kinds are substituted for them. Some dairy farmers prefer sending their cows out on the after-

math-grass in the autumn, as they find that the milk continues longer, is of better quality, and is given in greater quantity; but the smaller farmers object to this system owing to the damage done by the treading of the cattle. On feeding farms, especially where sugar-beet is grown, it is very important to have good pasture for the beasts during the summer, so that on such holdings they only mow sufficient grass annually to furnish hay for the horses, and fodder for the earliest-bought beasts in the spring. On the previous class of farms the cows are tethered on the grass either singly or in small droves of from two to four or five, according to the size of the farm, each drove being attended by a child or a woman. On feeding farms the cattle are "folded" on the pastures, and after they are moved to the next fold, or "park," their droppings are carefully and evenly spread over that which they have just left.

5. *Flax.*—Of the "Industrial Crops," which form so prominent a feature in Belgian agriculture, this is one of the most important, its only rival being sugar-beet. The culture of the plant has already been described very frequently; and as, like all other crops, its treatment must vary with circumstances (especially its place in the rotation, the quality of the land, the climate, &c.), a detailed description of the tillage operations would be for the most part a repetition without practical benefit; we shall, therefore, confine ourselves to a general statement of the practice as pursued in the chief flax-growing district in Belgium, viz., in the neighbourhood of Courtrai.

In that district oats are considered the best preparatory crop, although flax is frequently taken after potatoes, and sometimes after any white crop. Whatever crop precedes it, the ground must have been well manured, so as to remain in good heart, otherwise the yield and quality of flax will certainly be deficient. Another point is that flax must not be grown often, certainly not more than once in seven, or, better still, in nine years. A third requisite is to obtain a very fine and even tilth.

Presuming that the preceding crop is oats, the stubbles are ploughed-in to a depth of from 6 to 10 inches, according to the land,* about November. The land is left during the winter; and about the end of February, if possible, it is ploughed and harrowed until a sufficiently fine and even tilth is secured. When these spring operations are once commenced they are continued as fast as the weather will permit, the last process being a good rolling. On this rolled seed-bed it is usual to sow a certain amount of guano, and immediately afterwards the mixture of linseed and clover. The quantity of linseed sown per

* The lighter the land the deeper it is ploughed.

acre is often enormous, in some cases as much as 2 cwt. as well as 10 lbs. of red clover, the reason being that with thin sowing the straw is coarse and branched, although the produce of seed (a secondary consideration) is greater. The seeds are harrowed in lightly, to the depth of about an inch, and the land is again thoroughly rolled. The after preparation consists of repeated hand-weeding and a hoeing. About the end of June the flax is reaped by pulling it up by the roots, and the remaining clover gets well grown by the end of the year, so much so that it is not unusual to get a mowing the same autumn. Pulling, sheafing, drying, and stacking, will cost, in the Courtrai district, about 25s. per acre. An average crop will yield about 5 tons of straw and between 3 and 4 cwt. of seed.*

The straw is bought by merchants or factors immediately after harvest, and frequently paid for on the spot, the farmer contracting to deliver it within a specified time on the drying-ground on the banks of the Lys, at Courtrai. The times of payment and of delivery are matters of arrangement, and depend upon the greater or less confidence existing between buyer and seller more than upon any other circumstance. On both banks of the Lys, near Courtrai, the land is occupied by extensive drying-grounds, and the steeping and drying of flax form of themselves a very important industry, giving employment to a large number of people. The land is rented by the principals of these establishments, and they find labour and all means and appliances to steep and dry the flax at certain fixed prices.

Flax is generally steeped in the Lys in crates holding from 25 to 30 cwt. each, according to the length of the staple. The steeping season is from May to October, but varies a little with the season; and it is not usual to steep the straw the same year as it is harvested. The crates are first lined with clean wheat-straw, then sheaves of flax are placed two together, head to tail, bound firmly together, and placed in the crate until it is full, when the flax is covered by wheat-straw and the crate is sunk in the river by means of stones. It remains in the water from eight days to a fortnight, according to the temperature; and the proof of the steeper's mastery of his art lies in the success with which he judges when the flax should be taken out. The crate being got on land, each sheaf is separated from its fellow, its base is spread out to the utmost, a wisp of straw being tied round its head, and thus it is left to dry. The outside dries first, and the sheaf is then turned inside out until it is thoroughly dry all through. This is the first operation, and the charge made is 4 francs per

* For further details as to the culture and harvesting of flax, see Mr. Scott Burn's Essay in 'Quarterly Journal of Agriculture,' vol. xxii. pp. 268, 269.

crate for steeping, and 9 francs for drying, getting out the dust, &c., or nearly 10*s.* 6*d.* for the whole operation. Formerly it was the custom to steep the flax only once, and then to bleach it in the sun by spreading it out on the grass ; but this mode, although still in vogue in small-farm districts, such as the Pays de Waes, is no longer practised on the banks of the Lys, for there the land is too valuable, and the quantity to be bleached in a given time is too great. The flax is, therefore, now steeped a second time, in exactly the same manner, and at precisely the same cost as before, so that the total cost is one guinea per crate for preparation. The water of the Lys is found to be exceptionally well adapted for steeping flax, on account, it is supposed, of its extreme purity. The river has a tolerably rapid current, but not so rapid as to make the water turbid. At the slightest indication of a flood, all the crates are got ashore as soon as possible, to prevent mud, sand, or other impurities, being washed into the flax, as they would break the staple.

Flax-steeping in still water as practised in the Polder districts in essentially the same manner as in the running water of the Lys, except that it is steeped once only, for a period of from 12 to 14 days, and is afterwards dried and bleached in the sun, the latter process occupying about a fortnight in fine weather. As no stones of any description can be found in the Polder district, the crates are sunk by means of barrels filled with water. In the small-farm districts flax is steeped in flax-pits, and as the quantity which each farmer has to prepare is very small, he, or his wife, is able to give each sheaf, and almost each stalk, individually, a certain amount of attention.

Another method of steeping flax, more primitive than any of these, is still practised extensively on very small holdings. The stalks are spread on the grass with wonderful neatness and regularity, and left there until dew, rain, and sunshine, have sufficiently decomposed the connecting tissue and bleached the flax-fibres. We thus have a water-system of steeping, an atmospheric system, and a combination of both.

In all flax-steeping districts the smell of the decaying fibre is positively sickening ; but we are not aware whether it exercises any very injurious effect upon the inhabitants.* To us it seemed more like a smell of tallow than any other ordinary stench.

The following extract from a Report on 'Flax Cultivation,' from Mr. Lumley, Her Majesty's Representative at Brussels, to the Earl of Clarendon, Secretary of State for Foreign Affairs, received as these pages were being put into type, may also serve to illustrate this important subject :—

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* Compare the statements which follow on pp. 45 and 46.

The system of steeping flax in Belgium is much the same as was followed fifty years ago.

Trials have been made of artificial modes of steeping on a large scale, and in established manufactories; but though the quality of the fibres steeped in hot water is admitted to be superior to that of the same fibres treated in the ordinary manner, none of these systems have proved remunerative, and they have consequently found little favour in this country.

It may be stated generally, therefore, that in Belgium flax is either steeped in meadows ("*sur le pré*"), in stagnant or in running waters. The two latter methods are preferred; for, as the fibre prepared in meadows is apt to become discoloured or spotted through the action of the soil, the former system is little practised, save in districts where water is scarce.

Steeping in stagnant water makes the fibre softer and more flexible, in running water stronger and of a better colour. Flax fibre, however, that has been steeped in streams, if kept in store for a year before being worked, acquires the same flexibility as that steeped in stagnant water. Steeping in running water is therefore considered in Belgium as the best mode of preparation, though in some districts, such as the neighbourhood of Lokeren, and generally in the Pays de Waes, the plan of steeping in stagnant water is successfully practised.

The favourable results of the flax-steeping operations conducted in Belgium must be attributed in a very great measure to the watchfulness and unremitting care of those employed in them, and to their discernment in seizing the proper moment for commencing or leaving off the process. Every stage of the preparation of flax, indeed, requires the greatest care—from the choice of the seed till it reaches the spinning-mill; but the steeping and peeling processes require much skill. It is in the care and skill bestowed on these operations that the inhabitants of Flanders show great superiority.

It would be necessary to study with great minuteness the work of culture and preparation, in order to obtain an exact idea of the various causes which affect the quality of the manufactured article.

On the subject of the effect of steeping flax, in rendering the waters in which it has been steeped poisonous to fish and other animals, many inquiries have been made in Belgium. Special Commissions have examined and reported on the question. The water of the River Lys, on the banks of which many flax-retting frames are established, have been repeatedly analysed. If the question has not been officially decided in any conclusive report published or sanctioned by the Government, it is not the less true that, after a careful study of all that has been written on the subject by individuals, and of all the opinions expressed by competent authorities or Government Commissions, the balance of evidence leans towards a belief in the innocuous nature of the effects of flax-steeping upon animal life.

As to its effects on the health of human beings, it may be affirmed that no single instance of illness, of epidemic, or of increased mortality, has given any confirmation of the fears of those who hold that the steeping process produces miasma, or gases prejudicial to health.

As to its effects on fish and cattle, as far as regards the River Lys, no injury seems to have been caused them from the above-mentioned process in this district; but it is doubtful whether an answer could be given with the same certainty in the case of other streams. If the retting-tanks be established in or near small shallow streams, or if water from a stagnant retting-pond be discharged suddenly into a river, no doubt consequences prejudicial to animal life may ensue.

The volume of the running water, indeed, seems to constitute the principal element of the solution of the question at issue; it is essential, moreover, to add that it is only after being dried in stack or barn for at least a year that flax should be steeped in running water.

To this we may add the following extracts from a Report by Mr. T. Percy Ffrench, annexed to the one previously quoted:—

The best system of "rouissage" (steeping) practised until lately in Belgium is on the banks of the River Lys, but it has many drawbacks: firstly, that of vitiating the atmosphere and corrupting the water, and this to such a degree that numerous petitions have been presented to the Chamber of Representatives in order to obtain the abolition of a practice so productive of fever and other diseases. Moreover, this system is subject to many other inconveniences—from atmospheric irregularities, &c. Quantities of flax are annually destroyed by storms, or even by the influence of an impending storm.

M. Alkan, a celebrated French engineer, Professor of the Conservatoire des Arts et Métiers, &c., remarks, in a Report on the treatment of flax, that 'the intelligent flax-growers of the banks of the Lys have learnt by experience how impossible it is for them to obtain satisfactory results from a *single* process of steeping—that, notwithstanding the loss of time and money, they are obliged to make two operations of it, with an interval of a year between each; and that, owing to the impurity of the water, the chemical state, colour, quality, and appearance of the filament, the ulterior manipulation of it which is indispensable, this system of steeping is very imperfect, and the filament is never properly divested of its gummy element.

It is on account of these defects, so inherent to the preparation of flax in the open air, without any system of control or regularity beyond those of sight and touch more or less exercised, that every effort and research have been made in order to arrive at the suppression of the rural system of steeping ("rouissage rural"), which, if performed in stagnant pools, is a source of infection and ill-health, and if in running water, adds a considerable loss of time to the above-mentioned drawback.

* * * * *

There are two systems of steeping at present followed in Belgium, one in the open air, called "rural steeping," and the other in covered barns, called "manufacturier," or American.

The rural system is subdivided into steeping by dew and steeping in rivers.

The first-named, principally practised in the provinces of Hainaut and Namur, and the cantons of Grammont and Ninove, consists in spreading the flax over a field of grass or clover late in the autumn, or in the months of January and February. The winter steeping gives the best and whitest flax.

In France, before spreading, it is customary to wet it with a solution of alkali, and in Holland with sea-water, to prevent its being stained.

This process of steeping occupies about a month.

The expense of this process is on an average 59 francs 50 centimes per hectare.

This system gives a grey or blueish filament, and is only resorted to in places where water is scarce.

Steeping in stagnant pools.—The water should be as clear as possible, and devoid of chalk properties, which affect the colour and qualities of the flax.

In the province of Waës two sorts of "routoirs" (steeping pools) are employed—the "routoir bleu argentin," which owes its colour to the natural sediment of the soil, and the "routoir jaune," also owing its colour to the same natural causes. Alder leaves and poppy-heads are supposed to improve the colour of the flax. The flax plants are made into bundles, placed in the pool, and covered with planks and stones, to keep them under water, and are left to soak for ten or twelve days.

This process costs from 60 to 65 francs per hectare.

Steeping in rivers.—The flax must be a year old, and the stream limpid so as to preserve the whiteness of the filament. In the environs of Courtrai it is generally kept for two or three years previously to being steeped, which is done either horizontally or vertically; flax steeped horizontally is not so white, but, on the other hand, is softer than the other, the water making its way through it much less rapidly, and by its putrefaction producing the softness.

The bundles of flax are tied with osier twigs, fastened to stakes embedded in the river, and kept stationary by means of cords fastened to posts on the banks of the river.

Flax that is to be steeped vertically is either fastened to poles and plunged under water, or else placed in cages or frames, containing 150 bundles, and lined with straw; the cage once filled, and the top of it covered with three or four centimètres of straw, it is fastened by cords to posts, and let down into the river.

At the end of a few days fermentation sets in, and the cage becomes heavier; care must be taken not to disturb its equilibrium.

This process generally requires from seven to ten days, the time varying according to the season and temperature; thus, in May, it requires between nine and ten days, in August seven days, and in October twelve days.

The steeping of a hectare of flax, including what is called the "arrière rouissage," costs 150 francs 50 centimes.

This process generally gives a coarse filament, but strong and of a good colour, and in quality inferior to that produced by the steeping in stagnant pools. The flax does not begin to soften for nine or ten months after the operation of steeping.

The "arrière rouissage" consists in stacking the bundles after they have been taken out of the steeping-cages, and are free from water. Once the flax is well dried, it is again spread over a field to whiten.

The "rouissage manufacturier," or American process, is already well known in Ireland, under the name of "Schenk's patent system for steeping flax;" it would be therefore superfluous to describe it.

6. *Colza.*—This crop is rarely grown on a sugar-beet farm; indeed, we did not meet with a single instance. As a rule it is taken between two or more grain crops, either instead of flax, or as part of a long rotation of which flax is one course, or as part of the root-course. There are comparatively few farms in Belgium on which no "industrial crop" is grown. The crops which come under that title are flax, hemp, colza, tobacco, and sugar-beet. Tobacco is grown only to a small extent, and generally on small farms; colza and sugar-beet we never found together, but two out of the remaining three are often grown on the same farm—usually flax and hemp, or flax and colza. If clover is sown with flax, the colza will generally be succeeded by turnips as a catch crop; but if carrots are sown with flax, clover is sown amongst the colza-plants. The former is the usual practice on loamy soils, and the latter on the sandy land.

The rape is sown in seed-beds in July or August, and the plants are pricked out, about 7 or 8 inches apart, in September or October, the land having been well manured in the autumn. The young plants generally receive a dressing of liquid manure, except in severe seasons, and they are protected against frost to a certain extent, either by earthing up, or, if clover is to be sown, by drawing the earth into a ridge on each side of the lines of plants. In the latter case the clover-seed is sown in the spring, and covered by raking down the ridges; the crop is harvested in June, and a cutting of clover is frequently got the same year. If no clover has been sown in the colza, turnips are sown as soon as possible after harvest, except on some farms where a long succession of white crops, coupled with a paucity of beasts (and consequently of manure) renders a summer fallow almost imperative.

7. *Clover.*—No point in the farming of Belgium is so remarkable as the general excellence of the "seeds;" and there is no subject upon which the farmer, especially in Flanders, is more sensitive. An exceptionally good crop of clover is as much a matter for congratulation there as a fine root-crop is in England; and in other respects the clover-crop is regarded much as we look upon the turnip-fields as indicative of the nature of the farming.

We were so much struck with the bulk of the clover-crop in North Belgium, and the general absence of cases of failure, that the subject necessarily attracted a large share of our attention. Of all natural phenomena against which the farmer has to fight, there is none more baffling than clover-sickness; and we, therefore, were careful to observe the conditions which appeared to exist in a country where clover-sickness is a rarity.

One generalization is easily made, namely, that clover-sickness is unknown on farms worked on a long course, consisting chiefly of successive white crops. This *may* be due to the number of years between each clover-course—seven, eight, or nine; but as the whole "seed-course" is sown with cow-grass, that explanation ought to be as valid in England, where the winter is not so severe, and where, especially on light land, as in Norfolk, red clover cannot be grown with certainty even once in twelve years. On sugar-beet farms, where the course is only of four or five years' duration, red clover can only be taken on a portion of the "seed-course" every year, and not always on so much as one-half of it.

In long rotations clover is sown either with a grain crop or an industrial crop, occasionally a part being sown with each. Thus clover is sown on some farms in winter at the same time as wheat, rye, or winter oats; generally it is sown in spring on wheat, barley, or rye, with oats or flax, or amongst colza-plants; and occasionally, in small-farm districts (so great is the liberty that may be taken with it), it is sown late in the summer in carrots which have been sown with flax, or with stubble turnips after rye, colza, or flax has been harvested. On sugar-beet farms it is sown with oats, or on rye or wheat. There is much difference of opinion and of practice as to the treatment of the young seeds; but, speaking generally, there are two schools, the teaching of each being what its advocates have found practicable.

Commencing with a farm on very light sandy land, where red clover is sown amongst colza-plants in the spring, the seed being covered by raking down the ridges, one cutting will be got the same year and either consumed or sold off the farm at about 45*s.* per acre; the first year there will be three cuttings of clover, yielding enormous crops; and the second year, some grass-seeds being sown in the spring, the yield is given chiefly to feeding beasts in the byres. These seeds were preceded by four white crops in succession, not a single root (except a few potatoes) being grown on the farm, and therefore, after another four grain crops, the process will be repeated with the same result. Each plant of colza on this farm received a liberal dressing of liquid manure, which, of course, fertilised the land for the clover as well. An ordinary crop, yielded by three cuttings the first year, cannot be put at much less than 16 tons of green clover (equal to about 4 tons of clover hay).

On a farm on stronger land, more typical of Central Belgium, and the occupier of which preferred to let his clover grow to its full height, branch out, and get full of flower before cutting it, there was a similar result. The clover was taken after three successive white crops (wheat, rye followed by turnips, and oats), which came after a root-course, preceded by four white crops. The first cutting was got about the end of May, and the second in about two months after, the two yielding 10 tons of green clover per acre. No third cutting was taken, the aftermath being reserved as autumn keep for sheep. On this farm we saw the best system of keeping the liquid manure from the cowhouses in a concentrated state, as the rain-water was carefully drained off by a separate system of pipes. The "purin" was, therefore, very slightly diluted when applied to the clover, which was generally in March.

In another district of this division of Belgium we first heard of clover-sickness. Clover was taken only once in eight years; but great difficulty had been experienced in keeping a good plant through the winter, and we attributed it to the elevation of the land subjecting the plant to severe climatic influences. The system adopted, after many unsuccessful experiments, was to sow the white crop (oats) and lightly harrow it in; then to sow the clover immediately, and harrow the seeds in very deeply. Immediately after the oats had been harvested sheep were put on the clover for four or five days, just long enough to tread and consolidate the land, without giving time enough for them to pull up the young plants. By these means, owing to the increased root-hold which the plants thus obtained, we were told that the yield of clover had been nearly doubled, because formerly at least two-thirds of the plants were lost in the winter.

On sugar-beet farms the seed-course rarely, if ever, consists entirely of red clover. The following examples will suffice: on a five-course farm one-half was sown with red clover, and the remainder with white; on a six-course farm in another district one-half was *Trifolium incarnatum;* and on M. Dumont's farm at Chassart (four-course), described by Mr. James Howard, M.P., in his paper read before the Farmers' Club, one-half the course was red clover, and the other half white Dutch and rye-grass, ploughed in as green manure in February, preparatory to the land being sown with flax. The yield on such farms is also less than on those previously described, and cannot be put at more than from 2 to 2½ tons of clover-hay per acre.

Sugar-beet land is much stronger and better than the light sandy land which yields such enormous crops of clover. But the sand-land farmers generally use more liquid-manure than the others; they are also, as a rule, more careful in dressing the clover (usually in March) either with town manure or Dutch ashes; and on the farm (good loam) where the seeds were harrowed in so deeply, ammoniacal water from the gas-works was very largely employed. Whatever the cause, we continually saw remarkable crops of red clover associated with a terribly exhaustive course of culture, and consequent light yields of grain, on poor sandy land.

8. *Sugar-Beet.*—The ordinary mode of cultivation is to plough 10 inches deep in November, and to put farmyard-manure in the furrows to the amount of about 10 tons per acre; the land is then rolled* by the majority of farmers, the idea being that a finer and more consolidated tilth is thereby secured. Early in spring the land is ploughed to the depth of 6 inches, and soon afterwards either lightly ploughed or scarified. Sowing commences as soon in April as the weather will allow, generally about the end of the month. Nothing is gained by too early sowing, but, on the contrary, it often entails loss; for, if frosty weather sets in after the plants are up, they are immediately ploughed in, and the land is resown on the return of warmer weather. In "awkward" seasons it is necessary sometimes to resort to this practice two or three times, as plants checked by frost when they are young invariably run to seed towards the end of the summer. Sugar-manufacturers do not like guano to be applied to the land for beets, as it tends to give a bulky crop poor in sugar. But as the farmers are paid for their roots by weight, without regard to the percentage of sugar they contain,

* This seemed to us a very injurious practice, because the surface becomes "caked" after the first shower.

it is to their interest to produce as heavy a crop as possible. Therefore, on the one hand, we have the farmer trying to apply secretly guano and other stimulants, and on the other the manufacturer keeping up a system of *espionage* to prevent his doing so. Generally, however, the farmer gets the best of it, because so many "sucreries" have recently been established that amongst the manufacturers there is great competition to secure the roots.

What manufacturers prefer is to have the sugar-beet grown after a well-manured white crop, such as wheat, to have little or no manure put on the stubbles, and no artificial manure applied in any case. But there is every possible deviation from this course; and in one instance we found sugar-beet, well manured with dung *and guano*, taken after clover sown in wheat. The crop of roots was, of course, heavy, from 20 to 25 tons per acre, and they would fetch 16*s.* per ton, the pulp to be returned at a certain price per ton.

So far we have described only the practice of the farmer. We now come, in the natural order of things, to the disposal of the crop. The sugar-manufacturer is generally a large farmer in one of two senses: either he has an ordinary farm of considerable size, or he annually rents land from other farmers—preferably a wheat-stubble—for the purpose of growing sugar-beet on it. The reason is obvious: the factory cannot begin work until the end of September at the earliest, and all the roots are disposed of by early spring. The manufacturer must, therefore, find employment for a large proportion of his best workmen during the summer, and the easiest way of doing this profitably and keeping them together is by cultivating a considerable extent of land. If the manufacturer hires land for the year, the price which he pays for it includes the winter and spring ploughing and other preparations of the land for sowing. Sowing, weeding, hoeing, and harvesting, are done by the factory people; and the tops and leaves are left as the perquisites of the farmer. The roots that are bought from other farmers are delivered topped at a certain price per ton, either unconditionally, or on condition that a certain proportional weight, generally about 15 per cent., shall be returned as pulp at a certain price. The price of roots this year (1869) was said to reach 1*l.* per ton without pulp in some districts, and about 16*s.* per ton, on the average, on condition that 15 per cent. in weight was returned to the farmer at about 12*s.* per ton.

The manufacture of sugar, like that of linen, does not come within the province of an agricultural report; but there are one or two points connected with it that have an agricultural bearing. When the roots arrive at the factory they are either stored in long "buries," as we keep mangolds, but without apertures for ventilation, or they are at once washed and put through the usual processes. The earth washed off the roots is collected and drained, and sold as manure at the rate of about 4*s*. per cubic yard. The scum produced by the addition of an excess of lime to the beet-root juice is also utilised for the same purpose after being compressed like the beet-root pulp; it is considered a particularly good dressing for clover. The animal black, when no longer fit for use in the factory, is sold for the manufacture of superphosphate; but not for use in Belgium, we believe. Thus every waste product of the beet-root, and of the substances used in the manufacture of sugar, is put to a useful purpose. The only "waste" product of which it is necessary to say more is the pulp; and to describe its consumption properly we must devote a few pages to the subject of cattle-feeding.

Before leaving the subject of sugar-beet and sugar-making, we must draw attention to the immense benefit which the "sucreries" confer on an agricultural district. It is not only that the crop is a profitable one to the farmer, and that sugar-making is profitable to the manufacturer, but it is also that, at the otherwise dullest season of the year, agricultural labourers (men, women, and children) can earn in the factory, working piecework, at least as good wages as in the summer * when farming operations are in full swing.

9. *Cattle-feeding: (a) Pulp-feeding.*—For the sake of preserving the sequence of ideas, we will commence with pulp feeding. Of this there are two kinds, perfectly distinct in practice and result. The most simple kind is where young stock (preferably two-year-old heifers) are bought as wanted, put immediately on pulp with a little corn or cake, and sold to the butcher at the end of three or four months in a state which we should call "half-fat." This would not do for the English market; but, on the other hand, our fat beasts would be unsaleable in Belgium.

When these young stock are first put on pulp they will not touch it, and a large quantity of salt must be added to induce them to eat it even when they are nearly starving. After a while, however, necessity compels them to eat the pulp, and it gives them diarrhœa. The result is that during the first fortnight they get even more skinny than they were when they came in; but about the end of the second week, or the middle of the third, the poor beasts break into a most profuse perspiration, and the diarrhœa gradually ceases. The quantity of salt given with the pulp is then gradually diminished, and from

* Except during harvest, in some districts.

the cessation of the diarrhœa the animals rapidly improve in condition. They get as much pulp as they can eat at each meal, and are fed punctually twice a day, at, say, 11 A.M. and 6 P.M.; and, when they are thoroughly accustomed to their food, about 2 lbs. of crushed corn or cake per head per diem is mixed with some of the pulp. After this stage they look for feeding time with great eagerness.

Generally speaking, they weigh from 550 to 600 lbs. live weight when they come in, and, after having been fed in this manner between three and four months, they are sold at an average increase of 50 per cent. in weight. About three lots will thus be fed off in the course of the year if there is sufficient pulp for them. What the *quality* of the meat is we had no opportunity of judging; but we felt somewhat doubtful in consequence of the very serious check which the animals receive, and the consequent loss of the "calf's flesh," at the commencement of the feeding process.

The more complex system seemed to us more likely to produce good beef. The beasts, either young steers, cows of 6 or 7 years old, or heifers—but preferably the last description—are bought in February and are fed off by the end of the year. When first bought, they are put into the byres and eat what forage there may be left. In the middle of March they go on to the pastures in "parks," and remain out until the middle of July, after which period they are kept entirely in the byres, their food chiefly consisting of the cut aftermath from the meadows. When this is finished, which is generally in September, they are fed on beet-root pulp or distillery refuse (see *infrà*) mixed with rye-meal; and if these articles of diet are properly given the beasts have no disinclination to take them. They begin with about 14 lbs. of pulp and 1 lb. of rye-meal, and the quantity is increased to 56 lbs. of pulp and 4 lbs. of meal.* When doing well, at the finish, the beasts are said to increase nearly 7 lbs. each per diem, live weight; and when sold the heifers will weigh about 13 cwt., the older beasts rising to 15 cwt. Some farmers prefer to give less pulp and more meal; and a good allowance for a beast weighing 10 cwt. will be 40 lbs. of pulp and 8 or 9 lbs. of meal. This system, it must be remembered, requires the possession of some good grass-land, which the one previously described does not.

Farmers whose occupation does not include good meadow-land do not buy in their stock until later in the year; and they keep them on the pastures until the end of October. The food

* Dr. Voelcker considers that the proportion of pulp is too great to give the best economic result.

will then consist of two meals per day of pulp and rape-cake (or rye-meal), generally about 60 lbs. of pulp and from 2 to 4 lbs. of meal each per diem, and in the middle of the day a drink of water mixed with 1 lb. of meal per head. Generally, at night, they get a little long straw, which we have seen them eat with great avidity. The tops and leaves of beet-roots are given them on the pastures. Whatever the system of feeding adopted by a farmer, he always recognises the importance of carrying it out with perfect regularity. A steer or heifer bought in, say, in February, at from 8*l.* to 10*l.*, will fetch 24*l.* to 28*l.* when sold at Christmas, or early in the year, if in good condition.

The number of beasts which can be fed off every year, on a given area, under the pulp system, must vary, of course, with the quality of the land, and especially with the supply of grass and clover. It is extremely difficult to estimate what the land will carry, because many of the best feeders are also sugar-manufacturers, and they may retain the pulp of two or three times the quantity of beet-roots which they grow themselves. But supposing that no sheep are fed (they are not often bred by beet-root growers), that no other stock is kept, and that a farmer gets 15 per cent. of the weight of his roots back in pulp, he will, with the addition of cake or meal as we have described, fatten from 18 to 25 beasts per 100 acres, according to the quantity and the quality of his grass and clover; but such farmers, as already stated, generally farm on a four or five-course system.

(*b*) *Feeding with distillery refuse.*—Heifers and cows are generally preferred for this and other descriptions of feeding, because, amongst other reasons, oxen are somewhat dearer owing to their employment instead of horses. On every feeding farm there is a certain proportion of oxen, which are worked for two or three years and then fed off; but in the large-farm districts, where there is not much demand for milk and butter, heifers from 2 to 3 years old, and some cows of 6 or 7 years old, constitute the bulk of the feeding beasts. An animal weighing from 7 to 8 cwt. live-weight will get about 15 gallons per day of distillery refuse with straw and cut hay, and, when being finished off, an allowance of about 2 lbs. of rape-cake per diem. Some farmers prefer, or are obliged, to give more cake and little or no hay, in which case the quantity given will be gradually increased until, for a short time at the finish, the daily allowance will be as much as 7 lbs. per head. Heifers are supposed to be ready for the butcher in about 100 days after they are put up; but oxen will take from $4\frac{1}{2}$ to 6 months, making more meat but not so much fat. Under proper management a distiller will, therefore, feed off two lots of beasts per annum, the number varying chiefly according to the magnitude of his distillery. Other circumstances, such as the possession of grass-land, regulate the age at which the animals are bought, the length of time they are kept, and the profit they yield. As a rule, however, in Belgium it is considered that beasts should increase 50 per cent. in weight from the time they are put up to feed until they are sold to the butcher. Farmers who have the opportunity are generally glad to combine pulp-feeding with an allowance of distillery refuse.

(*c*) *Root-feeding.*—This is not so important as either of the systems already described, although its practice is attempted by most of the ordinary farmers in this division of Belgium. In treating of the rotation of crops we endeavoured to show that, where sugar-beet was not grown, a long course of 7, 8, or 9 years contains only one root-course, which is encroached upon by beans, oats, and flax, and a great part of which consists of potatoes for household use. The proportion of land in clover is, of course, equally small. Under these circumstances the feeding beasts must be few in number unless the soil and climate admit of the growth of large catch-crops of carrots or turnips. Probably we shall not be far wrong in estimating the proportion of beasts kept to be not more than 12 to every 100 acres. This estimate is obtained by a comparison of the information which we obtained on several ordinary farms in different localities; that the *proportion* between this number and that given on beet-root farms is tolerably accurate will be seen by the fact that on the former not more than one-fifth or one-sixth of the farm is annually manured, on the latter the proportion rises to three-eighths and even two-fifths, according to whether the farm is worked on a four or a five course shift. The system usually employed is to keep the cattle on grass and clover during the summer. They go on the pastures in the morning and evening, and get clover in the stables during the day. About the beginning of November they begin to get roots, generally sliced, commencing with turnips and finishing with mangolds, swedes being a rarity. They also get cake or meal, in varying quantities up to 7 or 8 lbs. at the finish. Although there are good farmers who do not grow sugar-beet, and who feed off a good proportion of beasts. the generality of them find the winter a difficult season to get over, and they are frequently compelled to sell their beasts lean, or not half fat, when they mostly find their way to the sugar-manufacturers. Many farmers of this class do not attempt feeding; they keep cows and raise the calves, selling them lean as two-year-old heifers and steers. The amount of meat produced in Belgium is not so great as we have been led to believe, as may be seen by the fact that although Belgians cannot be called a "meat-eating" people, and although England is practically their only market for surplus meat, our imports of sheep and cattle from Belgium are insignificant compared with those from Holland.

(*d*) *Pleuro-pneumonia.*—Belgian farmers say they are not so much troubled with this scourge as we are in England. They, almost without exception, "inoculate" for the disease, and (assuming that they enjoy the immunity which they claim) we believed that they were justified in considering it a "sovereign remedy." But after reading Professor Simonds's reports on the subject * we have gone over the ground again, and we think it possible that two other conditions may help to ward off the disease. The first is that cattle in Belgium are not exposed to changes of temperature and of weather to anything like the extent that they are in England, as we have already described. The next is that the food, in feeding establishments especially, contains more of the material from which alcohol is formed, *e.g.*, distillery refuse and sugar-beet pulp (in which vinous fermentation has generally set up before it is given to the beasts), while where these materials are wanting it is a favourite practice to put a mass of cut roots into a heap mixed with meal for about 12 hours—until fermentation has commenced—before giving them to the cows. As alcohol is said to have been used in France with great success, as a *remedy* for pleuro-pneumonia, it is possible that food capable of entering into alcoholic and other fermentations may assist in *preventing* the disease.

The question of the efficacy of inoculation is again being investigated; and we have made the foregoing remarks in the hope that they may lead to other lines of enquiry being also taken up.†

10. *Sheep-feeding.*—In the sugar-beet districts sheep-breeding is exceptional, therefore it will be more convenient to describe that department of farming when we are dealing with a district in which it possesses more importance. On some sugar-beet farms, however, a large number of sheep are fed on beetroot-pulp and a little cake or meal, farmers generally reckoning ten sheep to one ox,‡ and giving them food in that proportion. Thus, an

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* 'Journal Royal Agricultural Society,' vol. xiii., p. 373, and vol. xiv., p. 244.

† M. Leclerc states that pleuro-pneumonia has on several occasions made serious ravages in Belgium, particularly in the establishments of distillers, who feed a large number of beasts. No curative means are known. Dr. Willems, of Hasselt, has proposed inoculation as a preventive means. This method is practised by many distillers and some farmers, who maintain that it gives good results. However, the special commission instituted by the Government to investigate this system has not come to a positive conclusion after the numerous experiments which they have carried on for several years.

‡ This has led M. de Laveleye ('Economie rurale de la Belgique') to his magnanimous reduction of 8 to 1, when comparing the stock kept in England with that kept in Belgium. He has forgotten the vast difference between the keep of a sheep imported from the other side of the frontier half-fat, and worked off in

ox has, say, in round numbers, about 50 lbs. of beetroot-pulp and 5 lbs. of cake per diem, and this quantity will, therefore, be considered a sufficient daily allowance for ten feeding sheep. As an example of the system adopted, we cannot do better than describe the practice of M. Dumont, of Chassart, whose farm we have already mentioned. That gentleman buys sheep in different parts of Germany, preferring a cross of Merino with Southdown. Most of them come half-fat from the Polish frontier, between two and three years old, and they are fed off in between two and three months, according to the season. Generally from 1400 to 1500 are on the farm at one time. Those bought in the spring, when clover is scarce, get about half a pound of linseed-cake each per diem on pastures; then the clover, consisting of rye-grass and white Dutch, yields abundance of food until the end of September, when it is assisted, until the beginning of November, by tops and leaves of beetroots. About the end of November "house-feeding" commences in the "bergeries," the food consisting entirely of beetroot-pulp, which they eat with avidity. All the lots are finished off with a little cake just before they are fit for market. M. Dumont does not find his "house-fed" mutton so profitable as his beef; but he attributes this chiefly to the market being glutted with sheep during the later autumn and winter months. Most of his sheep are sold for the Brussels or the English markets.

The native sheep weigh heavier than the cross with an English breed; but notwithstanding that fact, the latter will sell for more money, even to native butchers. In Belgium generally fat meat is not liked, and what is there considered "fat," would in England require a deal of feeding to make it fit for market; but Merino sheep never can be fattened, and the butcher, although he knows that he gets more weight, puts a tolerably accurate value on the overwhelming proportion of skin and bone.

11. *Pigs.*—The true Belgian pigs have precisely those qualities which English breeders and feeders try to avoid. They are long-bodied, flat-sided, lop-eared, and very large animals, which look as if they had enormous appetites, but a small propensity to fatten. Of late years they have been in some districts much improved by crossing with English breeds. We complimented one proprietor-farmer on his possession of capital English pigs; but his reply rather startled us. "The English races," he said, "are the best in the world, and the easiest to fatten; but they are the very worst of all for the farmer." This seemed to us a paradox, and we asked for an explanation, which was thus rendered:

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between two and three months, and that of a breeding ewe which has to be kept all the year round. These and other differences between sheep-farming in England and sheep-keeping in Belgium will strike the agricultural reader more forcibly in a later portion of this Report.

"If you give English pork or bacon to a Flemish labourer, he never knows when to stop eating, and immediately he has stopped he is anxious to begin again; but with Flemish pork or bacon he eats about a pound, and it remains all day in his chest!" We thought of the traditional navvy, who condemned nutritious food because it had not sufficient "stay-by" in it, and we said no more. Doubtless, this remark, however absurd it may appear, contains the explanation of the fact that the ordinary Flemish pig is still a great brute. This is the more noteworthy, because great attention is given to pigs all over Belgium, especially in connection with their domiciles. We have already given (p. 11) a plan showing the most approved arrangement of pig-styes on small occupations; but on large farms the arrangements reminded us more of one of the ruminant-houses in the Zoological Gardens than anything else we had ever seen.

The following description, which is substantially true for many other piggeries that we afterwards saw, refers actually to that on M. Jacquemyn's farm in the Campine:—The building has a span-roof, and contains a row of styes on each side, with a good bricked walk in the centre. Each stye is about 6 feet square, and the sides and front are about 3 feet high. All the work is of brick, capped with a solid piece of timber, about 6 inches thick. A stone trough is fixed in the front wall of each stye; it is fitted with a swinging door, by means of which the pig can be shut off from it while it is being cleaned or filled, and afterwards can be prevented from scattering the food over the path; in each position the door is secured by a bolt. At the back of each stye is a door which opens into a small open-air paddock, about the size of the stye, and all these paddocks outside the piggery are as distinct from one another as are the styes within. The cleanliness and the absence of smell were remarkable, and were evidently due to frequent sweepings and scrubbings. The building was well ventilated, but, like all Belgian pig-styes, kept as dark as possible.

The food given to pigs consists simply of boiled potatoes and meal, together with any refuse that may be available. When put up to fatten they get as much as they can eat, the proportion of meal in particular being increased. There is a great demand for young pigs, in consequence of the number of farm-labourers and small farmers who are always in want of them, and they find a ready sale, at from six to eight weeks old, at 20*s.* to 28*s.* each. Fat pigs, containing much English blood, are eagerly sought after by town butchers, and fetch very good prices. Moreover, they are generally bespoke some time in advance, so that, with good prices and a ready sale, such pig-feeding is found to be extremely remunerative.

12. *Horses.*—The Flemish breed of horses is well known, but the pure blood is now rarely met with, except in breeding establishments. For farm purposes the most esteemed kind is a cross of the native breed with an English, or with the French *Percheron.* Pure Flemish horses, though possessing great strength, have not sufficient *life* in them. It is probably owing in some measure to their native sluggishness that the proportion of horses required for farm-purposes is so high in Belgium; but the nature of the implements must also have an effect. Most frequently we found that five horses were kept for every 100 acres; occasionally the number was as low as four, but only once did we meet with a farm worked by the usual English number of three horses per 100 acres. That farm was on some of the lightest Campine land —almost a pure sand; but as there were brick-kilns attached to it, and belonging to the proprietor and occupier of the farm, no doubt some of the draught-work was done by horses not really kept on the farm. One horse to 20 acres is considered the right proportion in the light land of the Pays de Waes; and it is only on large farms that the proportion is perceptibly reduced. Considering the excellence and cheapness of the railway accommodation, the large number of market towns at small distances apart, the lightness of the land, and the tendency of the Belgian farmer to consume so large a quantity of his own crops, this proportion must be regarded as excessively high.

The usual food in summer is clover or lucerne, and oats; in winter it is generally hay and a larger allowance of oats. Beans are not given unless grown on the farm, and then in many cases, for want of a bean-splitter, they are soaked in water for some hours previously. Rye-bread is also given, especially on small occupations, and to stallions after serving. Some farmers give their horses carrots in winter; but the general opinion is, that although they are fattening, they do not keep the horses in good condition. We may say that the Belgian farm-horses are kept quite as well as is the rule on ordinary English farms, chiefly on account of the quantity of oats given, 14 lbs. per diem being an ordinary allowance when the horses are hard worked. When they have clover, as much of it as they can eat is within their reach, and about 8 or 10 lbs. of oats is allowed them also. The stables are generally without any divisions, and the horses have what we should consider rather too much room.

Horses fetch good prices in Belgium, agricultural stallions ranging from 80*l.* to 120*l.* each; geldings, at 6 or 7 years old, from 30*l.* to 40*l.* Some farmers keep stallions which serve mares brought to the farm at 8*s.* each; such stallions are bought as yearlings at from 24*l.* to 32*l.* each. On one such farm we saw seven stallions, five of which were in service; these would be sold at 5 or 6 years old at from 60*l.* to 120*l.* each. On large farms in sugar-beet districts oxen do the ploughing and other operations connected with the cultivation of the land, so that horses are kept chiefly for draught purposes; but, wherever horses are kept, the farmer likes, if possible, to raise his own—hence the stallion-farms in Central Belgium are by no means unprofitable.

The improvement of the breed of horses is encouraged by the State by the annual offer of prizes for mares and stallions in each province of the kingdom. Previous to 1865 a stud-establishment was also maintained by the Government, small fees being charged to farmers who availed themselves of its advantages.

V.—The Polders and River-valleys.

1. *The Polders.*—We have already indicated the nature of the Polder-land sufficiently to enable its culture to be understood; but before describing what is the mode of farming now practised, it may be desirable to give a brief sketch of the manner in which these tracts of land are first brought into cultivation.

Formerly the Government granted "concessions" of unreclaimed polder-land (*schorres*) to Companies who undertook to make and maintain the dykes, the ditches, and everything that was necessary to protect the land from the sea, and to carry off the surface-water. For this concession the Government generally received a sum agreed upon, and the concessionaires obtained the lease of the land for a certain number of years; but any polder abandoned to the sea for a stated period reverted again to the Government. The most recent polders, however, have been "endigued" by the State, and the land afterwards sold in small lots of from 12 to 20 acres at about 200*l.* per acre.*

Under the old system new polders were almost invariably farmed by the concessionaires, who devoted the land to a most exhausting course of cropping. The usual practice was, after the lapse of a year, to commence with colza, ploughing not more than 4 inches deep. This crop would be so luxuriant that it would be necessary to hack off each stem singly; the yield in seed is said to have been as much as from 50 to 55 bushels per acre, and the quality extremely good. The next year the land was ploughed a very little deeper, and every succeeding year the plough turned up a little virgin soil until a depth of 9 or 10 inches was reached. The second crop taken was frequently winter barley, giving a product of 70 or 80 bushels per acre, or even more; wheat or flax came next, and then 3, 4, or 5 crops

* The engineering and farming operations are well described in detail, by M. de Hoon in his prize essay, 'Mémoire sur les Polders de la rive gauche de l'Escaut.' Mem. Couronnés. Bruxelles. Coll. in 8vo. vol. v., 1852.

of wheat were taken alternately with beans or oats. The yield of flax was about 8 cwt. of prepared fibre, and 24 bushels of seed;* of wheat more than 50 bushels, and of beans about 40. After such an exhaustive course of cropping it was found desirable to give the land a rest by sowing clover, which yielded about 5 tons of hay per acre in two cuttings. It was the practice to sell everything off the land: corn, straw, and clover. No roots were grown, and no manure applied. The sole object of the concessionaires was to get as much as possible out of the land while it was in their hands. Under the new system the result is not much better, for the proprietors follow the old practice; and when the land begins to require manuring and management they let it at rents which vary to some extent with the age of the polder and the quality of the land. Old polders, forming the bulk of the district, are let at from 32*s.* to 45*s.* per acre; but first-rate grass-land will easily fetch 4*l.* per acre.

One practice, however, is considered essential in the cultivation of a new polder, and that is to reap all the corn-crops "knee-high." This long stubble is ploughed in, not so much as a manure, but as a means of lightening the land, and of assisting in its drainage, for which no other provision is made except the ditches and canals already mentioned.

The course of cropping pursued on the majority of old-polder farms would in England be regarded as the last effort of a bad farmer. The following is a fair example: (1) winter barley, (2) beans, (3) wheat, or rye followed by turnips,† (4) beans, (5) wheat, (6) oats, (7) fallow, on which couch grows spontaneously and is encouraged. After this "natural grass" has remained its appointed time, generally two or three years, the land is ploughed in the autumn to the depth of 5 or 6 inches, and, after the furrow has got stale by exposure during fine weather, it is harrowed, and cleaned as well as possible. Manure is then spread on, and the land is ploughed to the depth of 10 inches, the first crop taken being either beans, wheat, or winter barley. No manure is given to any other course. The only roots grown are the catch-crop of turnips after rye, certainly not on more than one-twentieth of the arable land every year; and the only other provision for cattle, except permanent grass, is that yielded by grass-fallows. Therefore it is by no means wonderful that we found on these farms, as we were told we should, as many horses as cows and oxen. Formerly the fallow was left bare, and kept so for a year by repeated ploughings after a spring manuring; but the farmers say that the land is now too dear for them to

* The quantity of fibre is not relatively so great as might have been expected, but the yield of seed is very large.

† Only on the lightest Polder-land.

afford that, therefore they take a grass fallow instead, sometimes assisting the natural growth by sowing a few seeds.

The most advanced polder-farmers, however, have begun to grow clover as a regular course (most frequently sown with beans or flax), and this has enabled them to dispense with the grass-fallow, if they take it once in five or six years. Of course it is not all cow-grass. So deeply rooted, however, is the idea that any course which does not bear grain is unproductive, that we sometimes were in danger of recording as fallow a good crop of seeds. In some districts again, sugar-beet is grown, and this culture has had there the usual effect of a root-course, in enabling the farmer to dispense with fallows, and to obtain better crops of grain. The misfortune is that very frequently the pulp is not used on the farm, and the only portions returned to the soil are the undigested residue of the tops and leaves. This arises from the circumstance that it is chiefly in the polder-districts that the land is hired for the cultivation of the sugar-beet by the sugar-manufacturer. The Flemish adage, "No cattle, no manure; no manure, no crops," cannot be gainsayed where artificial manures are almost unknown; and thus this polder-land—the best in all Belgium—may be quoted as a model of the worst farming in the country.

It is not only that the arable land is managed badly, nor is it only that there are very few beasts kept on these farms; but everything else is in the same category. The polder-farmer of 100 or 150 acres, and such farms are of the ordinary size, often has no more education and no more intelligence than the farmer of 30 or 40 acres in other districts. Frequently, indeed, he has not so much; and, in proportion to the size of his farm, he has not one-half, frequently not one-quarter, of the capital. The polder-farmer relies on the fertility of the land, while the sand-land farmer makes up his mind to fight against its sterility, and relies solely on his own industry and the amount of manure he can put on the land.* Thus the "traditions" of the two classes of farmers are entirely opposed. The consequences are obvious. Men who now hold the farms which their fathers held before them, cannot grow such heavy crops as they can remember to have assisted in harvesting in their youth. The exhausting rotation pursued during a series of years, without the use of phosphatic manures, and in the absence of good implements, has "run out" the land. The use of superphosphates and steam-ploughing machinery would probably create an agricultural revolution, which would benefit alike the landlord, the tenant, and the country.

* The best farming is frequently the result of a contest with difficult conditions, either legal or natural; and most men have heard of the landlord who turned a bad farmer into a good one simply by raising his rent.

2. *Ordinary Sheep-breeding.*—The sheep usually kept are the original Flemish, because they are great wool-growers. We were not favourably impressed by the breed in any one respect, although they appear to yield a great weight of wool. Otherwise they possess most of the characteristics which English farmers dislike. At first we regarded their defects as inherent—defects which a naturalist would consider diagnostic of the species. But, after a while, we began to doubt whether the poor sheep were not more sinned against than sinning. Certainly the system pursued by the majority of Polder flockmasters would soon ruin even the best breed in England. To give our report the stamp of reality, therefore, we will describe a particular example, just as we had it from the farmer; merely premising that our note-book contains several parallel cases, and that the one we have selected is a type of the system pursued in the district.

Our example farmer had about 110 acres of land, 25 of which were in pasture. His course consisted of barley, beans, wheat, beans, wheat, oats, and fallow. He had, at the time of our visit, 8 cows, 5 heifers, 5 calves, 2 bulls, and 105 sheep. His flock consisted of 47 breeding ewes (which had yielded 48 lambs) and 21 shearlings; but 11 lambs had been sold, so that 105 sheep, all told, were on the farm when we saw it. All the gimmers, except any remarkably small ones, were incorporated into the breeding flock, so that he rarely had more than 10 three-shear ewes. The ewes are put to the ram in the beginning of August, picking up what they can get on the grass margins of the roads by day; at night they go on to a stubble near the farmhouse, where the shepherd (who never leaves them) makes a hut for himself. This treatment continues until the middle of October or beginning of November, according to the weather, when their night-quarters are the "sheep-house" (*bergerie*). During the day they pick up what they can get on the road-sides and pastures; but before they go out they get some bean-straw, about 8 o'clock in the morning; and when they return in the evening they get beans and straw together (unthreshed). When lambing, they get a little rape-cake, 7 lbs. being considered sufficient for the whole flock of 47 breeding ewes; and this allowance is continued for three months. The lambs are turned into the yard of the *bergerie* every day when old enough, and given a few crushed oats. The lambs are never weaned,* but run with the ewes and rams by day all through the autumn, being separated only by night when the ewes lose their milk. The oldest ewes are sold lean, as many as there are gimmers to supply their places.

* We saw lambs suckling in September, more than a month after the ewes, as we were told, had been put to the ram.

The fleeces of ewes will weigh about 9 lbs. each, and hoggs will yield as much as from 11 to 14 lbs., according to the liberality with which they have been kept during the winter. These figures seem very large, but we could not ascertain how much of the weight was wool, and how much was dirt;* for it is not the practice either to wash or to dip sheep unless they have some disease which renders it necessary. We mention this more particularly in consequence of the number of foreign sheep imported into England which are found to be suffering from scab and other diseases.

3. *Improved Sheep-breeding.*—Under this head we wish to show that the ordinary Polder farmers, whose practice we have just described, are not in want of good example. The services rendered to Belgian agriculture by M. le Baron Peers, of Oostcamp, have been frequently eulogized; but we are not aware that any detailed account of his system of sheep-keeping (only one out of many admirable points in his farming practice) has ever been published. For this reason, and because the Baron's farm is very close to the Polder district, though not quite on it, we give here the following account of his mode of sheep-farming. It is necessary to begin our description by stating that the Baron farms on the Norfolk four-course shift, and that the root-course is apportioned especially with a view to providing food for sheep in a climate where swedes, if left in the land, are very apt to freeze in winter. He has in hand nearly 200 acres, of which about 40 are in grass. The root-course will therefore consist also of nearly 40 acres, divided between mangolds, swedes, potatoes, carrots, chicory (for cattle-feeding), and cabbages succeeded by kohl rabi. The mangolds, swedes, potatoes and carrots are pitted before winter, and the chicory is consumed. Cabbages are sown in seed-beds in October, planted out in March, and are ready for use about the end of June. Kohl rabi is sown in seed-beds in the spring, and planted out in the middle of July, when the plants grow very fast, owing to the stimulus of liquid manure which they receive. If they were planted earlier they would run to seed and become woody. This evil being avoided, they stand the winter without injury, and are fed off by sheep on the ground in February or March. Thus Baron Peers is one of the few agriculturists in Belgium who recognize the value of folding sheep on the land.

At the time of our visit, Baron Peers had 450 sheep on his farm, about equally divided into breeding ewes, feeding sheep, and lambs. For some years he kept Hampshire Downs, but he now crosses them with Oxford Down rams, two or three of which

* A proprietor-farmer told us that he got 1½ fr. per kilo. for his wool. This would not be more than 16s. per tod of 28 lbs.

he imports from England about every second or third year. He departs also from the custom of the country in not drafting more than about one-fourth of his ewes every year. His crop of lambs is not much in excess of the number of ewes; indeed, twins he does not like, because twin-lambs do not thrive anything like as well as singles. This was a wonderful contrast to a proprietor-farmer in the Pays de Waes, who kept Texel ewes simply because, *on an average*, they would yield couples each!

The ewes are put to the rams on grass about the end of August, the whole flock and the three rams together, the shepherd taking them about from pasture to pasture. Later in the season they go on stubbles, either his own or a neighbour's (according to the custom of the country), and at night they are brought on to his own grass. About the end of November they are housed at night, being given hay, turnips, and a little bean-straw; and during the day they go on the pastures. This treatment is continued until the beginning of February, when they feed off kohl rabi on the land by day, and at night get the same food as previously in the *bergeries*, with the exception that they now get mangolds until lambing time, which begins at the end of the month. They lamb in the *bergeries*, and are fed with crushed corn or pulse—either beans, peas, rye, oats, barley, or cake—whichever is the cheapest; the allowance being 1 lb. per head per diem. Six weeks after lambing, both ewes and lambs go on the pastures, coming back to the *bergeries* at night; but every night and morning the lambs are sent into another house, and get half a pound per day each, in the two meals, of cake or crushed beans or oats, with a little salt. The lambs are *weaned* in July, being given grass and corn in the *bergeries* during the day, and hay at night. It will thus be seen that Baron Peers not only weans his lambs, but that he feeds his sheep more liberally than his neighbours, and that he thoroughly recognises the advantages to be gained by a daily change of food.

4. *Feeding-Sheep.*—The feeding-sheep belonging to Baron Peers are commenced on grass and finished off with about 1lb. each of crushed corn per day in two meals, given in the *bergeries* at morning and evening, with hay during the night. They are got off during the winter and sent to London alive, most of them being clipped first. The other sheep are clipped by the Baron's own labourers in the beginning of May. None of them are washed before clipping, as it is a thing not understood in the country. Dipping, also, is not practised; but the Baron thinks it is advisible to do it every four or five years.

Other farmers either sell their lambs lean or they do not keep breeding ewes. Comparatively few farmers both breed and feed. Feeding-sheep are bought clipped about April and sent on pastures during the summer, going on the stubbles also after harvest. For the home market no artificial food or corn is given, and this suits the majority of the farmers of the country; they are sold in August to be delivered according to agreement by instalments, before November 1, by which date they are all got rid of. Sheep for the English market are required fatter, and must, therefore, have better keep; they are generally fed on beetroot-pulp as already described.

5. *River-valleys.*—The soil in the river-valleys, continually fertilized by fresh deposits from the rivers, is especially adapted for grass, and yields the very best pasturage in the country. In some districts its value as feeding land is enormous; so great, indeed, that some proprietors will not let it at any price. In other neighbourhoods it is not so dear. The rent may fairly be said to range between 3*l.* and 6*l.* per English acre, the latter of course being an excessively high rent, and only obtainable for small portions in small-farm districts.

The grass is usually cut every alternate year; but it is considered better management to feed two years and cut the third. In small-farm districts the hay is generally sold by auction. This practice was commenced about twenty years ago, and is now very general, as the proprietor gets a far better return than by letting the land. In a good year, the hay off tolerably good meadows will fetch 10*l.* per acre; in ordinary years from 7*l.* to 8*l.* In some communes the farmers have the right to turn their beasts on to the aftermath in September and October; but in other parishes this privilege has to be paid for. Wherever it has been possible to do so, this kind of "common-right" has been extinguished, in consequence of the damage done by the cows at that time of year. Irrigating commences about the middle of November, and is discontinued in March. Where tidal influence is felt, the water overflows the meadows, when turned on them, every high tide.

Many of these valley-pastures, until the rivers had been properly canalized, were flooded whenever they overflowed, and the lower land was thus rendered so wet that it was worthless for a great part of the year. Now that the overflow of the rivers is carefully regulated, the low-lying land has become far more valuable than the higher ground.*

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* On this subject M. Leclere observes:—"In some provinces, particularly in Luxembourg, where the land is hilly and small water-courses abound, the water is used in the winter for artificial irrigation, but the results are not very satisfactory, because irrigation is generally badly conducted. The proprietors will not go to the necessary expense for levelling the land, so as to facilitate the regular distribution and flowing of the water. It is only in that part of the provinces of Antwerp and Limbourg, known under the name of 'Campine,' that well established irrigation is found. With the view of fertilising this region,

All these valley-pastures are celebrated feeding-grounds, and their richness is very remarkable. We find here the same objection to oxen that we have previously noticed as existing in the sugar-beet districts; but draft cows, if not more than 6 or 7 years old, are preferred to heifers, as the latter grow rather than fatten. Cows that are rejected on account of being poor milkers are most in demand. In the valley of the Dendre, near Grammont, for instance, the land will carry fully one cow per acre, so that, if it was tolerably young and in pretty good condition to begin with, it can be sold off in about three months' time; but if it was too old or too poor when bought, it would take the whole summer. A first lot, having been put on in April, will be sold off about the first or second week in July, when a second lot, to the number of one cow to two acres, can be fed off by the winter; but some are occasionally finished off in the stables. Cows are bought lean at about 8*l.* to 10*l.*, but occasionally one will fetch 12*l.* After three months' grazing, they are supposed to have gained in value from 6*l.* to 8*l.* When sold off, they weigh from 7 to 8 cwt.

On this land the dairy cows remain on the grass during the summer, from May to the middle of October; but if the weather is bad, they are taken in at night and fed with turnip and mangold tops and some young turnips. It is found that cows give much more milk when kept out on pastures than when kept most of the day in-doors, according to the practice of the small farmers.

Occupiers of river-side meadows are anxious to allow the sheep belonging to other farmers to run over their grass. They are usually folded during the day (except when snow is on the ground) from the middle of October to New Year's-day, and go

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which 25 years ago was quite uncultivated, Government caused to be construct about 120 miles of canals, which are fed by the River Meuse, and which serve simultaneously for navigation and irrigation. Since the year 1848 we have been able to create, by means of these canals, irrigated meadows, which occupy now a superficies of about 9,250 acres. The insufficiency of water has not permitted us to extend them more. The soil of the 'Campine' district being on about a level, it is set out in ridges for irrigation, and this is effected by tapping the main courses. The comparative expenses come to about 52*s.* 6*d.* per acre. A new law on water-courses is at this moment before the Chamber. Its application will probably admit of the utilization, for the profit of the agriculturist, of hose riches which are at present lost or badly employed, on account of the state of the water-courses. Irrigation would then develop itself in a manner quite impossible at the present time. Sewage water has not been used for irrigation in Belgium up to the present time. An English public company (the Belgian Public Works Company) is carrying out at this time at Brussels an important work of purification, which comprises the utilisation of the sewage water of this town for the irrigation of 150 acres of meadow situate in the valley of the Seune. But this portion of the work is not yet begun, and it is likely that it will not give a good result, because the extent of the meadows to be irrigated appears much too limited for the quantity of sewage water to be employed."

into *bergeries* at night; but occasionally, soon after hay-harvest is over, sheep are kept on the meadows both day and night. The sheep are considered to keep the grass of uniform quality—a result which is also attempted by mixing the cows' droppings with water, and applying it as liquid manure to the worst parts.

VI. The Plateau-Region of Southern Belgium.

1. *The Condroz.*—This ancient province forms the lower portion of this division. It is an undulating plain at a considerable height above the river Meuse, and, notwithstanding the monotony which such scenery always possesses, the aspect of the country is by no means unpleasing. The "chateaux" have more the appearance of English country residences than any we had seen elsewhere: the parks were better kept; the roads were admirable; and there seemed to be more of what we term "comfort" than in any other district in Belgium. The farms are comparatively large, averaging about 250 acres; and the farmers seem to possess more intelligence than those in the Polders. Compared with other districts, this region was thinly populated outside the towns and their outskirts, owing to the great demand for labour at Liège, Huy, and other manufacturing centres. Wages were therefore much higher than elsewhere, and as the Walloon race, which inhabits this district, does not possess the Flemish propensity to hoard, the money was spent as well as earned. Very little need be said about the agriculture, except that the farmers work on a four-field rotation, of which bare fallow used invariably to form one course, the shift being (1) oats, partly with clover; (2) clover or potatoes; (3) wheat; (4) bare fallow. The majority of farmers now cultivate roots, and assimilate their farming to the methods already described as practised in Central Belgium. The land is very strong, and a large quantity of lime is habitually applied to it.

2. *The Ardennes.*—The higher portion of the region consists of the celebrated Ardennes forest. Here the climate is rude, the land is strong, and the population scanty. The ordinary farming is very poor, both in system and in detail. A piece of *bruyere* (forest or waste) having been broken up, it will be sown the first year with rye, then oats will be taken two, or three, or more years in succession, until the crops become too bad, and then the land will be abandoned to a grass-fallow, similar to what we have described as characteristic of the Polders, for 5 or 6, or even 10 years. Sometimes a little clover is sown with the last crop of oats to help out the pasture, but not as a rule; and it is very seldom that there is enough herbage on it to yield a crop of hay. The general run of farmers seem very careless about the quality

of their seed, frequently sowing a mixture of black and white oats, for instance, or planting red and white potatoes indiscriminately. Occasionally a few roots are taken instead of oats, but they are badly cultivated. They are left too close together, are allowed to be nearly choked with weeds, and the land evidently does not receive a proper preparation for them in the first place. But a large proportion of the Ardennes farmers are proprietors, and farm better. In the midst of this cold and desolate country, consisting mostly of forest or waste, interspersed with badly cultivated arable land and poor fallow-pasture, you find labourers earning nearly twice the wages that can be got in Flanders, and living, by comparison, in a state of luxury. The farms are even larger than in the Condroz, and the population is not too numerous for the requirements of the country. The "bruyère" can be bought at about 5*l.* per acre; it is generally disforested by the proprietors, and will afterwards let at from 12*s.* to 15*s.* per acre.

The process of disforestation is very simple. The trees, which are mostly stunted oaks and beeches, yield little return except as firewood; they are therefore cut down, and the roots either dug out, or ploughed out with a heavy plough. The land is then ploughed to a depth of about 4 inches and sown with rye. About this stage of the proceedings a peculiar practice is adopted. The roots, underwood, and some soil, are burnt, and then spread over the land, as we use burnt clay. The soil is then traversed by lines of parallel trenches, from 6 to 8 inches wide, 4 inches deep, and about 2 feet apart, the earth out of them being thrown over the burnt soil on the intervening spaces. This is a representative of the sand-land system pursued under spade culture in Flanders and the Campine; but as the trenches are not deeper than 4 inches in this district, it seems as if their only possible use is to carry off surface-water. All these operations, including ploughing out the roots, ploughing the land, burning, trenching, sowing, and other operations until the rye is harvested, are done in some districts by gangs of men who take the crop of rye as their payment. Thus the proprietor is at no cost for the labour of bringing his land into cultivation, and as either pine-seeds or grass-seeds are sown with the rye, he has in addition a crop coming on without any expense to him.

We went over one estate, near Couvin, in process of disforestation, which was managed for a German banker by a very energetic Dutch farmer, M. Schellinx. He had found that the poverty of the land, the severity of the climate, and the high price of labour, rendered arable cultivation barely profitable, or at any rate a speculative business. The estate consisted of between 9000 and 10,000 acres, of which about 1750 had been disforested. Of this quantity four-fifths were in pasture every year, the system being to sow grass-seeds with the first crop (of rye) and allow the pasture to remain five years. He would then plough this as deeply as possible, about 15 inches, and subsoil to a depth of 8 inches more. He would then sow a white crop and a mixture of seeds, to remain another five years. When roots were taken after broken-up pasture, the land would be sown with white crop and grasses the succeeding year. On this estate there were 20 horses and 400 beasts; 240 of the latter were working oxen, 34 milch-cows, and the rest feeding beasts, heifers, steers, and calves. The working oxen were sold off half-fat at six or seven years old, to suit the requirements of the purchasing butchers. On this estate all the lighter land was sown with pine-seeds in the rye, as those conifers are found to produce an extremely good return.

In another portion of the Ardennes, where there were some very superior farmers, we found a somewhat different culture. On a farm held by a gentleman who had been several times in England, and who had learnt, *inter alia*, the value of dissolved bones, the mode of cropping consisted of two rotations, so that half the farm was always on each system. The pastures having been manured and broken up, the first rotation was (1) rye or swedes, (2) oats or barley, and clover, (3) clover, (4) epautre (spelt), (5) oats or spring vetches. The other course was (1) rye, (2) oats and clover, (3, 4, and 5) grass, which is kept clean, and not allowed to grow what will come naturally, as is the custom of the district. This farm consists of 500 acres, and supports between 40 and 50 feeding-beasts, 10 cows, several heifers and calves, and two bulls (one Devon and one Polled Angus). There are also 150 breeding ewes, and altogether about 400 sheep. The sheep-keeping was similar to that pursued by Baron Peers, except that the lambs are got late, the ewes being put to the ram towards the end of September, and the lambs not weaned until the beginning of the month. The breed was Southdown.

VII. Résumé.

Before leaving the farming-practices of Belgium, we think it desirable to recapitulate some of the more salient features which differ from those of English agriculture. The practice of taking successive white crops we have frequently dilated upon, and we have also mentioned more than once the want of artificial manures, especially phosphates. The practice of "soiling" has also been noticed, and no doubt much valuable food is thereby economized, though at the cost of some labour; but in Belgium this is not a very serious item. In contrast to this saving we must place a considerable waste on account of *chaff* not being used as fodder; we were frequently told that it was used, but invariably, on seeing it, we found it to be "cavings." Most of the straw is used as litter, only a very small portion being given to the cattle, and that in a long state. Much labour is expended in the frequent removal of the dung and litter to either a midden, a manure-house, or the courtyard; and extraordinary trouble, especially in the northern and central districts, is taken in the collection and application of liquid manure. The remarkable crops of clover, so generally noticed, seem to have but this one circumstance in their favour, in addition to those which are found in England. Nightsoil is invariably turned to account, its collection in the towns, its transport into the country, and the sale of it to the farmers being the chief occupation of a large number of people.

Of the yield generally we have been somewhat reticent, we think discreetly so. No point in farming is more difficult to report upon, especially in such a country as Belgium. The Government collect statistics annually, and it is very likely that the farmers, in giving their returns, keep in mind the possible contingency of an increased rent; while to us, foreigners, we were sadly dubious whether a love of national prestige did not occasionally lead them into the opposite extreme of romance. At any rate the two sets of statements rarely agreed. When one considers how few of these farmers have any means of weighing and measuring, it seems impossible that they can know, although they may estimate, their produce of anything that they do not sell. We found that the yield of wheat, a produce that is sold, ranged in different districts from 24 to 30 bushels per acre on an average, for good farmers; but in 1868 (a very good year) some of the best farmers got as much as 35 bushels. The Government returns give the average of the kingdom in 1868, in round numbers, as follows:—Wheat, 24 bush.; barley, 38½ bush.; oats, 37 bush.; rye, 23 bush.; mixture, 24 bush. per English acre. These figures certainly do not bear out the Flemish reputation for enormous crops; but that they are not unfavourable to Flanders is apparent by the fact that the large-farm province of Hainaut carried off the palm in wheat, barley, and oats. The small-farm province of East Flanders was best in rye and mixture, but these crops are not grown by good farmers in the south. We found that oats, in 1868, yielded to the best farmers, who do measure their crops, from 35 to 40 bushels per acre, and barley, which is always a comparatively good crop where it is grown, from 40 to 45 bushels. For the general run of Belgian farmers, a deduction from these figures of 20 per cent. would probably be not far from the truth.

Mr. James Howard, M.P., has kindly placed at our disposal an estimate of the crops of 1869, published in 'L'Agronome' (Namur), for November 13th. The crop of wheat was considered good, and estimated at 23½ bush. per acre; rye was thought fair at 22 bush. per acre; barley good at 34 bush.; oats good at 37½ bush.; and beans good at 24 bush. These figures are the average estimates for the whole kingdom.

Returning from produce to practice, we cannot help drawing attention to the fact that sheep are never allowed to feed off a crop on the land, except by a few landowners, like Baron Peers, who have adopted the English model. The system of meat-making altogether is anything but good; and the results would not, we think, satisfy an English farmer, with the exception, perhaps, of those obtained by the best methods of pulp-feeding. Arable-land dairying, however, is the most striking feature in Belgian stock-farming. Feeding-land is a different matter; but that is a gift, not a practice.

VIII.—Rural Economy.

1. *Capital.*—It is remarkably difficult to obtain anything like reliable information regarding the capital employed by Belgian farmers, for two reasons:—first of all, the meaning which they attach to the term capital is so elastic, that very few of them understood precisely what we meant; and, secondly, the tendency to exaggerate the importance of *la petite culture*, by showing how much more capital is employed, proportionately, on small farms than on large ones. In the small-farm districts, a large number of farmers cannot get so much land as they have capital to work, while in other districts, where there is less competition, farmers are tempted to hold *more* land than they have capital to occupy to advantage. The latter consideration does diminish the capital employed per acre, while the former does not enhance it. It would be ridiculous to assert that a millionaire who rented a farm of 1000 acres, employed on it a capital of 1000*l.* per acre. The capital employed on very minute farms must be relatively large, because the expenses in many respects must be actually the same, or nearly so, as on farms much larger. Then on very small farms, where six months' rent is paid in advance, and where the incoming tenant buys everything on the land from his predecessor, the capital must be very large compared with that on a farm of 200 or 300 acres, where rent is not paid in advance, and where the straw, the manure, and so on, are the property of the landlord, and are made over to the tenant, *in trust*, as it were, for his successors. Bearing in mind these facts, we admit that, on the general run of large farms, the capital employed is probably not more than 5*l.* or 6*l.* per acre, while on very small

farms it will be as much, in some cases, as 12*l.* or 15*l.* per acre, of which 3*l.* or 4*l.* per acre in some cases has been paid for manure in the ground, and another 3*l.* or 4*l.* for manure in the midden. What the actual value of the manure, estimated by its fertilising powers, really is, we should very much like to know.

2. *Labour.*—In Flanders wages are very low, ranging from 9*d.* per day in winter to 1*s.* in summer; in Brabant they are about 3*d.* per day higher; but in the sugar-beet districts and the Polders they rise to 16*d.* in winter, and 20*d.* in summer for field-work. In the Condroz and the Ardennes wages for field-work reach their maximum in Belgium—about 2*s.* per day in summer. On most farms there is a certain number of boarded labourers, some of whom are lodged, and some not. A labourer's keep is estimated to cost from 5*d.* to 6*d.* per day, and his wages are therefore reduced accordingly. Female servants get from 4*l.* to 6*l.* per annum, with board and lodging, in the small-farm districts; and 2*l.* or even 3*l.* per annum more on large farms, especially if they can make good butter and rear calves, when occasionally as much as 10*l.* is given. Shepherds never leave the sheep, and cowherds never leave the beasts. The latter sleep in the cow-houses on a shelf-bed, or a kind of board-hammock swung from the roof or ceiling. Their wages will average about 8*l.* per annum in Flanders, and from 10*l.* to 12*l.* in large-farm districts; but good men occasionally get more on large feeding establishments. It is usual to give yearly servants a gratuity (God's penny) when the bargain is made, also at harvest time, and on one or two other occasions, the whole amounting to from 16*s.* to 20*s.* per head in the course of the year. Women employed in weeding and other field operations get from 7½*d.* to 1*s.* per day in summer, according to the district; in winter there is little or no work for them. Belgian farmers are not in the habit of calculating their labour-expenses per hectare, and very few of them know what their labour-account is per annum; but the mean result of several attempts which we made to calculate this item on large and well-cultivated farms is, that the labour of a good farm costs from 20*s.* to 24*s.* per acre annually, according to the rate of wages in the district. On small farms the labour-account will not bear calculation, as may be seen by referring to our description of "a farm of 10 acres," which kept three men in constant employment.

The food of boarded labourers in Flanders and the Campine generally consists of rye-bread, lard, and buttermilk for breakfast; potatoes, buttermilk, haricot-beans boiled in their shells (when in season), or carrots or turnips, with rye-bread, and occasionally a little pork or bacon for dinner; for supper they get rye-bread, lard, potatoes, and buttermilk. The small farmers, and even some more considerable farmers in Flanders and the Campine (the sandy-land district) live just as their labourers do, and eat with them. We were frequently told of their custom, and more than once saw it. At dinner-time we noticed that the potatoes, haricot beans, and buttermilk, with salt and vinegar, were placed on an immense platter in the centre of the table, with large slices of rye-bread round it; about eight or nine people sat down and cleared the platter with remarkable rapidity. Frequently they have no separate plates, no knives, forks, or spoons; and each man, woman, or child, uses Nature's implements as fast as possible. We saw this on a farm of 60 acres in the Campine; and the party consisted of the farmer and his wife, three sons, two maid-servants, and one or two labourers. There was no beer on the table; but many farmers allow themselves that luxury, although they do not give it to their servants or labourers. In some parts of Belgium they live much better. Indeed, a daily labourer in the Ardennes lives far better than an ordinary well-to-do *petit cultivateur*. But this is the secret of his being "well-to-do."

Harvesting is not generally done as piece-work, but during harvest-time wages rise considerably, probably in most cases as much as 50 per cent.* In winter, however, work is scarce, except in sugar-beet districts; and on the small farms, in particular, there is no work at all for day labourers. As each labourer, however, is also a *petit cultivateur*, and "farms" from a quarter of an acre upwards, growing potatoes, rye, and carrots, more especially; and keeping either a cow, a pig, or a goat, according to his means, this hardship is not felt so keenly as it otherwise would be, because he manages to get through the winter on the rye-bread, potatoes, and carrots, of his own growing.

The culture of the bit of land devolves chiefly on the wife, who works quite as hard as the husband,—sometimes harder. The man and the children also help when they have time—for the true Fleming is never tired of working *for himself*. He must keep some animal as a manure-maker, say a pig, or a couple of goats. Every penny is hoarded, and every luxury denied, to enable him to buy a cow. Once he has a cow he may be said to commence a new existence, and many men who die the owners

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* M. Leclerc states that labourers engaged by the year are not paid the balance of their wages at harvest-time. Daily labourers get at this period as much as 3 or 4 francs (2*s.* 5*d.* to 3*s.* 2*d.*) per diem; and in districts where harvesting is done by piece-work they earn from 5 to 6 francs (4*s.* to 4*s.* 9*d.*) per diem. Threshing by the flail is often paid for as piece-work, *in kind*, at the rate of one-sixteenth of the quantity threshed. For some years past it has been possible to hire threshing-machines, which go from farm to farm, paying from 4 to 5 francs per 1000 kilos. (3*s.* 2*d.* to 4*s* per ton) of threshed grain. At the present time there are about 40 of such machines in Belgium.

of several hectares of land commenced life and got on precisely in this manner. They never invest in any security but land, and, until the opportunity of purchasing arrives, the money is carefully secreted.

Labourers' cottages vary in Belgium, and in different parts of the country, to as great an extent as they do in England; but we may state generally that the rents are from 9*d.* to 18*d.* per week, according to the district and the quantity of land attached. The labourers are generally enabled to hire other land in consequence of the custom, prevalent in and near most towns, of letting allotments by auction, either for a year or a term of years (generally three). The plan and section annexed illustrate the structure of a model cottage (one of a pair), several pairs of which have been built in the Campine by a large landed proprietor. The cottages cost 64*l.* per pair, and they have each about three-quarters of an acre of land attached, the rent for the whole being one franc (9½*d.*) per week, which is extremely cheap.* These cottages have each two bed-cupboards opening into a common living-room, and a kind of loft, without chimney or window, *yclept* a "bedroom, ;" they are built on arches, instead of concrete foundations.

3. *Poor-relief and Parochial Affairs.*—To describe completely the institutions for the relief of the poor, and for the education and maintenance of pauper children, would occupy a whole number of the 'Journal.' We must, therefore, be contented to state that, with the exception of the charitable institutions in the old Flemish cities of mediæval renown, poor-relief is under the entire control of the Minister of the Interior.† There is no actual poor-rate in Belgium, and all the institutions for the relief of able-bodied tramps are expected to be conducted with little or no cost to the State. The principle of management is simply to make every pauper work hard and live harder, and to charge the commune to which he belongs with the cost of his maintenance.

* M. Leclerc states that the rent of a labourer's cottage in rural districts is from 4*l.* to 8*l.* per annum, according to its size; but that in the poor parts of the country a similar cottage could be got for about 48*s.* per annum. The general custom in Belgium is, that each family has a separate habitation even in the towns, and in the country one never finds a number of families in one house. Every family in rural districts has a kitchen-garden, and very frequently a small field, which produce potatoes and grain for family consumption. These gardens and fields are hired.

† On this head M. Leclerc states:—"The poor are relieved by the *bureaux de bienfaisance*, or public relieving offices, in the rural parishes. In towns there are, besides the *bureaux de bienfaisance*, hospital-boards (*administrations de l'hospice*). These two institutions, which are under the control of the Government, have for the most part—the hospital-boards (*administrations de l'hospice*) always—properties of more or less importance resulting from donations, legacies, &c. The *bureaux de bienfaisance* are subsidised by the parishes when they have no longer sufficient resources. Several hospital-boards, those for example at Brussels, Nivelles, and Namur, are very rich; and cannot find ways to employ all their revenues."

Fig. 7.—*Section of a Model Cottage in the Campine.*

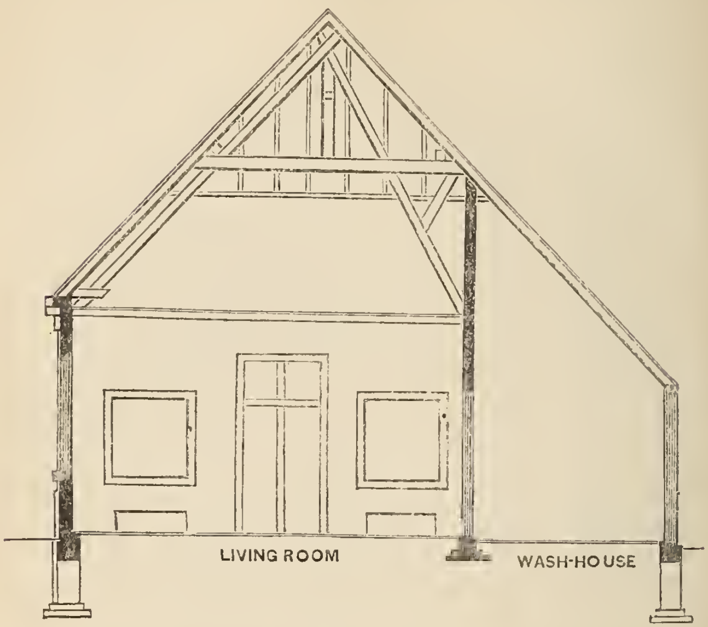

Fig. 8.—*Plan of a Model Cottage in the Campine.*

The institutions for the reception of able-bodied tramps and vagrants are termed "Depôts de Mendicité;" to each of them is attached a large farm, which is cultivated by the paupers held in durance. They are kept there for a few months, and then returned to their communes; but if caught "tramping" again and identified, they undergo imprisonment and hard labour. Boys and children are sent to one of the State "Écoles de Reforme," the chief of which are at Ruysselede (for boys), and at Beernem (for girls). The last report on these institutions was published in 1861; it embraces the ten years from 1849 to 1858 inclusive. At the end of 1858 Ruysselede contained 575 boys, and Beernem 246 girls. The farm attached to Ruysselede is more than 300 acres in extent, that at Beernem is about 150 acres. A large proportion of the boys work in the fields in the summer, and a certain number of girls; they are also taught different trades, the boys being tailors, shoemakers, &c., and the girls learning dressmaking, knitting, &c. About 100 boys are brought up for sailors, and a certain number of girls are specially prepared as domestic servants. The cost of these establishments to the State in the year 1858 was in round numbers 8600*l.*, of which nearly 2000*l.* was spent in permanent works. Deducting the latter amount, the cost per head is about 8*l.*, which includes the expenses of the respective establishments.

The able-bodied and the young being thus provided for by the State, the communes have only the care of the aged and infirm; but, as we have already indicated the mode in which they are provided for, and made to earn a portion of their own living (see p. 23), we need not dilate further on that subject.

Although there is no poor-rate levied by the State as a regular system, certain communes have found it desirable to obtain the authority of the Government to levy a rate for the relief of paupers, in consequence of the charge made by the "Depôts de Mendicité." In the parish of Haeltert, containing over 3200 inhabitants, and comprising 2500 acres, an authority to levy this rate is obtained every third year; the amount raised has been about 160*l.* per annum for the last ten or twelve years, and it is devoted chiefly to the purpose of *obtaining work* for the poor of the parish, and partly to the support of the infirm. The schools in this commune are admirable, but are not more than a somewhat favourable type of Belgian communal schools. There are separate school-rooms, play-grounds, &c., for boys and girls. About 400 children annually attend, 250 *gratis*, and the remainder paying 6*d.* per month for their education. The children are taught, whenever it is possible, *ocularly*—a great contrast to the oral system so prevalent with us. In our National Schools a boy will tell you at once how many quarts there are in an imperial bushel, when he may not have the faintest idea of the absolute or relative sizes of the standard measures. Similarly with maps; the boy is well acquainted with the map of Europe, and he knows how long it takes him to walk from one end of his parish to the other; but he has no notion what is the relative distance between those two points and between St. Petersburg and Lisbon. In these Belgian schools, however, everything takes a concrete form. You see long rows of the standard weights and measures; a series of maps on the same scale, commencing with the commune, and followed by the arrondissement, the province, the kingdom, and the continent.*

In the commune of Haeltert, the schoolmaster's salary was 60*l.* per annum, and that of his assistant 40*l.* The schoolmistress got 50*l.* The schoolmaster had about half an acre of ground, with a midden and cow-house, and he kept a cow. The three officials had lodgings in the school-house. The ventilation of the schoolrooms was effected partly by means of air-shafts in the walls, about 10 feet apart, fitted with internal and external gratings, and partly by ventilators in the roof of the building.

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* M. Leclerc observes :—"By our system of parish schools for the education of children of the working classes, poor children are received therein gratuitously. The funds necessary for these schools are taken out of the ordinary resources. They are furnished in part by the parishes and in part by the State. The State intervenes with subsidies, which amount generally to a third of the expense in the construction and furnishing of the school buildings. The province also grants subsidies for this object, but they are less important than those furnished by the State. There are at this time in Belgium 3511 parish schools, 627 private schools subject to inspectiou, 1492 private schools perfectly free; in all 5630 elementary schools. The first are attended by 382,484 pupils, the second by 73,824, and the third by 107,408—total, 563,718 for a population of 4,827,833 in our kingdom. Compulsory education does not exist in Belgium. It has been a question during the last three years, and an interesting discussion on this subject took place recently in the Chamber of Representatives, but without result. This system has numerous partisans here, but it is generally believed that its application presents great practical difficulties. The principal is that Belgium, in spite of the considerable sacrifices that the Government has made during several years, for the sake of elementary education, is not yet sufficiently provided with schools and schoolmasters to allow of compulsory education being efficaciously applied. The law allows benevolent societies to withdraw their succour from poor parents who do not send their children to school. This is the only measure of coercion which we have. The majority of parents send voluntarily their children to the parish schools. Statistics show that amongst the young men of 19 years of age, who draw lots for the militia, there is only 24 per cent. who can neither read nor write; but this is not a precise basis, because many young men who attended the elementary schools have forgotten what they learnt, when they come to the age for drawing for the militia. According to the statistics of the elementary instruction, which I have given in a previous answer, the relation between the number of pupils and the total population of the kingdom is 11·7 per cent.; but the number of pupils indicated does not comprise the children of the age of 7 to 14, which are admitted in large numbers to the ordinary schools and reformatories. Children begin to work upon the farm generally at the age of 14 or 15 years, when regular work which requires a certain physical force is required. In certain parts of the country children from 11 to 12 years of age are employed to drive cows, sheep, and pigs to the pasture-lands, and watch them there. In this case the children attend school in the winter."

The only thing that struck us as still wanting was the teaching of agriculture. If the schoolmaster had ten or a dozen acres of land for his own benefit, on condition that he gave the boys lessons in Practical Agriculture, while he should have the advantage of their labour at certain times, we believe that the result would, in the course of time, have a good effect on *la petite culture* in the kingdom.

Taxes, including government, local, and personal imposts, range from 3*s.* 6*d.* to 5*s.* per acre, in different districts.*

4. *Agricultural Education.*—Under this head we have to notice the State Agricultural College at Gembloux, which was established in 1860. The first volume of its 'Bulletin' comprises the history of the establishment for the eight years 1860 to 1867 inclusive. It appears that 166 students had been admitted; but that only 21 had passed the examinations, which entitle the students to the diploma of "Ingénieur Agricole." About one-half of these passed students were foreigners, four being Cubans and two Spaniards. The staff consists of seven professors, three demonstrators, and other officials; and the total cost to the Government is about 3300*l.* per annum. Attached to the College is a farm of 160 acres, which is worked with a capital of about 2300*l.* advanced by the State. Notwithstanding that 20 acres of this land is devoted to experimental and educational purposes, the profit on the whole extent was, as stated in the 'Bulletin,' in 1867 no less than 375*l.*, or more than $16\frac{1}{2}$ per cent.

These statements show that while, on the one hand, the College is not an expensive appendage to the State department of Agriculture, on the other its influence is not very great; 166 students in eight years, only 79, or less than half, of whom were Belgian, cannot be considered a very brilliant commencement for a State College in a nation of farmers. The paucity of students cannot be attributed to the expensiveness of the college;

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* According to M. Leclerc, landed property in Belgium is taxed by the Government, the province, and the parish. The basis of this taxation is the rateable value as fixed by the surveyor, and is generally 25 per cent. less than the annual value. The Government taxes vary a little in different parts of the country, the average amount being $6\frac{7}{10}$ per cent. (6*l.* 14*s.* per 100*l.*) of the rateable value. The provincial taxes amount on the average to 15 per cent. of those paid to the Government, while the parochial taxes vary from 5 to 50 per cent. of that amount. There are no special taxes on the land for the support of the poor. In addition the farmer pays personal taxes to the State, the province, and the parish. The roads, bridges, &c., are kept in repair by the State, or by the provinces or communes which have constructed them. The cost of their maintenance is defrayed out of the ordinary funds, no special tax being levied for the purpose. In the case of communal roads, when the ordinary resources are insufficient, each ratepayer must contribute either *in kind* or by an equivalent payment in money. The payment in kind includes one or two days' work to be furnished by each head of a family, according to his importance, and two days' work for each horse or beast of burden.

for "internal students" (boarders) pay only 28*l.* per annum, and "externals" only 12*l.* Then the fact that so small a proportion of students take their diploma seems to lend probability to the assertion made to us that when a man finds that he can make nothing good of a lad he sends him to Gembloux! The reproach is not to Gembloux, but to the practice of trying to make an "Ingénieur Agricole" of the "fool of the family."

5. *Large Farms versus Small Holdings.*—The question which we have now to consider is usually asked thus:—Is a national system of large farms or a national system of small farms best for a country? Our reply to that question would be one with which we became only too familiar in Belgium,—"That depends." It depends, of course, upon the condition and requirements of the country. In the case of the two countries which first suggest themselves—Belgium and Ireland—it is probable, at the present moment, that what is best for one is worst for the other. At the outset, therefore, it is necessary to ascertain precisely what is really the problem to be solved. Is it,—under which system is most food produced per acre; or, under which system is the most *surplus* food produced per acre; or, which system is the best as an employer of labour; or, under what circumstances is either one or the other most conducive to national prosperity?

Almost every Belgian is a firm believer in the superiority of *la petite culture* as a national system; but his arguments are generally based on considerations which are more æsthetic than economic, and his facts are derived from a comparison of, say, the Pays de Waes with the Polders. Such a comparison, even, seems to us illogical; as the districts compared differ so widely in soil that there is no analogy between them. For instance, in the Pays de Waes a farmer can reckon upon getting a good crop of turnips by sowing after harvest; but in the Polders it is often very difficult to grow turnips at all. As for the poetry, the "coquetterie," and the other æsthetical attributes of *la petite culture*, so much admired by some writers, they ought not to be imported into the stern region of Political Economy.

Our observations with regard to the production of food led us to believe that, *cæteris paribus*, the larger farms yield a relatively larger produce. In Flanders, farms of 20 acres are generally better *done* than those of 5 or 10; and farms of 50 acres better than those of 20. At the "Concours de Fermes" held this year (1869) by the Agricultural Society of East Flanders (the province of *la petite culture, par excellence*), the first prize was awarded to a farm of 105 acres, situated in the Pays de Waes, and surrounded by the best types of *la petite culture.* The second prize was awarded to a farm of 62½ acres; but it should be stated that special prizes were awarded to farms of less than 35 acres in extent. The first and second prize farms no doubt produced larger crops than any of the smaller farms in their neighbourhood, and the same thing is noticeable in every district. We venture to mention the farm of M. Dumont, of Chassart, comprising 1500 acres, and that of M. Van Vinkeroy, of Hasselt, measuring 500 acres, as indubitable instances of the superiority of the large farming in both the loamy and the sandy region. In Belgium very many large farmers are very bad ones, but, as a rule, the smaller farmers in their immediate neighbourhood are still worse. Of course there are exceptions. Small farmers generally try to do too much, and this peculiarity has led to the prevalent opinion that it is possible, under a small-farm system, to produce larger crops and to keep more stock than on large farms. They sow and plant every crop too thickly, and require double duty from land and stock. English farmers will be able to judge for themselves, from what we have described, of the relative amount of food consumed by cattle and sheep per head in Belgium and in England, and of the value of the animals in each case when sold to the butcher. The fact is, that the *petit cultivateur* keeps as many cows as he can for the sake of their manure and their butter; but he not unfrequently half-starves them, although he uses as their food all his own grain-crops except wheat. As they say in Staffordshire, "If you want more milk sell a cow!" * Eventually the cow is sold to the larger farmers, and by them made into beef. Practically, *la petite culture* in Belgium produces no meat but pork. Fortunately the small farmers consume none. That landlords are advocates of the small-farm system is but natural, because a large number of small holdings tends to raise rents. High rents and low wages are the predominant features of *la petite culture*,—features which in England would be considered anything but commendable. In large-farm districts, as we have shown, rents are relatively lower and wages higher.

The large farms yield the most *surplus* food, partly because their gross produce is more than that of the small ones, but more particularly because they give employment, in proportion, to a much smaller number of people, owing to the more extensive use of machinery. Which system is most conducive to the national prosperity of Belgium? The reply is, obviously, the large-farm system, because it sets free a large number of people for employment in other industries, the expansion of which seems to be entirely dependent on the supply of labour. When a railway is opened in a new district in the Walloon country, what is the effect? A man can travel in Belgium 100 miles for half-a-crown, so the agricultural labourers go to the manufacturing

* 'Journal Royal Agricultural Society,' 2nd Series, vol. v. p., 271.

districts in search of work, and get it: and in three months the rate of wages in the newly opened district will have risen 20 per cent. This is not the case in the northern part of Flanders, for there you can hardly induce a man to leave his native commune. The consequence is that there one sees a dense agricultural population, low wages, and poor living; and nearly the whole produce of the soil is consumed by those who are employed in obtaining it. Of course, if the only employment for a large mass of the population is the cultivation of the land, a large-farm system is impossible; but such a state of things is, in a civilized country, a political and commercial disease.

The most primitive condition of a country is that in which the population is evenly distributed, where there are neither towns nor villages, and where every family has to supply its own wants. The most advanced condition of a country is where the distributed population is no more than sufficient to till the land, and the remainder is congregated in centres of manufacture and commerce. In the latter we have division of labour, where the tiller of the soil feeds the man who clothes him, and so on through the endless labyrinth of interdependency which is formed by civilization; this condition must be co-existent with a system of large farms.

The small-farm system of Flanders, on the contrary, necessitates the employment of a large number of people on a relatively small area, and consequently at very low wages. We have endeavoured to show that this fact retards the natural increase in the prosperity of the country; and this consideration has, in fact, been brought home to some of the more instructed men in Belgium. M. Jacquemyns, President of the Agricultural Society of East Flanders, in speaking of the relatively large amount of manual labour required on their small-farm system, says "Twenty years ago this was its great merit, now it is its great defect." * This is because manufacturing industries and public works now require a constantly increasing number of workmen at higher wages than those of an agricultural labourer; and while this increase in his income benefits the individual, the result of his work is a benefit to the nation. The authorities of the State Agricultural College at Gembloux have also stated in their 'Bulletin,' p. 191, that "under equal conditions large farms have over small ones all the advantages which manufacturers on a large possess over those on a small scale."

The inherent proclivities of different races should not, however, be forgotten. The Flemish, for instance, are naturally

* M. Leclerc observes that "labour in the rural districts of Belgium is becoming more and more scarce, owing to the great development of manufactures. The insufficiency of labour is compensated for by the use of machines." This is obviously impossible on small farms.

devoted to agricultural pursuits, and they will make enormous sacrifices in order to buy a piece of land. They are very industrious when working for themselves; but otherwise their labour is dear even at the low price they get paid for it. Therefore, under a small-farm system, a certain amount of force is utilised which would otherwise have been wasted. The Walloons are entirely different; they are more energetic, and do more justice to their employers; then they get better wages, live very much better, and have neither the hoarding propensity nor the land-mania so characteristic of the Flemish.

Although we have endeavoured to show that small farming, as a national system, is not desirable in a manufacturing country like Belgium, we are far from saying that there should be no small farms. Such an opinion would be equivalent to saying that because it is not desirable that every soldier should be an officer, therefore there should be no officers. *La petite culture* of Belgium is favoured by the provisions of the Code Napoleon with respect to the inheritance of property; and we imagine that the tendency of those provisions must be to gradually extend the system of small farms, and to diminish the average size of the holdings.* This tendency seems to us directly opposed to an increase in the material prosperity of the country.

6. *Land-tenure and Tenant-right.*—In every part of Belgium, except the Pays de Waes, land is held under a system of short leases. The customary maximum duration of a lease is 9 years, but either landlord or tenant can terminate it at the end of 3 or 6 years by giving 6 months' notice. Occasionally one meets with a large farm held under an 18 years' lease. The date of entry varies from October 1st to May 15th in different parts of Belgium, and the covenants and customs are so variable that it is impossible to describe them in detail. Not only are the customs different in adjoining provinces, but in any one province half-a-dozen descriptions of agricultural usage may be found. Many of these customs vary with the date of entry, and refer particularly to what the incoming farmer is to be allowed to do previous to his entry, and what the outgoing farmer may do after the expiration of his tenancy. But as the present and future tenants seldom possess much mutual goodwill, these customs not unfrequently lead to disputes. Therefore some landlords have acquired the property of the outgoing tenant in the crops which he has sown, in the unconsumed forage, and so

* M. Leclerc remarks that "Landed property in Belgium tends to become more and more divided. This is the one inevitable consequence of the legislative enactment which gives to each child the right to claim an equal part *in kind* of the paternal heritage; it is also a conseqence of the increase of the public riches. as a large number of men who have acquired fortunes in manufactures and commerce desire to become landed proprietors."

forth; and the incoming tenant pays the outgoing one for performing those operations which he previously was obliged to do himself before the commencement of his tenancy. Then, at the expiration of his lease, the new tenant, according to covenant, is obliged to leave the farm as he found it; that is to say, to leave the landlord an equivalent of those crops which had been presented to him at the commencement of his tenancy. With regard to straw and manure the customs also vary; in some districts the farmer is obliged to leave in the barn and the midden all the straw and manure of the last year of his tenancy—these being in those cases the property of the landlord; in other districts, where they are the property of the tenant, they are paid for by his successor according to a valuation made by two experts. This leads us to the subject of tenant-right—a phrase which in Belgium is understood to mean a payment for unexhausted manures. In Flanders an incoming farmer buys everything that is not moveable of his predecessor, the growing crops, the manure applied to them, the unexhausted manure applied to the previous crop, and for work done since the previous harvest. He also buys all the hedge-row wood, if not more than 6 years old; but if above that age the outgoing farmer cuts and sells it in the ordinary way. These valuations are generally made by experts, and the money must be paid before the incoming tenant can take possession. Generally speaking, farmyard manure is valued at a higher figure than English farmers would like to buy it at, considering the food given to the beasts.* It is thought to leave from one-third to one-half after potatoes, and one-third after wheat, if what they consider a full dressing has been given, otherwise only an equivalent proportion of those residues is allowed for. Liquid manure is considered exhausted by one crop, and no allowance is made for cake, whether used directly as manure (rape-cake), or for feeding. Guano is considered to leave one-fourth of its value behind. In most parts of the Polders lime is curiously estimated. Supposing it to consist of 21 parts, it is estimated that 15 remain after the first crop, 10 after the second, 6 after the third, 3 after the fourth, and 1 after the fifth. Drainage had been done by the proprietor in the few cases where we found that it had been carried out; this was on farms held by their owners. Buildings are erected by the landlord and kept in repair by the tenant.

In the Pays de Waes there is a very curious state of things. The farmhouses, with a small piece of ground, just enough for

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* The most general estimate of manure out of the ground is 1 centime per kilo., which in our money would be about 8*s.* 6*d.* per ton.

outbuildings, and perhaps a little paddock, belong almost invariably to the occupiers. The land belongs to a multitude of small proprietors, who are very often tradesmen in the villages. A farmer of 7 or 8 acres frequently has 3 or 4 landlords; indeed almost every field belongs to a different person. There are no leases in this district; but the land is let from year to year, commencing on October 1st, and the tenancy absolutely ends that day twelve months. It is easy to see what a condition of things this brings about. Suppose that a farmer of 10 acres has 5 landlords; they will not impossibly be a tailor, a shoemaker, a grocer, a draper, and a lawyer, all living in a neighbouring town or village. The farmer is obliged to buy boots of one, clothes of another, and so on, or his tenancy will not be continued after the end of next September. On the last day of that month he will get the notice to quit on the following morning. Another danger is that a neighbour may go to one or more of his landlords, and offer more rent for a part of his farm. In any case he receives his tenant-right, namely one-half the value of the manure used for the last crop, and a fixed sum of about 6*s.* 8*d.* per acre for manure applied the two previous years. The farmer cannot, it is true, be turned out of his own house, and he has, probably, so many landlords that he will be able to get on for a year without the piece of land which he has been forced to quit, and, if he has been outbid, at the end of the year he will retaliate; then it is very likely that he may have heard of the approaching event, and provided himself with another field at the expense of his despoiler or some other neighbour. But under any circumstances the system is entirely vicious. Fortunately the district in which this practice occurs is very limited, and as tradesmen-landlords die the property is bought by farmers at fabulous prices, quite out of proportion to the rent-value.

So great is the demand for land in the northern parts of Belgium that the money-value of the fee-simple has been calculated to increase 3 per cent. per annum; and it is said to be a fact that for the last 10 years the increase, on the average, has been at that ratio, so that land is there worth 30 per cent. more than it was 10 years ago. The chief reason for this increase in value seems to be that land is the only security in which farmers will invest their money.

The transfer of land is by no means a cheap proceeding in Belgium, for the Government charge nearly 7 per cent. on the purchase money for registration of the transfer, and the purchaser pays the notary 1 per cent. for conveyance. The vendor's expenses come to more than 3 per cent. for notary's fees, advertisements and bill-posting, as every "poster" in Belgium must be stamped. In the case of sale by auction the vendor's expenses are necessarily increased.* After a deed has been registered, its validity cannot be questioned.

Agricultural interests receive a large share of the attention of the Government. One department of the Ministry of the Interior, under the control of a Director-General, has for its function the care of agriculture and industries. There is a sub-department for agriculture, presided over by a Director, which has its executive officers and Provincial Councils in every province of the kingdom, the ruling authority being the Superior Council of Agriculture, of which the Director of the Department is the Secretary. Thus any matter requiring the attention of the Government is brought by the burgomaster of the village before the Committee of the District, by whom it is laid before the Provincial Council, and similarly sent up to the fountain-head—the Superior Council of Agriculture, the Secretary of which has the chief executive power on behalf of the Government. Although there is necessarily some amount of routine involved in such proceedings, there can be no doubt that the Government by those means holds the detailed parts of the organization in more efficient control than it could by a direct system of communication with the various burgomasters.

We have in the foregoing pages attempted to perform the task which the Council of the Society assigned to us—to give a fair description of the salient features of the long-famed Belgian farming. That our Report will disappoint the admirers of *la petite culture* we must expect, but we hope they will feel that their disappointment is due to the nature of the subject.

POSTSCRIPT.—Since this Report has been in type, I have read M. de Laveleye's paper on "The Land System of Belgium and Holland," which has just been published by the Cobden Club in a volume entitled 'Systems of Land Tenure in various Countries.' So far as regards the systems of land-tenure and land-transfer, there is no essential difference between the statements in M. de Laveleye's essay and those in the foregoing pages.—H. M. J.

* M. Leclerc makes the following statement:—"The conveyance of property encounters no serious obstacles. It is made by an authentic act, done in the presence of a notary (a public officer appointed by the King), which is afterwards submitted to the formality of registration in a special office instituted by the Government. The expenses of sale generally amount to 10 per cent. of the value of the property. The registration-fees absorb about 6½ per cent.; the surplus represents the expenses of advertisements, bill-posting, deeds, and payment of the notary. These expenses are paid by the vendor. The purchaser pays in addition to the notary a sum amounting to 1 per cent. of the value of the property for the official receipt of the purchase-money."

II.—*Farm Labourers, their Friendly Societies, and the Poor Law.* By the Rev. J. Y. STRATTON, Rector of Ditton, Kent.

THE following article will treat of the means of improving the condition of the agricultural classes of this country, by the development of trustworthy insurances suited to their requirements. It will be necessary to our purpose to consider the bearing of the Poor Law, and the influences exerted by it in diminishing and retarding efforts which might be made by farm labourers to attain a position superior to that now commonly occupied by them, and alterations will be suggested in the mode of affording relief and collecting the rate, by the adoption of which labourers who now on their view of the rate commonly waste their surplus wages in societies, miscalled benefit clubs, may be induced and encouraged either to improve and reform their societies, or to forsake them and join better.

Burial societies, their cost and management, will form no part of our subject. A Commission of Enquiry can alone deal satisfactorily with them, and there is sufficient in the state of these societies to render enquiry under a Royal Commission desirable, even if there were no other classes of industrial insurance than burial societies in need of attention.* Neither shall we deal with the state of the friendly societies of the superior artisan and labourer, who commonly seek such advice and protection as the Registrar-General is able to afford them. The members of these institutions have for many years struggled hard to obtain a provision for their need, such as the friendly society offers, and now that many difficulties, among which want of money is not to be reckoned, have been overcome, they will find their task less arduous than hitherto. That they will succeed in the long run in securing an independent provision by insurances best adapted to their wants is not so much a matter of uncertainty as a question of time.

No such hopeful prospect, however, is in store for those whose insurances demand our special attention, and whose lot is cast within the verge of pauperism. In order to understand the construction and cost, the management and provision of their benefit societies, reference must be made to the Poor Law. And we are glad that at length the necessity of enquiry into the bearing of the Poor Law or Friendly Societies is recognised.

* The Commission on the Employment of Children, Young Persons, and Women in Agriculture, after reporting that the attention of four of the Assistant-Commissioners was specially directed to the subject of benefit societies, reports that it is "one of far too wide a nature, embracing as it does the town as well as the country populations, to be capable of being exhaustively dealt with in the course of our enquiries."

The last report* of the Commission on the employment of children, young persons, and women in agriculture, recommends further investigation. An important consideration, which underlies the whole question of the insurances of the rural poor, is that their wages shall be sufficient to enable them to save.† The variation in the rate of wages is a question into which we need not enter further than to notice that it varies with the price of food and fuel, house and garden rents, and the pernicious custom of part payment in drink or the produce of the farm, and also the means of the farmer. But the point in connection with the wages to which we shall draw attention is one which appears to have escaped the notice of the Commissioners. There is no difficulty in proving that, wherever farm labourers form and maintain benefit societies of the common order, their wages are sufficient to secure to them over and above their present maintenance an independence, provided only they had the means of safe insurances, and would turn them to a right account. It is, we admit, an independence of an humble kind, but still sufficient to raise those who gain it above pauperism, unless under extraordinary pressure and trial, when help from the poor-rate may be honestly claimed, and received without social or moral degradation. And the effort to secure such provision by self-help and prudent management would of itself infuse new life and energies into the English labourer.

But while we claim on behalf of the rural poor some assistance, not of a pecuniary kind, by which they may be aided in the duty of securing provision for themselves in sickness and old age, alterations of great importance are at the same time equally needed in the administration of relief, in order to stop

* "The difficulties in the way of forming sound benefit clubs in the agricultural districts are noticed by the Hon. Edward Stanhope as involving (*inter alia*) the uncertain way in which boards of guardians deal with the fact of a man belonging to a club or not.

"Some never recognise in giving relief the fact of a man belonging to a club; others do take it into consideration, and some refuse relief altogether. More often they are guided by no fixed or uniform rule."

Mr. Stanhope justly remarks:—

"It is most surprising that the question which yields to no other in importance —What is the best way of administering out-door relief so as to give encouragement to provident habits?—is not only not answered by an authoritative interpretation of the principle which should govern such cases but is actually left to be answered by each board of guardians for itself."

Upon this Mr. Stanhope proceeds to add his opinion that further "enquiry is imperatively needed."

† "Happily this enquiry has brought out the fact that the earnings of the best class of agricultural labourers in permanent employ are now, generally speaking, such as to afford them the means of living, and maintaining their families in decency and comfort."—*Commission . . . in Agriculture.*

Mr. Bailey Denton, in his valuable essay on the "Agricultural Labourer," had previously come to the same conclusion. The exceptions, however, to the fact are admitted to be numerous.

the demoralising habits of improvidence and waste which it does at present encourage among the rural poor.* It is simply hopeless to work for any permanent material improvement in the social condition of the agricultural labourer so long as he considers the poor-rate to be his rent-charge in lieu of the portion of soil which he cultivates for another, and in part payment for his labour. It is not possible either to improve their benefit societies to any great extent or to induce labourers in any considerable number to join safe and well managed friendly societies, so long as the vicious notion is not eradicated from their minds that the provision of a pauper is one which they must on no account forfeit by any effort on their part to obtain support for themselves.

In attempting to improve the position of those who dwell in the debatable land wherein independence ends, and pauperism begins, we must endeavour to call forth their own exertions if we would succeed in emancipating them from the abject serfdom of the Poor Law, and put them in the way of securing

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* The following extracts are from the report of the Commission in Agriculture:—

"There can be no doubt," says Mr. P. A. Norman, Assistant-Commissioner, "but that the Poor Law has a direct tendency to weaken those feelings of self-reliance and independence among the labouring class on the development of which qualities the amelioration of that class must necessarily depend."

The following is of interest:—

"The great and effectual bar to the formation of habits of independence is the existence of a poor law. Why should a labourer provide against sickness and old age when he has no interest in so doing? If by the age of 65 he is able to cease work and purchase an annuity of 2*s.* 6*d.* a week until death, the guardians, very properly, give him nothing. If he has lived freely and saved nothing, the board give him 2*s.* 6*d.* a week. Out-of-door relief is a direct premium on improvidence. No class in the community spends so much in proportion to income on personal gratification as the average labourer. He supports all the beer and public houses. . . The low condition of the labourer, whether in respect of wages and external circumstances, or of mental or spiritual enlightenment, is ascribable to the Poor Law. The first step for his elevation must be its gradual repeal. I have been an active member of the board of guardians for twenty years—a magistrate for eighteen." (From evidence of the Rev. Preb. Wilkinson.)

Mr. G. Culley, Assistant-Commissioner, writes thus:—

"The influence adverse to the fostering of provident habits is the present administration of the poor law, and especially the lax aud uncertain manner in which out-door relief is given."

The evidence and remarks of the Commissioners on the subject are of special interest. (See Reports and Appendix *in loco.*)

Sir Stafford Northcote, the President of the Social Science Congress receutly held at Bristol, spoke as follows:—

"Two things only were necessary. First, you must raise the labourer's standard of life; and, secondly, you must clear away all obstacles and give him fair play in striving after it. . . . Make the labourer feel that his earnings will be in proportion to his work, and much will be effected. But the deadening influence of the Poor Law must be counteracted. The system of Post Office Savings Banks—for which we are so much indebted to the present Prime Minister—might be extended; improved cottages, garden allotments, security for his clubs and investments, would all be legitimate and useful helps."

their independence by habits of self-reliance, and making good use of the opportunities afforded them.

With these remarks, we shall describe the farm labourer as he is in fairly wage-paid districts, and see what may be done in order to render the bearing of the Poor Law conducive to provident habits instead of being subversive of them. We shall, then, examine one or two of his benefit societies, whether formed and managed for him or by him; and it will be our duty again to urge the advantages which a system * of insurances under Government supervision would place within his disposal.

Unless the education † of the farm labourer is commenced early, and diligently prosecuted in the fields, he will not learn it well. It is, therefore, something more than a mere coincidence that necessity to help in earning his living enforces this law in nineteen families out of twenty. For this purpose the young labourer is taken from school as soon as he can earn 4*d.* or 6*d.* a day on the farm. He forgets all he has learned at school as fast as other boys do, and has few opportunities of doing more than just to regain what he was taught before ten years of age. As my specimen grows bigger, he is worth more money. He leaves home, and goes into service as a "mate," or lad, to help the waggoner, whose wife takes care of his clothes. He is speedily ambitious of all the distinctions of early manhood, and after passing through the half-dozen violent attachments which the matrons of Grumbleton denominate calf-love, he is seen some fine morning, before he is two-and-twenty, on his way from church with his bride, who is only seventeen. There is reason to hope that the blessings which the friends of the happy couple bestow upon them—and they can give them nothing more—will not be in vain, for they will have occasion for everything of the kind before long. If they cannot be accommodated under the roof of their parents, and wonderful are the contrivances made with this object in view, they locate themselves in a couple of rooms ready furnished in a noisy row of cottages. They hire the furniture of the broker, and, for a time, all goes on merrily. Work is plentiful. She is a managing girl, he is a hard-working lad; and by the time there are a couple of children, they are in a cottage. One thing is a trouble, and that is the broker's bill. As that wary dealer saw opportunity, he would sell them some useful article of furniture which they had hitherto rented. Thus, by slow degrees, the bed they sleep on, the table, the

* See pamphlet, "Friendly Societies versus Beerhouse Clubs," by the writer, reprinted in Appendix to "The Report of the Commission in Agriculture," p. 98, art. 228. Also published by Ridgway, Piccadilly.

† See "Life of a Farm Labourer," 'Cornhill Magazine,' 1864, by the writer.

chairs, and household clock, are in due time all their own. Still they have not bought cheaply, and, while they owed the broker a bill for furniture hire, had a cogent reason for not disputing his price list.

The doctor's bill proves a heavy item, but the doctor is kind, and will wait till they can pay him; he will have a tolerable test of his kindness, I fear. In addition is the monthly call of the bagman-clothier for a contribution for a dress nearly worn out, but not nearly paid for; also of the bagman-shoemaker for boots in the same predicament. So that what with the rent and fixed outgoings, as well as incidental ones, the wife has looked trouble in the face, and trouble has returned the gaze, and stamped upon her countenance a careworn expression before she is one-and-twenty. There is also another confinement approaching, and this time there will be less difficulty in obtaining union relief, for the ice was broken on a former occasion, and if their case was good then, it is better now. In the meantime my specimen has joined his sick and benefit club. He had heard of several which offered various advantages, but nothing so good, he thinks, as the Black Bear Club, and so thinks the landlord who manages the club, which holds its meetings every other Saturday night. The club shall be described in its place. It is sufficient here to state that its cost (not counting extraordinary charges, such as for more beer than that supplied under rules, the cost of "regalia," and of the club-day) averages 9*d.* a week, which is hard upon 2*l.* a year. This sum my specimen *does contrive to pay*, notwithstanding that the pinch of poverty is pretty sharp upon him at the time when his family comprises half a dozen little children, not one of whom is strong enough to be worth 6*d.* a day as a perambulating scarecrow on the farm.

Time passes on, and the boys are worth money. The eldest lad works like a man for a shilling a day, and eats like two men. The second, hardly ten years of age, is employed as sheep-boy, or else on the land at 6*d.* a day.

The average weekly earnings and expenditure of the family are much as follows. We take the rate of living in a neighbourhood where rents, fuel, and repairs run high, and wages are correspondingly high :—

Income.	*s.*	*d.*	*Expenditure.*	*s.*	*d.*
Father, average wages	14	0	Rent	3	0
Mother, ditto	2	0	Club	0	9
Eldest boy (7 days a week) ..	7	0	Food	16	6
Second ditto ..	3	6	School	0	6
			Fuel and lights	2	0
	26	6		22	9

The balance of 3*s*. 9*d*. remains for the bagmen, and, save the mark, for clothing father, mother, and children, for bedding, for accidents, and repairs not paid for by the landlord, and incidental expenditure which will arise and must be met. The average of the wife's earnings at light field work is given, though her earnings come in in such a manner that they can only be said to exercise a healthy disturbing influence upon the income. For every week in which she makes 6*s*. there are two when she earns nothing. Prudence, therefore, is necessary, and great economy to keep things together. But no man can count on a single day's health. Those who undergo no harassing term of sickness are singularly happy, and ought to review mercies of preservation as not the least marks of the care of a good Providence over them. And so, as a rule, my specimen does; he is much more in the habit of thinking with gratitude of the blessing of good health than is generally supposed. Still illness, or an accident, may come at any time; and now take the other side of the picture:—

	s.	*d.*
Father, ill and on the club	10	0
Mother and boys average	11	0
From union: medical relief, and relief according to scale, viz., four children dependent at 1s. in flour	4	0
	25	0

Expenses as before, excepting that the club payment is 6*d*., as he does not attend meetings, and, being ill, is not fined for absence.

If his illness lasts more than three months, the sickness pay from his club is reduced to half; but in this case the board of guardians will give him a money payment of 4*s*. in addition to its grant in food.

Pass on half a dozen years, and examine my specimen again. The family are growing up; two sons entirely off his hands, out at service, and conducting themselves on the approved system as their father before them; two daughters in domestic service, one boy at 7*s*. a week, and a girl still at school.

His income averages 23*s*. a week, and the easier strain on his means is perceptible in the improved condition of the family and the home. They are out of debt at last, reject all overtures from bagmen, buy their things where they are known, and, lastly, keep a better table. As the remaining children quit the parents' nest, and go forth to earn their own living, a lodger or two can be taken in and done for; so far as ability is concerned, they might begin to save money beyond the payment always punctually made to the club. He might, for instance, deposit a small sum monthly in the Post Office Savings Bank; or, better still, he might invest the same in securing an annuity at the Post Office, or by means of the large and trustworthy County Friendly Society, which would be glad to take him. Why does he not take one of these courses, each of which offers such an advantage to him as his forefathers never enjoyed? His forefathers!—the utmost security for any little sum they scraped together was an old tea-cup in the cupboard, or the foot of an old stocking hid in the thatch, or, more perilous still, the custody of their master. Annuities and deposit accounts were impossibilities to them. Why then does not the labourer avail himself of his opportunities and walk in one of the avenues to independence opened to his very door by a beneficent legislation? He prefers to walk in no such ways, but in view of the provision of the poor-rate, refuses to save one farthing beyond that which he contracts with his club. He spends his money as he receives it, and for these reasons. With a sum in the Savings Bank he cannot claim relief from the rate. In case of need, the money must go, before the board will help him; that is to say, in his opinion he would be saving money, not for himself, but for the ratepayers, the owners of the soil. And further, my specimen has a grievance, and that not a sentimental one, on the subject of the rates. His landlord "*farms the rates;*" he pays a composition in lieu of leaving the occupier to pay the rate as it becomes due. The composition is half the annual amount of the rates, or less if anything, and the amount paid by the landlord varies according to the number of rates made in the course of the year, from 3*s.* to 4*s.* 6*d.*, according as there are two or three rates. For this the landlord charges him 3*d.* a week in the rent, which amounts to 13*s.* a year. No wonder that an intelligent cottager considers such an arrangement* an injustice for which he has no means of redress, excepting that of obtaining as much as he can from the funds of the rate. Again, if the man was compelled to pay his share of the rate as it became due, he would have one reason supplied him for uniting

* The following is from a local paper, dated October 23 ult.:—

"Poor-Rates.—In Preston, 457 persons have been summoned for non-payment of the poor-rate laid in April last. About one-half of the summonses was settled out of court; in several cases the defaulters were excused on account of extreme poverty, arising from the depressed condition of the cotton trade; and in the remaining cases orders for immediate payment were made. It transpired that in many instances the ratepayers had entered into agreements with their landlords that the latter should pay the rates (2*d.* or 3*d.* per week being added to the rent on that account), and that the landlords had pocketed both rents and rates, and left the tenant to bear the brunt of the law. On Monday, Mr. Stephenson, the assistant-overseer, intimated that every one of such landlords might be sued in the County Court for the recovery of the amount paid in lieu of rates. At the Borough Revision Court, on Friday, several persons lost their votes through similar dishonesty on the part of landlords, and they also were advised to sue for the recovery of the amounts paid as rates."

in the effort to make two rates in the year sufficient, and save the third, whereas he is now utterly indifferent whether there are two or half a dozen, so long as he can make good his claim for relief. Public opinion in his class is in favour of rate plunder, and the effort to reverse it by compelling all cottagers to pay their rates as they are made, and at the same time abolishing the injustice practised by unscrupulous owners of cottages as above noticed, remains yet to be made. The same reason which deters him from saving money holds good in the case of his providing himself with an annuity. Why should he save the parish from paying half a crown a week for his support when the process will interfere with the expenditure which he allows himself as his children become able to find a home of their own?

We will now trace his life another stage. The infirmities of age begin to affect him, and recourse is had to the funds of the club. As he grows older, he does not grow stronger, and at length he must be got rid of, or he will break up the club. The day of the annual election of the members affords the opportunity, and he is passed over. Old-age pay at 2*s.* 6*d.* a week, *minus* the weekly contribution of 6*d.*, would not be greatly grudged him by the members, but the consideration that the board of guardians will allow him half a crown without any deduction, and that the rate can bear such a payment much easier than the funds of the Black Bear, settles the point against his being suffered to remain among the members. And thus, after having paid to the funds of his society a sum in hard cash, not computing interest, little short of 100*l.*, he is turned adrift in his old age. He is, however, somewhat consoled by being reminded that he paid as the squire pays insurance, against loss by fire, an insurance which would cover such loss. He has had his pennyworth for his penny. He has been blessed with wonderful health, and did not therefore require much assistance from the fund. He must not therefore complain. Nor does he complain, but bears the severance with patience. An invitation gratis to the festival dinner he accepts, and is thenceforward parted from association with mine host of the Black Bear, and the fortnightly meeting of his old friends and fellow-labourers. One enquiry he makes relating to burial money, a sum of 8*l.* being included in his insurance, and a fine joke they make at the notion of the merry old fellow wanting money "to prepare his funeral."

By and bye the "Domus ultima"—the workhouse—opens its doors to receive him and his wife. Home and its little comforts, which become necessaries of life to the aged, must be given up; the goods and chattels are divided among his sons and daughters, who are only too glad to get all they can, and could not help the parents much, even if they recognised the duty of so doing, having children and cares of their own. Once in the union, he parts from his wife, to meet her but for a short half-hour in each week of the brief term remaining to them before they turn "to the unremembered and unremembering dust." She soon pines away of no disease in particular, and he remains a desolate old man, so far as desolation consists in the destruction of home and family associations and sympathies, and the want of every human kindness, but the conventional kindness contracted for and paid by the poor-rate. His associates in the old men's ward by day, his companions in the old men's ward by night, in all the feebleness and with something of the petulance and peevishness of the aged, are (with one or two exceptions*) men whom he never would have been, from a feeling of self-respect, familiar with so long as he could help it, men some of whom have eaten their Christmas dinners in the gaol, in their time, and say they enjoyed them more than in the workhouse. His relations seldom go near the old man, and he can no longer walk over to the scene of his home, and he waits with such patience and resignation as religion and experience have combined to teach him till the jest of the club day becomes sober truth, for the parish has to pay for the funeral after all.

Now that man had the intelligence, the industry, and the will, which would have secured him independence and a home in his old age. But he had no fair chance. In addition to the ancient difficulty of earning such provision by the sweat of his brow, he fell under the modern contrivance of a law which unintentionally, but yet with deadly certainty, hindered his making the effort. He had the natural wish for the friendship and help of his neighbours, and the desire to reciprocate their kindness, and the friendly society secured these advantages. Further than this, and reaching to permanent provision, the society must not, in his opinion go, unless he would jeopardise his presumed right to a share of the poor-rate. His society exacted the cost of his independence, so far as money goes, and the natural and unavoidable consequence was his gradual fall in social position, till he became a permanent pauper. Under auspicious legislation the man might have saved not only himself, but, by example and influence, others from such a fate. But having no moral support or encouragement

* The Earl of Lichfield obtained a return of the number of paupers in union workhouses in England and Wales who had formerly been members of benefit societies. The number was, in August, 1867, 4015. Subsequent enquiry elicited the fact that such persons were about 12 per cent. of the whole number of male paupers at that date who were inmates of the workhouses.

from legislation, but the fear instead that his earnings would benefit, not himself and family, but the ratepayers, he consents to cross over the frontier-line, and at last to abide under the cold shade and desolating sway of the Poor Law.

There are many thousands of honest and respectable farm labourers in this country who are in a similar condition, and whose prospects are the ultimate provision from the rate; the effort to save these men from the degradation to which they submit themselves is yet to be made.

There is another class, and that a numerous and costly one, to be taken into account, the members of which recruit the gaol as well as the workhouse. As young men they were disobedient sons, idle and disreputable, whom no farmer would employ unless under compulsion. My specimen of this class is the son of a pilfering sire, his mother a slattern and a scold; his earliest recollections, probably, are of his father coming home drunk on a Sunday afternoon and finding him and his brothers and sisters crying for food, and beating his mother, for which he was sent to prison, while the wife and family found refuge in the union. In the union (he remembers it as one of the horrors of the place) they forced him to learn to read, and hence his hatred of learning. He will never work if he can help it, and calls himself a bricklayer's labourer. Now and then I see him on the farm, as an additional hand, when there is nobody better to be had, or as ostler at the public-house. He is out at elbows, out of victuals, and generally out of work. He joins a beer-house club, held at a beer-shop in the wood, which offers unusual facilities for him and other choice spirits like him, inasmuch as it is secluded and not often troubled by the police. He drinks his full share of the beer supplied in the way of fines for absence from the meetings and for oaths unawares let slip during the business hours of the club, which at a pint an oath supplies a good deal of beer. He has a turn on the treadmill, after a little preparatory training in the winter at the union, where he refused to break stones or pick oakum, and came within the definition of a refractory pauper. He manages to pick up a wife, a girl who insisted "on going out," *i.e.* leaving the union at the fair-time in a neighbouring town, and is married at one-and-twenty at the register office. She ends the honeymoon with a confinement, and has parish doctor and nurse, and within six months of matrimony you may see her a wretched, half-starved, and ragged woman, with a black eye, and a puny child, which cries piteously and unceasingly. He has the common luck of idle men, an accident, which gives him a right to the sick-fund of his club. He applies for union relief, and then discovers that instead of receiving as large a share of "his rights" as a former companion, who had been turned out of the club for cheating, he obtains only half, and that not in cash, but in flour. My specimen therefore considers himself an ill-used man, and as the stewards of the club stop his pay before he considers himself well, he thenceforward takes up his parable against self-help and benefit societies, and in the long run will have cost the ratepayers a little fortune in maintaining him and his family. When he comes permanently into the house, he has the same care and attention as the most respectable poor man in it, who, indeed, occupies the next bed in the ward in which my specimen sleeps.

Placed between the two classes of which these are the representative men, and influenced by the example of each for good and evil in turn, is the mass of the farm labourers of this country. Something surely might be done to encourage the good and repress the evil, not by destroying the Poor Law, as some earnest reformers * think possible, but by judicious and careful alterations in the mode of dealing with applicants for relief; and we venture to call attention to the points in which reform should be attempted, before discussing the treatment of applicants for poor-relief who belong to benefit societies. And, first, with regard to the treatment of idle and vicious able-bodied paupers. There is at present no provision in our unions adequate to their deserts. The system of administration is weak, and fails when applied to them. The cost of their maintenance and clothing should be exacted from the male pauper of this class. We have labour tests, useful in some cases, useless in others, but no organisation which would secure to these encumbrances of the community the strict necessity of earning their bread. Retaining the power of dealing with refractory and disorderly paupers according to the law, the guardians of the poor might be empowered to draft able-bodied paupers of bad character from among the inmates of their union, and send them for a term to an establishment where work was exacted in return for maintenance.† One such establishment in each county would suffice for all the unions in it, and labour could be found, both indoors and out of doors, for its occupants, who should be kept there for not less than a month, and receive sufficient food and clothing during that time, provided that they earned it,

* No one has attacked the Poor Law with more hearty good-will than Mr. Corrance, member for East Suffolk, who maintains with Sydney Smith that it must not be amended, but abolished. "It fails," says Mr. Corrance, "through the absolute failure of the principle upon which it is built—the test. The vagrant laughs at it; the aged and the sick are not fit objects for it, and children are beyond its scope. It had a work to do, and it did that work. Since that time it is obsolete. In these days our agents must be the actuary, the friendly society, the schoolmaster, and the surgeon. That a vast work of legislation lies before us, let no one doubt—not less than in 1834."

† Compare the system adopted in Belgium, p. 77.—Ed.

and in all respects to be amenable to the law as at present in force.

But in the case of those whose want arises not from their fault but misfortune, the care of the local board of guardians may properly be exercised with kindness, and even some indulgence, often, be it remembered, shown by them at present on the worthless as well as the deserving poor. There is a class of able-bodied paupers whose necessities arise not from their idleness or other vice, but their incapacity in districts where there is some competition for farm labour to keep their employment. It is one of the advantages of the system of local boards that they can deal better in applying the principle of treating such applicants than any other organisation, past or present, in the relief of the poor. Taking care to avoid the rocks on which the old Poor Law struck and foundered, one of which was the contrivance of supplementing wages from the poor-rate,* there are many cases in which out-door relief might be afforded, to which, from a just fear of establishing a precedent liable to abuse, the guardians refuse relief other than the house.

It is further germane to the improvement of the poor that a reform of the law in points in which it is confessedly at variance with laws designed by the Creator for the good of the human race should be made. The regulations which break up families, which separate husband and wife, parent and child, perpetuate greater evil than that inflicted on those who are thus parted. Results of this unnatural law are plainly and sadly traceable in the brutality of husbands towards their wives and families, the relaxation of family ties, or in the unnatural coolness with which an only son will leave a widowed mother to end her days in the workhouse, and will refuse, unless compelled by the magistrates, to contribute one farthing of his ample wages towards her maintenance. It is true that the Act makes a distinction between able-bodied married people and couples infirm from age or other cause. With respect to the former, if there is good reason why a man, crushed by adversity and not by vice, should desire the consolation of his wife, instead of being compelled to separate at the time when mutual support is most strongly needed; if it is true that the

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* In some parts of England it was a common contrivance of the farmers under the former Poor Law to pay their labourers a fixed sum, and "make up" by an additional grant from the rate, sufficient to support them and their families; by which means the parson or vicar, who was rated on his tithes, and owners of property not agricultural, were compelled to pay part of the wages of the farm labourers. A mere abuse of this kind may raise a smile at the expense of the ratepayers thus victimised by the proceedings in vestry of other days, but the evil inflicted on labourers in thus degrading them into paupers is no trifling matter, and its effects are felt to this day.

anguish of being parted is but keener in the female mind, then let us not continue, for the sake of a neat system of regulating the inmates of the union house, to augment the distress of the poor by such forced separation. And with regard to the permission given to infirm married people to live together in the workhouse, let us ask how often is it complied with? There may be unions in which rooms are assigned to one or more such couples, and the Poor Law Board might be requested to name them. The schedule of such a return would not, we think, be a lengthy one. How can we look for moral and social advancement among the poor so long as the Creator's regulations for the comfort and happiness of mankind are thus invaded by those of the Poor Law? The mischief extends far beyond the immediate victims; it affects the mass of the labourers by degrading in their eyes the bond of matrimony, and impairing the influences of family affection and of reciprocal duties.

We will now turn to the benefit societies in common request among the rural poor, which almost succeed in keeping at a distance from them large and well-managed certified societies, or trustworthy branches of the great societies, such as the Manchester Unity and the Foresters, and which will continue to maintain their ground till alterations in the mode of dispensing relief from the rate are made.

They are the sharing-out* or "brummagem" clubs, and divide their funds at the end of the year among the members, after which they form anew, and thus continue from year to year.

The sharing-out club holds its meetings at the public-house, and is principally managed by the landlord. "Sometimes," says Mr. Tidd Pratt, "the club is sold with the good-will of the house." It is contrived to secure a "connection" for the house, and at the same time to comprise the advantages of the provident society without abandoning the member's claim on the poor-rate. All the members pay the same weekly contribution, which is settled on the following rough and ready calculation. One halfpenny a week from each member is to secure 1*s.* a week for every sick member for a term of three or six months (mark the indifference to the duration of the term); 6*d.* for a further like term, after which, provided the claimant does not miss re-election, superannuation or old-age pay. Where wages run high, 6*d.* a week is no uncommon contribution. This will secure—

* The number of these clubs is unknown. They have been estimated at 100,000, which would seem too high. Mr. Stanhope found them in Kent to be in the proportion of three to two certified societies. They appear, however, to be increasing, and at present keep better societies off their ground.

12*s*. a week in sickness, or 10*s*. with, say, 8*l*. burial money;
6*s*. " " half-pay, or 5*s*. if with burial money;
2*s*. 6*d*. a week, old-age pay;

subject, however, to the deduction, in each case, of the weekly contribution of 6*d*. In case of the death of a member, an additional levy of 1*s*. is made; if a member's wife dies, a levy of 6*d*.; if a child, 3*d*. Each member pays for a pint of beer at the fortnightly meeting, which he is welcome to come and drink if he likes; if he does not, the club will drink it for him. On quarterly nights the amount spent by rule in beer is 6*d*.; there is also something from fines (which should rather be called extra pay) for refusing to serve the office of steward, and which goes to the officiating steward.

The cost of the club, always supposing that no extra pints of beer are drunk, is as follows:—

	s.	*d.*	
At 6*d*. a week, for the year	26	0	
Expenses of the room, at 3*d*. (26 meetings)	6	6	
Extra expenses on quarterly nights	1	0	
Fixed contributions by rules	33	6	
Add for steward and other fines, say	1	0	(very moderate)
Levy for deaths	1	0	
	£1 15	6	

Something more must, in fairness, be added for cost of a flag or two, and a few ribbons and beer; for, in truth, a member scarcely gets out of the business meeting for the pint, and our estimate of 9*d*. a week for the current expenses of the club will not be found above the mark. The annual club day runs into a good deal of incidental expenditure, but as it is the annual holiday of the villagers, which they would most likely have if there were no benefit societies in existence, we will not take the items into account in computing the cost, which is but little, if at all, below 2*l*. a year. The members are elected on the annual feast-day, and make a declaration that they are subject to no disorder or disease likely to cause them to fall on the sick-fund. If their declaration is untrue, such members are at once turned out of the club, and forfeit all that they have paid. There are many societies in which a medical certificate is required instead of a verbal declaration, and the cost of the certificate is 1*s*. When the member is ill, he sends to the steward, and "declares on the sick-fund." Whereupon the steward visits him, and if satisfied that the illness is such as to incapacitate the member from work, he is at liberty to pay at the end of one week from the declaration 12*s*., less 6*d*., the weekly contribution. If the steward is not satisfied, he will have medical evidence, and lay the case before the next meeting, when instructions will be given how to proceed. The custom is that the club is satisfied of the correctness of the claim if the board of guardians admit it and afford relief. It may be noted that the board, in its turn, attach importance to the fact of a member being in receipt of sickness pay; and in societies which give no allowance for anything but "total and undisputed incapacity by reason of illness to do any work whatever," the man who is too ill to earn his living, but not sufficiently ill to claim money from the sickness fund, may receive, and occasionally does receive, hard treatment from the board. The faulty system of espionage, which, as an adequate protection against imposition in sickness, has been strangely overrated, is strictly enforced, and falls to the lot of the stewards, though all the members are expected to assist by giving information if need be. The rules are strict, and properly so, in the case of sickness:—"No member receiving benefit from this club shall be allowed to walk more than three miles from home, without being fined 1*s.*; if found drunk, to be fined 1*s.*; if found working or assisting in anything of the kind, or if he be out after seven o'clock in the evening, he shall be fined or excluded, as the majority of members at an ordinary meeting shall determine."

The weekly contributions of the members are the same in amount. Objection has been persistently taken against the "uniform contributions," on the score of causing insolvency. That it is unjust for a man of 45 to pay the same as a lad of 18, both entering at the same time, is beyond dispute. But there is no great injustice in all members under the age of 30 years paying alike, and the vast majority of the members join on the younger side of 20; nor will the club admit new members if upwards of 35 years of age.

There is but one instance within our knowledge in which the contribution appears to be too low, and in that case there is a guarantee in the shape of ample "honorary" contributions. There is much in the notion of "all paying alike" which commends itself to the farm labourer; "all pay alike, and all fare alike," he will say; and if you inform him that equality and fairness in contributions can only be secured by a scale of payments graduated according to age, the man is puzzled, but not shaken in his belief of fair play.

Be the case as it may, the annual election secures the means of relieving the club of the man who becomes too great a burden for his friends longer to sustain. The industrious and honest old man, who cannot tell the difference between sickness and "chronic ailments and mere decrepitude," but who knows that he is ill, must go. In order to save the leaky vessel from foundering, the unlucky victim is tossed overboard, and falls into the mouth of the Poor Law, from which he never has the good fortune to emerge with life. The grumbling and dishonest old man, who has fixed himself on the funds of the society, and compels his friends to carry him with a tenacity of hold like that of the Old Man of the Mountain, is shaken off, once and for all, on the club-day. "They gave me two shillings and sent me my dinner, and said the union might do all the rest, and was better able than they were." The poor-rate is, indeed, the virtual superannuation fund of the farm labourers' societies, and the annual election is the trap-door by which the member is transferred to the rate.

We have, lastly, the genial feature of the holiday, which is turned to account by the landlord, and other managers of the club. On Whit-Monday or Easter Monday the village is enlivened by flags and banners, and the sign of the Black Bear is entwined with garlands, and my specimens, good, bad, and indifferent, may be seen mustering in front of the inn in their Sunday clothes, with sashes and scarves, behind the band which is to "play them" to church. The strong box is carried by the treasurer, and two or three wands and baubles, dignified by the outlandish name of "regalia," are distributed into the custody of the stewards, and away they go to the church, where the vicar says the prayers, and preaches an appropriate sermon. Far be it from us to wish for one influence for good to be impaired or removed, especially where the best and highest of all influences is exerted, and our labourers brought within range of that power which has elevated unlettered men and women throughout the length and breadth of our land to a better knowledge than the scholar and the sage have always attained. Some shaft from the quiver of divine truth may strike home, and the chance listener, who came merely as a part of the rustic pageant, may return in possession of something of more consequence to him than the provision of a sick and burial club. But inasmuch as the public act of worship is oftentimes regarded by the managers and members merely as a means of consolidating and strengthening the position of the club, caution is needed in opening the church for special service and sermon. And not only by the prostitution of divine service, but by the attendance of the clergyman of the parish, and other influential parishioners at the dinner, and by their subscriptions, support is too commonly afforded which is in no way merited. No society ought ever to be in want of a single sixpence from subscriptions, and, unless there is evidence of financial soundness and good management, encouragement of any kind should be refused. Where moral and pecuniary aid are given to a pauperising sharing-out club, evil is done, however excellent the intentions of those who bestow it. By entirely withdrawing support from such institutions, and encouraging and influencing labourers to form or join safe and solvent societies, the clergyman and squire may render valuable help to many of their poor and deserving neighbours.*

The sharing-out club, then, is the offspring of the beer-house and the union, and is nourished and maintained by those who, in the long run, whether landowners or labourers, have small cause for congratulation. Diverted by the provisions of the Poor Law from attempts to save, where they can save, the labourers have thus resorted to the ingenious contrivance by which their presumed rights to relief are not brought into jeopardy, while, at the same time, all the advantages of social and kindly influences arising from friendly co-operation are preserved to them. The benefit society of the farm labourer is thus adapted to his requirements. Alter the conditions on which it is based, and he will soon begin to re-model, or else, if he cannot improve it, he will forsake it for a better. In order to make him begin, he must, whether willingly or not, be emancipated from the shackles of the Poor Law, and be taught to leave the pittance of the rate to his weaker brethren, whom no friendly society can take, and who are the maimed, or lame, or blind, or otherwise infirm, and those who are starving in rags and squalid wretchedness in and about the towns and cities of this country.

As an instance of what may be done by all classes in a parochial friendly society, attention may be called to the "Wicken Club," which was formed in 1838; "the object of it being not only to make provision for sick members, for superannuated members, and to insure a payment at death, but to encourage amongst the villagers a spirit of self-reliance, and a desire to render themselves independent, except under really unavoidable circumstances, of parochial relief." The population of Wicken is under 500, and the club, "including juniors," numbers 280 members. "Almost every man, woman, and child, of the labouring class in the parish is a member." Being in a small area, it is able to offer the additional benefit of medical attendance,† and, indeed, it engrafts on the friendly society proper,

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* "The clergy and the landowners have a great deal to answer for in this respect. On the annual feast-day of a club the proceedings commence by the members going in procession to church. The clergyman of the parish is asked to preach a sermon, and is threatened in the event of his refusal with the transfer of the place of worship to the Dissenting chapel. In very few cases he is firm enough to resist this pressure, and generally he not only preaches but in the absence of the chief landowner presides at the dinner. Neither of them, although they subscribe to the funds, know anything, except what they are told, of the state of the funds of the club, or of its real security; but the apparent sanction which they give to its proceedings induces many men to become members without any further enquiry."—Hon. E. Stanhope, *Commission . . . in Agriculture.*

† Mr. Tidd Pratt recommends medical attendance as one of the benefits to be

various useful branches, all of which appear to thrive and to bear good fruit. The rate of contribution is but half that quoted in the case of the sharing-out clubs, viz., a farthing contribution for every shilling a week of sickness pay, and the reserve of the Registrar as to the sufficiency of the rates of contribution is not to be wondered at. There is, however, a small sum, 600*l.*, in the Savings Bank to the credit of the club, and annual income from the subscription of honorary members. Under its present management the members of the society have little to fear on the score of insolvency. Several of the advantages offered to the members would not, we fear, be commonly available in other localities, but in many cases they might be secured with good results. "So long as you continue a member of this club" (we quote from the annual address), "you will enjoy the following privileges over and above those who are not members:—

1. "You will, if householders, have garden allotments,* a coal club, and a clothing club for your children, besides other advantages for your wives, during their confinements and in cases of dangerous illness.

2. "In common cases of illness you will have assistance from the honorary fund, so as to reduce your own payments to the small amount of a farthing for a shilling, or 8*s.* 8*d.* a year in health, for 8*s.* a week in sickness; and a death payment of 2*l.* for males, 1*l.* for females, and 10*s.* for all other members under twelve years of age.

3. "No charge will be made for management and keeping the accounts, both of which are provided for by the honorary members.

4. "The club feast will be paid for out of the honorary fund so long as it can meet the payments."

There is also a penny savings bank for the junior members. The treasurer of the club is (under rule) bound to act as agent for the Government in insurances for deferred annuities. But the members are, as usual, indifferent to the advantages which may by this means be obtained.

The management is entrusted to a committee, consisting of five honorary members, the secretary, and the stewards; the treasurer and any two of the five to be a quorum. The managing

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secured by the friendly society. There are, however, instances of very good societies in which such an arrangement is not practicable. In parish societies, or where the agency of a larger society comprises a considerable number of members in small compass, medical insurance may with advantage be added. The cost is generally 4*s.* to 5*s.* per member per annum. The members should be encouraged to form a "medical club" where practicable.

* The allotments are half an acre. Rent is 2*l.* per acre. Coals are sold at half-price, or 6*d.* and 7*d.* per cwt.

committee is also appointed by the honorary, and not by the benefit or free, members. All persons wishing to become free members are to apply to the clergyman of the parish. The age on admission not to be less than six or more than forty years. A certificate of health from the medical attendant to be produced, and the name and age of every such candidate (we suppose the ladies have no objection in Wicken) "shall be put up on the church door for three consecutive Sundays," after which, if no reason to the contrary is made good (which must be stated to the treasurer or the secretary), the candidate becomes a free member, provided also that he pays a shilling for the rules.

Full sickness pay is allowed for 26 weeks, and half-pay for 13, and there are facilities afforded for more pay should the case require it.

Each member is required to provide himself with a medal, which costs sixpence, and is to be worn on the club-day. In this respect a hint might be taken by the various orders of larger societies, whose members array themselves in an absurd and expensive manner on such occasions. The members muster at the rectory, and walk in procession, headed by their band, to church; and on their return parade the village, and dine together in a tent. The proceedings of the day commence at 11 and terminate at 7 o'clock. The rules "are framed on Christian principles, so that the business of the club may be carried on in the fear of God, and that its members may hope for His blessing." Some excellent advice is contained in the short address, which is printed, and given to each member on joining the club.

The benevolent founder states that, "while the poor themselves are benefited by the club, the ratepayer is also benefited to a greater extent than is generally supposed;" and he institutes a comparison from the point of view taken by the poor, of the effect of the friendly society in lessening the rate, between the cost of applicants for relief who are members of the society and applicants in the same parish who belong to no society, from which he shows that the saving is large.

The weak point in a club of the parochial kind (which has, however, much to recommend it to the notice of readers, especially among the clergy, who are interested in benefit societies) is that the real management is, and must be, in the hands of one or two persons. So long as the founder is spared to take the chief part, all may be well, but sooner or later a change comes. The management, which requires some skill and considerable labour, is thrown into the hands of a new officer, with whom the committee do not work with the ease and efficiency to which they have been accustomed. Attendance of the committee becomes slack, the members drop off, and new ones do not present themselves. The opportunity to form a public-house club is eagerly turned to account, and the parish club ceases to retain its hold on the bulk of the people. This is a defect by no means limited to small benefit societies, though more commonly found in them than in the large county societies, and supplies one reason why old-age pay, or superannuation allowance, is so seldom contracted for. A prudent artisan will say, "Admitting that your management is trustworthy, and your club solvent, who will answer for good management and solvency by the time I should be old enough to benefit by it?" And the apprehension is greatly strengthened by the notoriously insecure condition of the certified friendly societies, very few, indeed, of which (hardly one in a thousand) are admitted to be solvent. The managers of the better class of societies are, however, beginning to learn the difference between capital and surplus capital, but it is still no uncommon case to find that a society which has accumulated a few hundreds is considered able to divide among its members a considerable portion of its capital, which is the store from which coming liabilities can alone be met. After such a dissipation of the funds, which have been possibly increased owing to one or two healthy seasons, there comes a down-rush of claims for sickness pay and for burial money, and there is nothing to pay. Where the common fate is shipwreck, people are afraid to embark their fortunes, and hence superannuation allowance is not likely to be popular when granted by the friendly society. It will require time and a great change in the rural classes before they will seek such provision by means of the Post Office.

We will next take an instance of a friendly society which is well known, and which offers great advantages to the industrial and labouring classes of Kent.

The County of Kent Friendly Society was founded in 1828 by the philanthropic exertions of the Rev. John Hodgson, who subsequently founded, and now most ably superintends, the excellent institution formed for the benefit of the clergy and their families, known as the Clergy Mutual Assurance Society. The County of Kent Friendly Society consists of honorary and benefit members, and is managed by boards of directors, held at certain towns in Kent, the board at Maidstone being the principal. The directors comprise persons of all classes from the peer to the artisan. Agents are appointed in various districts into which the county is divided, who are in some cases honorary, in others are paid by a commission. At the last actuarial valuation of the society, it was declared to possess surplus capital to a large amount. As this society has often been referred to as a model for the formation of others, the benefits which it offers to the county, and its mode of dispensing them merit notice.

(1) "Any man residing in the county of Kent, being not less than 14 or more than 49 years of age, and in good health at the time of admission, may secure a sum not less than 4*s.* or more than 20*s.* per week, to be paid to him at any time or times till he reaches the age of 70, on his being unable to work in consequence of bodily injury. To this benefit is always added the further benefit of a sum to be paid to the survivors of a member at his death, which does not exceed 18*l.*"

(2) "Any person may insure for burial money not less than 5*l.* or more than 50*l.*, if under 65 years of age."

(3) "Any person may secure the benefit of a sum not less than 5*l.* and not exceeding 200*l.*, to be paid to him or her, or to any other person nominated to receive it, at the end of 7, 8, 9, or any other number of years, not exceeding 20." This benefit is called "Endowment."

(4) Weekly allowances not less than 1*s.* or exceeding 10*s.* may be assured to persons on reaching 65 or 70 years of age.

Part of the surplus funds is applied to increase weekly allowances (old-age pay), as well as to the additional relief of members suffering from lengthened illness.

(5) Assurances on life for sums not less than 55*l.* or exceeding 200*l.* are also granted.

The insurances best suited to the farm labourers are:—No. 1, sickness and burial money; No. 2, burial money; and No. 4. The sickness pay is invariably accompanied by a burial money benefit, and thus a twofold insurance is secured under a single contribution, which is an advantage to the insured. The old-age pay was formerly granted as a part of the same insurance, but it was soon found advisable to separate it from the sickness and burial money, and make it a distinct contract. As all sickness pay ceases at 70 years of age, the best plan is for the labourer who has joined in early manhood to effect an insurance for old-age pay, to commence at 70 years, as soon as his circumstances become easier, from his children ceasing to be a burden to his means. His position would thus become one of independence. So long as the man is able to work, his maintenance is obtained by his wages; if struck down by illness, there is the weekly payment from the society, which may be claimed for two years without deduction, and when reduced to half-pay, the surplus fund may, if the board direct, be made to help him. Cases which are reduced to half-pay are commonly aided from this fund, so as to receive three-fourths of the amount of full pay. The member is thus secured against want, whether well or ill, till he reaches the age of 70 years. He should then commence as a recipient of old-age pay. An insurance securing him 4*s.* a week for life would receive from the surplus fund an additional 2*s.* or 2*s.* 8*d.* When this admirable application of surplus money was first made, which was on the suggestion of the founder of the society, the directors allowed it to commence from the date of the next preceding valuation. In some cases, payments of 10*l.* or 12*l.* thus became due to old men and women who had never had so much money in their lives, and who shed tears of joy when it was placed, without any previous intimation, in their hands, and they were further informed of additions to be made to their future weekly allowances. It is right to add that, with the exception of a small amount which was in the early days of the society subscribed by honorary members and benevolent people, under the impression that a friendly society is a charity, the capital is the accumulation of the contributions of the benefit members, together with the savings in the management, which is upwards of 30 per cent. within the margin allowed for expenditure. With reference to the sickness pay ceasing at 70 years of age, it may be noted that this is as far as such a provision can go. Of late, the Registrar of Friendly Societies and some actuaries have recommended 65 years as the limit, against which there is nothing to be said unless that the earlier date of 65 strengthens the foolish prejudice, carefully fanned by the managers of pauperising public-house clubs, who tell their dupes that sickness pay should be available in a good club for the term of their natural lives! We cannot, however, insure sickness pay for the breaking up of the constitution in old age. "The days of our age are threescore years and ten, and though men be so strong that they come to fourscore years, yet is their strength then but labour and sorrow." The insurance against sickness must cease at the common limit, and those who survive it should be provided with the superannuation allowance.

The "endowment" insurance is but little used by the farm labourer. Women servants, however, have a fancy for it. An endowment of 10*l.* to be paid at the end of 7 years costs 2*s.* 2*d.* a month, a sum which a careful servant is oftentimes able to save. The same amount payable at the end of ten years from commencement of the insurance costs 1*s.* 6*d.* a month. Here is an opportunity for a labourer's daughter who gets into a good place, which is often turned to account, and by and bye the girl reaps the benefit of her forethought by the possession of a little dowry. The probability is that a girl who saves something of her wages, instead of wasting them in dress and trinkets composing the requisites of fashionable life below stairs, becomes a prudent wife to some respectable young fellow, and that the two are enabled to keep clear of rented furniture and travelling bagmen. Again, in cases where parents save something towards paying an apprentice-fee for the boy, they will take an endowment insurance, payable at the end of fourteen or fifteen years, which costs a 1*s.* or 11*d.* a month according to the term agreed upon. In case of the death of their nominee, or death of the father, the money is returned. Endowments are a better investment than deposits in the savings banks. In the first place, the interest paid on the contributions is a little more than that commonly paid in the old savings banks, and considerably more than that which is paid in the Post Office Banks, which at present does not exceed 2½ per cent.; and in the next, it is not so easy to realise the amount of contributions paid for an endowment before its completion as it is to withdraw the deposit from the bank. And such are the common trials of the wage-paid classes that they are often pressed to encroach, and they do encroach, on the small sum they have been able to put into the bank. But in the case of the endowment the society will interpose. If the pressure is such that in the judgment of the board the endowment policy should be turned into cash before it is complete, the amount of contributions, with a trifling deduction, is returned. Otherwise the board will decline to return the money; and the member is benefited in the long run, though for a time compelled, as it were, to save in spite of himself. No persons are warmer in their acknowledgements for the adoption of such a course towards them than those who have struggled on with their payments till the term is complete, and they receive their money according to their contract with the society. They are pretty sure to want a new endowment, and there are cases where, when No. 2 is complete, they will come for another. The habit to save something monthly has become confirmed, and they appear to like the notion of continuing to be benefit members of the society. This excellent insurance has been hitherto thought too good by the foes of friendly society insurances, "the companies," to be suffered to fall into the hands of the Postmaster-General. We would again, and notwithstanding the discouragements which led Lord Hartington to withdraw his bill last session, empowering the Post Office to grant further burial money insurance, submit its claims. It is admirably suited to the development of provident habits among the industrial and labouring classes, and it entails very little trouble and expense in the way of agency and management. In truth, the endowment ought to have been granted at the Post Office before any other insurance, and had it been practicable, it should even have had precedence over the establishment of Post Office Savings Banks.

When a person wishes to become an "endowment" member of the society, the agent gives him a blank declaration paper, which he fills up with his name, age, occupation, residence, and the amount for which he wishes to join, and further states in writing the amount of the monthly contribution (for which he refers to the society's tables), to be paid for the same. If the proposal is made in behalf of a nominee, the age of the nominee and parentage and residence are also stated. The declaration paper is then transmitted by the agent to the secretary, who lays it before the board of directors in the district to which the agency belongs. The policy, which is issued in such cases almost as a matter of course, is filled up, signed at the board by three directors, entered in the society's register by the secretary, who numbers it, and sends it to the agent, who gives it to the new member, with a little card on which the contributions are entered. The policy recites the conditions, quoted from the rules, on which the society is to pay, and with which the member must comply under the penalty of fines or forfeiture. The contributions are to be paid bi-monthly to the agent, who does not go about among the members to collect them, but receives them at his office. No difficulty occurs, and no special commission is so much as thought of for a transaction which consists in receiving money and marking the amount on the contribution card against which the agent's initials are placed. A small fine fixed by rule secures promptness of payment, both in the case of the endowment and all other insurances made in the society.

When a person wishes to insure for sickness pay and burial money, the agent supplies him with a declaration paper which he fills up; or, if he cannot write, the agent fills it up for him. Any false statement in it vitiates all subsequent claim. The candidate states his name, age, residence, occupation, and the amount he wishes to secure in sickness and burial money, and what is to be paid for it. He answers certain questions relating to his constitution, and signs his declaration. A paper is sent to the proposer's medical attendant, containing questions of the same character, and a third paper is filled up by the agent. Evidence of age is also required, and then the case is complete for the decision of the board. About ten per cent. of the applications for sickness and burial money are declined, great care being used to take none but healthy candidates. Nor will the society grant an insurance to a labourer which would secure him an equal amount of money from its funds in sickness to that which he can earn in health. A man whose wages are 15*s.* a week would be allowed to insure as high as 12*s.* in sickness.

When sickness pay is claimed, the member sends a paper declaring "on" the funds of the society, which is guaranteed by the certificate of the medical attendant, who states what the illness is. There are some illnesses for which sickness pay cannot be claimed. At the expiration of one week from the day on which the agent receives the declaration full pay is due. So long as the medical certificate continues to be renewed from week to week, pay is to be made. This is remitted in the way most convenient to the member. The agent uses due vigilance, and if imposition were attempted, its chance of success is small indeed, while fraudulent claims would be dealt with according to law. As a rule, a sick man is but too glad to be sufficiently restored to health to be able to resume his work and to declare "off" the funds. The declarations often express very proper sentiments of gratitude to the Almighty for restoration to health, and their satisfaction at being no longer burdens on the fund. The percentage of sick members in this society is commonly less than half the percentage of sick members in societies where the claimant is under the espionage of the stewards. So far from there being any argument in favour of espionage as compared with the system adopted, the weight of evidence is the other way. It is in favour of the medical certificate and due care on the part of the agent.

Burial money is paid as directed by the Act, the provisions of which are incorporated in the rules of the society. Old-age pay is remitted as sickness pay is made, the convenience of the recipient being taken into account. The agency of 100 or 150 members is an office which can be conveniently and efficiently managed by country postmasters of ordinary intelligence, or other trustworthy persons able to keep accounts correctly.

The cost of sickness pay for 10*s.* a week, together with 8*l.* burial money, in the case of a man 25 years of age at joining the society, is 1*s.* 8*d.* a month, or 1*l.* a year; for 12*s.* a week and 10*l.* at death, he would pay 24*s.* a year. For the additional sum of 10*s.* a year, he would secure old-age pay, commencing at 70, and lasting for the remainder of his life. Under the present conditions of the society, he would receive about 2*s.* a week as a bonus, and in addition to his pension.

If he preferred to wait till he was 35 before securing old-age provision, 5*s.* a week would cost him 16*s.* 4*d.* a year. That the amount of such contributions could be defrayed by labourers in districts where the wages are good is shown by the sums which they are at present lavishing on their beer-house clubs.

With such advantages as those offered by the Kent Friendly Society, it will be interesting to ask in what way the farm labourers of Kent avail themselves of them? All able-bodied labourers in Kent have the opportunity of raising themselves by means of this excellent institution to a position which would enable them to dispense with assistance from the poor-rate, excepting under unusual pressure, when they might properly claim its assistance. With the exception of an inconsiderable proportion compared with the number of labourers in this populous county, and comprising the best of them, farm labourers can with great difficulty be brought to join the society. It is true that no money is spent on annual festivals, and doubtless an attraction which has an influence over the rural classes is thereby lost, and so long as the law which will allow the managers to spend a large sum if they pleased in the comparatively useless effort to attract the attention of labourers by advertisements and placards, but will not allow one farthing in the best of all advertisements, a well-conducted annual festival, continues in force, so long must this advantage be foregone. But the principal obstacle to the progress of the society among the farm labourers is their fear that by joining it they will lose the provision of the rate, to which apparently to themselves they contribute either nothing at all or else contribute more than is right under the compounding system in force. When the society was first established, many of the employers persuaded their labourers to join; and paid or assisted the new members for a time in their contributions. All such assistance proved insufficient to retain the bulk of them, who, after paying considerable sums to the society, deserted it and returned to their wallowing in their pauperising beer-house clubs. The main difficulty from that time to this, a period of upwards of forty years, is to raise these men by means of the society above pauperism. And although it succeeds in many cases in effecting such rescue, the effort is rendered doubly arduous by the obstacles already noticed.

We have thus endeavoured to assist the reader to form a just opinion of the farm labourer with regard to his ability to secure an independent provision. With certain exceptions, by no means numerous, he is unwilling to exchange the dole provided for him by others for an honestly earned independence of his own winning. And inasmuch as he has framed the benefit society in such wise that it will meet his requirements, and is thereby injuring himself morally and socially, and at the same time unjustly burdening the ratepayer, the conditions which have induced him to this downward and mischievous course must be taken into account before remedial measures can be applied. In addition to the alterations already referred to in the administration of the laws of relief and of the mode of collecting the rate, certain regulations relating to members of benefit societies might be adopted by boards of guardians with advantage,* which we shall next consider.

Who does not see that a difference should be made in the treatment of the member of a trustworthy society and him of the club in which the rate is virtually the superannuation fund, when each is compelled to seek relief from the board of guardians? If the latter were enabled by the Registrar of Friendly Societies (who should be empowered to obtain and furnish information on which an opinion of the merits of the society might be formed) to distinguish the good from the bad, and were further aided by the Poor Law Board supplying the principle which to the best of their judgment they were to apply in such cases, they would render indirect but most powerful assistance in the reform of the friendly societies of the rural poor.

At present there is much confusion in dealing with applicants who belong to these institutions. By some boards, not perhaps so numerous as in bygone years, relief, other than the house, is denied; by others, an allowance dependent in part on the amount paid by the club is granted; in some, medical relief; but by none is enquiry made whether the club is good or good for nothing, in order to determine the amount, or the refusal, of relief.

The following suggestions, which may perhaps help to elicit better, are offered in order to obtain such alterations as will encourage self-reliance and promote the moral good of the labouring classes:—

(1) Boards of guardians to authorise relief to be granted to

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* At present all have their own rule of dealing with members of friendly societies; for instance, at Canterbury, medical relief only is given to the member of a club.

At Hollingbourne, in addition to medical treatment, "in all cases where the club money does not exceeed 10*s.* a week, and does not exceed the amount of relief ordered for the families of able-bodied men not in any club, one gallon of flour for each child is given after the first month. Where the sickness pay exceeds 10*s.* a week, no relief is given beyond the medical order. Where the sickness pay does not exced 3*s.* a week, no deduction is made from the ordinary scale of relief in consideration thereof."

In Maidstone Union, "in the case of a man with wife and four children receiving 10*s.* from his club per week, the board will order 4 or 5 gallons of flour weekly, but no money. If the man were in no club, they would give him an order for the house; but if the illness is severe or of long duration, 3*s.* a week and five gallons of flour. In the first week flour only is given."

In the Malling Union, whatever the man is insured for he has for himself, and the board relieves the wife and family on their scale, which is a liberal one. The three unions last named are adjacent.

In the union of Ashford an applicant member of a club with 10*s.* sickness pay, having a wife and four children, receives 5*s.* a week from the board. If not in any club, the board will give him 10*s.* a week. In some unions no rule is laid down.

applicants belonging to approved friendly societies where the sickness pay is in their opinion insufficient.

(2) The refusal of relief, other than the house, to applicants being members of sharing-out or other clubs not deserving of confidence.

(3) Strict treatment of able-bodied male paupers of indifferent or bad character; thus making a difference between them and able-bodied paupers whose want resulted from their misfortune and not from their fault.

(4) That able-bodied married paupers of the latter class, and aged and infirm married paupers, be allowed to live in conformity with the provision that husband and wife shall dwell together till death them do part.

(5) All occupiers of houses to pay rates on the rateable value. No composition in lieu thereof to be permitted.

There was a fair probability of indirectly gaining the last-named alteration in the extension of the franchise; but the session of 1869 witnessed an alteration which, in its bearing on the occupiers of small tenements, tends to perpetuate the pernicious view commonly taken by them of the poor-rate, and imposition by farming their rates. An enlargement of the powers of the Registrar of Friendly Societies, and certain alterations in the law relating to friendly societies, are needed, in order to secure the annual audit of accounts, and the periodical valuation of the societies. Such information should then be tabulated in the Registrar's reports, and thus be available to the guardians. But they would need no help from the Registrar in dealing with applicants belonging to uncertified farm labourers' benefit clubs of the common type until their managers began to improve them.

Such, then, is the nature of the work, so far as the Poor Law is concerned, and the alterations which appear to be necessary if the degradation of our rural poor is to be arrested, and their natural efforts for independence to be stimulated and developed. We would destroy or alter nothing in the Poor Law, or its administration, which is good and serviceable, but would amend it in those points in which it is working mischief to the labouring classes and loss and injury to the community.

The second part of this reform, which should on no account be postponed till the regulations for poor-relief are amended, is that which would develope and consolidate a system as complete and distinct in itself as that of the Poor Law, of the insurances of the wage-paid classes who dwell within the verge of pauperism.

While, on the one hand, labourers, whether agricultural, mining, or manufacturing, should be discouraged as much as possible from resorting to the rate, on the other, a trustworthy and easily understood system of insurance should be offered to them under Government supervision.

Effort has already been made to obtain such a boon to the working classes by the directors of the Kent Friendly Society and various boards of guardians, agricultural and clerical associations in Kent, by urging on the attention of the Duke of Montrose, when Postmaster-General, the proposal for an extension of the 27th and 28th Vic. cap. 43, by which certain insurances may be effected at the Post Office. The memorialists prayed that the sums payable at death might be granted as low as 5*l.*, and that "endowments" might be obtainable; and, lastly, that such a system might be established as would allow labourers to secure, by *a single policy of insurance obtainable from the Post Office, sums, in sickness, from six shillings a week and upwards, together with burial money from 5l. and upwards.* The objections with which the proposal for sickness pay and burial money were met were fairly disposed of by a deputation of the memorialists.* Nor has any valid argument against the proposal been advanced, unless that is held to be valid which consists in the unwillingness of influential officers of the Post Office, who do not view it at present with favour, and whose benevolent exertions for the benefit of the insuring public entitle their opinion to respect. It remains to be seen whether, by the sagacious counsels and guidance of the successor of the Duke of Montrose, the co-operation of those who now stand aloof might not be obtained. The argument that the good of the community, and especially of the labouring classes of the lower degree, may be secured and promoted by such a measure will not, we are sure, be without its weight with them. The Chief Commissioner, Mr. Tremenheere, endorses, in the report already alluded to, the opinion that this proposal is one which "is well deserving further consideration."†

The principal details of this proposal may here be briefly stated:—

Sickness pay and burial money to be offered in a single insurance, to healthy male persons under 36 years of age, from 6*s.* a week, for a term of weeks, with 5*l.* at death, to 20*s.* a week with 20*l.* at death. All contributions, and the claim for sickness pay, to cease at 70 years of age.

In order to encourage respectable labourers to join early, there should be but two scales of contributions; one for persons under

* See the appendix to "The Report of the Commission in Agriculture," p. 101; or the pamphlet, "Friendly Societies *v.* Beer-house Clubs" (Ridgway, Piccadilly), in which the objections are dealt with.

† Report of the Commission.

26 years, and the other (which would be higher in amount for the same benefits) for persons upwards of 26 and not exceeding 35 years of age.

In addition to this twofold insurance, a third benefit should be added (at the option of the parties contracting), for an annuity to commence when the sickness pay ceases. This might be, in some cases, included in one insurance; in others it would form a second and separate insurance.

Monthly and bimonthly contributions to be paid at the nearest money order office or post office selected, and the postmaster to be the local agent. A small fine, in case of negligence in payments, will secure punctuality. The whole cost to be defrayed by a portion of the contributions set apart for a management fund. The whole of the machinery and its management are already in fair working order, having been established, in 1864, by the Act already referred to. The expenses of the system, on its introduction, would be a very small addition to those already incurred. The staff at head-quarters might probably need increasing; and the plan adopted, we believe, in the Essex County Provident Society, of travelling inspectors, to certify in certain sickness cases, would, if approved and acted upon, necessitate some additional outlay. The agency staff, with the medical referees, is already secured under the Act. We trust that the recommendation of the Commission in Agriculture that further consideration may be devoted to this proposal will be granted, and that it may be tested by the scrutiny of a friendly societies commission.

The adoption of such a system would at once attract to itself the moral influence which the gentry, the medical profession, and the clergy possess. The support at present lavished upon untrustworthy benefit societies would be at once withdrawn, and though subscriptions might continue in behalf of an annual festival, in which all good societies might join with the Post Office branch, we should hear of no more bolstering up unsound societies by contributions from landowners and others. It would also receive the powerful support of the guardians. It would be a safeguard against the establishment of new and fraudulent clubs, whose managers, concealed and at a distance, may be compared to the fowler who catches the birds in his evil net. It would prevent the formation of new clubs. For the same answer which is now given to the proposal to establish a savings bank of the old style would be made to the promoters of new societies. They would be referred to the nearest post office. And it is, lastly, no unreasonable anticipation that a fair percentage of our best and steadiest young labourers would, as in the case of the Kent Friendly Society, avail themselves of such advantages, with the best results on their own present and future condition, even if the obstacles of the Poor Law remained untouched, and that their example and influence would not be lost on others.

The proposition which has found favour with most advocates of the reform of friendly societies, "to dissociate them from the public-houses," is impracticable. It has been "recommended unanimously" by a committee of Convocation, and gains such general assent that the expression of the opinion that the attempt ought not to be made to interfere with them by legislation is given with unwillingness. Much anxious consideration of the question fails, however, to show how such interference can be reconciled with the liberty of the citizen.* It would be the better course (granting that it could be made illegal for societies to meet at public-houses) that the managers and members should themselves reform and improve their societies, under influences brought to bear upon them, rather than that a crusade against public-house benefit clubs should be persisted in. The practical way to advance this reform is to establish in convenient local centres, such as the money order offices and the larger country post offices, a system of sickness-pay and burial-money insurances which will provide all healthy young men who are fairly remunerated for their labour with the means of raising themselves above the abject condition of paupers. And, *pari passu* with such provision, to make the labouring classes of this country fully understand that, with good wages, they will not be permitted such free access to the rate as they now possess, and that far from being a matter of indifference to them whether the rate is large or small, it will be to their advantage in every way to reduce the burden of the same. The application of the principles advocated in these pages should be confided to the experience and discretion of the guardians, in so far as they relate to the laws of relief. The two systems, of the Poor Law and of the friendly society, would have their respective spheres in which, without coming into collision, they might act for the good of all. If there were no higher ground for urging the work of reform than a saving in the cost of the rate,† in agricultural districts overburdened with rates, it has yet a strong claim on

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* "The liberty of the subject" appears to have been strangely overlooked in discussing the question of beer-house and other benefit societies since Mr. Gladstone's speech in Parliament on Post Office insurance in 1864, when stress was laid upon it.

† It is estimated that 2,000,000*l.* a year are saved to the poor-rate by friendly societies. If such is the saving by means of societies commonly insolvent, it is only reasonable to anticipate that a much larger sum would be raised for the support of the labouring classes by their own means, thus securing a further reduction in the rate, if only their insurances were of a trustworthy character.

the attention of the legislature. But there are higher reasons than those of a pecuniary character, to which all who are anxious for the welfare of their fellow-countrymen cannot be indifferent. Let it be remembered that mutual sympathy and goodwill between the classes commonly called the ratepayers and the poor are greatly weakened by the present system of collecting and dispensing the funds of the rate: that to such a depth of moral and social degradation have the farm labourers of this country commonly fallen that very few of them can be prevailed upon, where they have the opportunity, to set about the task of providing for themselves, and still less for their relations: that all is squandered in reliance on provision from the rate: that, lastly, the injury is by no means confined to the farm labourers, but is shared more or less by all. Nor must it be forgotten that the really poor and destitute are to be included among those who are thus injured, for in consequence of the embarrassing position taken by the pauper labourer, they oftentimes receive less consideration and assistance than they merit. The infirm and helpless among the strictly poor claim more attention. These, with the waifs and strays of the human race, who are houseless and homeless, who are destitute and afflicted, constitute the proper subjects of the Poor Law. But that the farm labourer, who has a comfortable home, a settled occupation, sufficient wages to support him sick or well, should arrest and apply to his own use funds raised for the miserable, is a reproach not only to him but to the legislation which does not teach him better.

There are other points affecting the condition of the labourer to which allusion can only here be made. In addition to the improvement of the cottage, its occupant should be as secure in possession as any other house-tenant. The education of the labourer, and the best way to give it, the wages and food, are questions of great importance. But, second to religion alone, and before all others, come those which we have endeavoured, however imperfectly, to deal with in these pages—the bearing of the Poor Law, and the friendly societies of the labourer. Let him be encouraged to form habits of self-reliance; let him clearly see the way by which he may secure his independence without any danger of his savings being made to benefit the ratepayers and not himself; let not his social and domestic relation be disturbed without urgent cause. He will then begin to improve, and, by prudence and industry, will be enabled to spend his days on the spot which is endeared to him by early and intimate associations, and by the ties of family: in lieu of submitting to the dreary reality of being parted from home, and wife and children, in his old age, and dragging out an enfeebled existence as an indoors' pauper. All the human influences which promote his happiness will thus be strengthened and preserved. Strength will be gained in that part of our social system which is at present weak, and the cause of weakness in the community. The effort to attain an honest independence by self-help, in union with one's neighbours and friends, has no evil in it. It promotes the welfare of the individual, and the public good.

NOTE.—The following statement was submitted to Mr. Bruce, the Home Secretary, and Mr. Goschen, the President of the Poor Law Board, who recently received a deputation urging inquiry into the state of friendly societies, certified and uncertified :—

"1. That the state of burial societies, according to the Report of the Registrar-General of Friendly Societies, requires attention with a view to their reform.

"2. That notwithstanding the certificate of the Registrar that their rules are in conformity with the law, there is reason to believe that a large proportion of the certified friendly societies are in an unsound state.

"3. That uncertified benefit societies exist in considerable numbers, which, in addition to the insecurity of their funds, are framed in such a manner as to secure to themselves a release from the burden of aged and infirm members, whose maintenance is forthwith suffered to fall upon the provision of the poor-rate.

"4. That the effect upon the development of friendly societies of the administration of poor-relief needs inquiry in the various Unions throughout the country.

"5. That provision for sickness, old age, and burial might be secured by industrious and prudent artisans and labourers, at a cost not exceeding that commonly paid by them into unsafe and uncertified benefit societies, provided that trustworthy insurances, suited to their requirements, were placed within their reach.

"6. That in order to secure the due care and administration of friendly societies, a revision of the powers of the Registrar is desirable.

"7. That, judging from discussions in both Houses of Parliament, and opinions expressed elsewhere, the advantage of instituting inquiries into friendly societies is now commonly admitted.

"8. That . . . . such investigation would be best conducted by means of a commission for the purpose of inquiry—

"(1) Into the state of burial and other societies.
"(2) The bearing of the Poor Law upon them.
"(3) The means of providing insurances suited to the wage-paid classes.
"(4) And providing for their due supervision."

The foregoing paper bears the signatures of peers, members of Parliament, and others, who have devoted attention to the question in its various bearings. The Manchester Unity and the Foresters also supported the deputation.

Since these pages were in type, the death of Mr. Tidd Pratt has caused a vacancy in the Registrarship. An opportunity is thus afforded for introducing changes which may secure improvements in the office.

III.—*On Straw-Chaff.* By SAMUEL JONAS.

To H. M. JENKINS, ESQ.,

DEAR SIR,

The following note is written in compliance with your request from the Journal Committee that I would furnish them with my opinion of the value of straw-chaff for feeding purposes, and the best manner of preserving the same.

I had for many years been a great advocate for the consumption of a large portion of straw-chaff for feeding purposes before we had the advantage of the scientific aid of such a man as Professor Voelcker, who, in Vol. XXI. of our Journal, furnishes us with an analytical statement of the materials contained in the straw of our cereal crops, which is highly valuable and satisfactory.

Some years ago our chaff was cut by hand, and used fresh from the knife without the least fermentation, and was consequently little used by us, or appreciated by our cattle and sheep. Since then a plan has gradually been adopted in this locality of cutting and storing chaff in a large mass, and using it when from six to twelve months old. It is, if well managed, thus rendered by fermentation as sweet as well-made hay, and eaten by our flocks with great avidity. It has in two seasons, with no turnips, enabled me to winter my sheep and fold the land, leaving sufficient folding to produce a good crop of barley, not from the chaff alone, but from its being the means by which I enabled my sheep to consume with it large quantities of bran, malt culms, and oilcake, sufficient to keep them in health and good condition, and to leave the land in a good state for the following crop of barley, which I could not have done by any other means. The turnips were such a complete failure that, the same two winters, all my fat cattle were fed without having a root to eat. I had two coppers hung in the mixing house, ground my corn, and broke my cake with an American mill. These were mixed together with malt culms and boiled, and, after a certain time, were emptied boiling hot into a prepared bed of my old straw-chaff; these were stirred over and mixed well together, and used for the stock in a warm state. They did well so fed, and became good fat bullocks, and paid for the expense of food and attendance, which they very seldom do. One of my sons has carried out this plan by fattening sheep in a yard well littered with wheat-straw (which is better than barley-straw for their feet), and feeding them entirely with boiled food and straw-chaff, no roots. These sheep paid very well for their food. Myself and sons have carried out this system of storing old chaff to such an extent, that we are using on our occupation (which consists of 4200 acres of arable land) seven barns which were previously used for storing corn. My plan of cutting and storing is as follows:—

I use a 12 horse-power engine by Hornsby, which enables me (when used on home premises) to thresh, dress, and sack the corn ready for market, and cut the straw into chaff. I use one of Maynard's powerful chaff-cutters, which sifts and puts the chaff into bags ready for being carried into the chaff-house. The straw, when delivered from the threshing-machine, is carried by rollers to the height of 9 feet; it then comes down an inclined plane. Three men get in the straw and hand it to the chaff-cutter; it is then cut and carried into the chaff-barn, and well trodden down, mixing about a bushel of salt to every ton, and also a certain quantity of green stuff. Tares or rye cut green into chaff are sown by hand as the chaff is brought in. This causes it to heat, and adding the amount of green stuff required to give it a proper heat is the secret of the successful operation of storing chaff.

Respecting the quantity of green chaff to be mixed with straw-chaff to cause a proper fermentation—I use about 1 cwt. to the ton of straw-chaff, and 1 bushel of salt to the ton of chaff. But some judgment is required as to the state of the green stuff. If it is green rye on the ear, a full cwt. is required, if very green tares, a rather less quantity will do, as the degree of fermentation depends upon the quantity of sap contained in it. This is done in spring and summer; the chaff is not used till October and the winter months. I can thus thresh and dress the corn-crops, and cut the straw into chaff in one process; the expense of cutting and storing the same being about 1*s.* per acre; the principal additional expense is for about 4 cwt. of coal per day, and we thresh and cut from 8 to 10 acres per day.

I am not stating that straw-chaff can be rendered as valuable as hay-chaff for feeding purposes, but that it may, by judicious management, be made a very important auxiliary to the production of meat food for our fast increasing population. I agree with Professor Voelcker, that the straw used for chaff should be wheat and oat, for these may be cut without loss in a far greener state than is generally done; but barley, to be of good quality, cannot fairly be cut too ripe.

Yours faithfully,

SAMUEL JONAS.

Chrishall Grange, Saffron Walden.
November 6th.

IV.—*Reports on Steam Cultivation by Machinery let by the Landlord, as practised on the Northumberland Estate of His Grace the Duke of* NORTHUMBERLAND. By JOS. SNOWBALL, CHIEF AGENT.*

Estates Offices, Alnwick Castle,
January, 1869.

MY LORD DUKE,—In accordance with your wish, I now give in detail the arrangements made for carrying out your scheme for

* Communicated by His Grace the Duke of Northumberland.

the cultivation of land by steam-power, as far as at present practicable, upon your Grace's estates in Northumberland, having divided the subject under the following heads:—

1st. The cost of steam-engines and tackle.
2nd. The extent, quality, and position, of land to which steam could be beneficially applied in cultivation.
3rd. The profitable application of the capital employed.
4th. The probable increase of produce, by deeper and more perfect cultivation, and the saving effected in the maintenance of plough-horses.

1st. Since your Grace's allusion to this subject at the meeting of the Northumberland Agricultural Society, held at Cornhill in July last, I communicated with Messrs. Fowler, of Leeds, who forwarded to me the following estimate for the supply of engines and tackle:—

	£	*s.*	*d.*
Two 12-horse engines complete	1200	0	0
One 4-furrow plough with steel scaifes	92	0	0
One 7-tine cultivator	65	0	0
800 yards of steel rope	84	0	0
10 porters	10	0	0
One large harrow	50	0	0
One water-cart with pump	25	0	0
Making an entire cost of	1526	0	0
Or, if only 10-horse engines were used	1486	0	0

It was decided to order the engines of 12-horse power, and they have proved far superior to those of 10-horse power. The capital sum of 1526*l.* for engines and apparatus and the cost of working them for a year form the basis of my estimate upon the entire scheme as follows:—

	£	*s.*	*d.*
Foreman engineman (whom it would be necessary to engage for a year) at 25*s.* per week, or say 50 weeks	62	10	0
Second engineman at 21*s.* per week for say 215 work days	37	12	6
Ploughman engineman at 18*s.* per week	32	5	0
One boy at 9*s.* per week	16	2	6
One boy at 6*s.* per week	10	15	0
Wear and tear, oil and repairs	70	0	0
Wear and tear of ropes and plough	90	0	0
For "reserved fund" for depreciation of capital ..	100	0	0
Interest upon, say, 1500*l.* capital at 5 per cent	75	0	0
Making a total of	494	5	0

The tenants have undertaken to supply water, which will take a man, and one, or perhaps two horses per day, when the engines are in full work; and during that time one ton of coals will be consumed.

2nd. The estimated annual expense being ascertained as nearly as possible, it became evident that such an outlay could not be borne out of the profits of an ordinary-sized farm, and that steam-cultivation would have to be undertaken by either a number of farmers combining to purchase the engines and apparatus, and agreeing upon a scheme for their general use; or by an owner of a district sufficiently large, who would advance the required capital, and establish the apparatus for the use of the tenantry upon fair and equitable terms. Upon mentioning the probable difficulty of accomplishing an arrangement with your tenants for their establishing such costly machinery, and for working it amicably and advantageously, your Grace at once proposed to be at the entire expense of doing so, if a proper arrangement could be made with them for its use. I then selected a district upon which the apparatus could be generally applied with the best possible results, and where the tenantry would willingly co-operate in endeavouring to benefit by the great prospective advantages offered. The district of Acklington was selected, the land being principally a heavy loam upon a sound clay, and the farms containing from 300 to 500 acres, the arable of which varies from 160 to 280 acres, and requires on an average from seven to eleven horses each farm for its cultivation. The farmers, at a meeting I held for the purpose of hearing their sentiments, on the 5th of September last, readily accepted your Grace's proposition, and expressed their desire to have all the land coming in course for the following year's fallow, turnips, and potatoes, ploughed by it as speedily as possible, and to pay any proportionate charge it might be necessary to make to meet the annual expenses of the establishment.

3rd. The tenantry having decided upon adopting the machinery, the question of area which the engines and tackle were capable of ploughing and cultivating annually and in due season, was next considered; and it was estimated that the fallow of about ten farms, averaging the quantity before stated, could be ploughed every autumn, and cultivated for turnips in the spring, or as bare fallow for wheat in the summer following. It was then arranged that those farmers occupying about the number of farms in the district mentioned should at once have the advantage of the boon offered. And it having been estimated that the annual charge against the engines and tackle, and of working them, would be 494*l.* 5*s.*, it was necessary to ascertain, as far as possible, how that sum could be realised by fair and reasonable charges for the several works to be performed. With the advice of Mr. Greig and Mr. Cockburn, Messrs. Fowler's agents, the following prices were named and agreed to by the tenantry :—For ploughing or digging, 10*s.* an acre ; for cultivating once, 5*s.* ; and as often after as necessary, 2*s.* 6*d.* per acre ; and for harrowing, 1*s.* 6*d.* per acre. Upon these charges the following estimate was made, the tenants undertaking to supply coals and water for the engines free of charge, as before mentioned :—

	£	*s.*	*d.*
For ploughing in autumn 400 acres at 10*s.* ..	200	0	0
Cultivating the following spring 400 acres at 5*s.*	100	0	0
Cultivating second time 400 acres at 2*s.* 6*d.* ..	50	0	0
Harrowing 3 times 400 acres at 1*s.* 6*d.* = 4*s.* 6*d.*	90	0	0
The use of the engines to be employed in winter in cutting timber in the parks and elsewhere was estimated to be worth at least the difference of	54	5	0
	494	5	0

Your Grace having placed the capital for the benefit of the tenantry at the ordinary rate of interest, the above prices were only determined upon *as a basis of charge*, it being understood that the tenantry should have every advantage to be gained by the fullest employment possible of the engines and apparatus and men engaged in working them. It being almost certain that the above calculation would be borne out, no further time was lost, and within five weeks from the time the meeting was held at Warkworth, the engines (which are named the Acklington and Warkworth) and tackle were steadily doing their work, and before the end of December had thrown up about 300 acres of land, to be mellowed by the action of the weather in winter, to the depth of from seven to eleven inches from the surface before ploughing, and after ploughing of from twelve to eighteen inches, without a single accident or impediment of any importance, doing, when the weather permitted, from six to eight acres per day.

4th. Independent of the saving of expense by the cultivation of land by steam-power to a greater depth than could, at a reasonable cost, be accomplished by horse-power, much greater scope will be given to the growth of every description of crops, to the retention of moisture for their sustenance and development, and for the gradual improvement in the productiveness of the soil ; and although the present temporary arrangement with the tenantry, which I have given in detail, is to some extent an experiment and encouragement to them, I am sanguine in thinking it will lead to a permanent use of steam for the cultivation of the soil of that and other districts belonging to your

Grace, and, if well arranged, will be a saving of a large annual expenditure in the maintenance of horses. The work the engines perform will certainly be equal to that of 25 horses (or about one-fourth of the total number used), costing the farmer annually for their keep, shoeing, risk, and depreciation of value from 30*l.* to 35*l.* each, or a total of from 750*l.* to 875*l.*

But, perhaps, the best test of the saving in the cost of horse-labour, as against steam, is to calculate the expense of a deep-ploughing early in autumn, the ploughings, grubbings, and harrowings the following spring in preparing the land for green crops or wheat, and these I estimate at 2*l.* 5*s.* per acre (though I am advised by practical farmers that that is within rather than over the regular cost), and for 400 acres the sum of 900*l.*, showing a benefit to the tenantry within the district mentioned and an advantage in favour of steam of about 400*l.* per annum.

I have the honour to be, my Lord Duke,

Your Grace's most obedient servant,

JOS. SNOWBALL.

To His Grace the Duke of Northumberland.

Estates Office, Alnwick Castle,
December 30th, 1869.

MY LORD DUKE,

It is now nearly a year since I reported upon the plan that had been adopted by your Grace upon your farms in the district of Acklington, Northumberland, for the cultivation of the land by steam; and as the engines and apparatus have been at work for a full year it may be satisfactory to all concerned to know the result of the year's experience. In the report alluded to, I estimated the cost of working the machinery and tackle for a year at 494*l.* 5*s.* That sum has been exceeded by 110*l.* 5*s.* 10*d.*; but the workmen having been taught their duties a part of the year, an experienced engineman and extra hands added materially to the wages; although this expense will not occur again, it is found that the estimate for labour in my first report is much too low.

The particulars of the expenses I give as follows:—

	£	*s.*	*d.*
Enginemen and workmen's wages for one year ..	284	12	4
Repairs, oil and materials	143	12	6
Interest upon capital 1,526*l.* at 5 per cent.	76	6	0
For a depreciation fund	100	0	0
Total	604	10	10

The receipts for the work performed at the low basis of charge named in my report in January last are as follows:—

	£	s.	d.
For ploughing or digging 562a. 3r. 26p. at 10*s*. ..	281	9	1
For cultivating 351a. 2r. at 5*s*.	87	17	6
For harrowing or rolling 1,518a. 2r. 27p. at 1*s*.6*d*.	113	18	0
For one engine with staff employed cutting timber 9 weeks	90	18	0
Total	574	2	7
Deficiency	30	8	3
	604	10	10

It having been your Grace's desire that the machinery and tackle should be placed for the use of the tenantry at a minimum charge to cover the interest upon the capital invested, working expenses, and depreciation of value, the prices named in my last report have been adhered to, although they leave a small deficiency. During the current year I fully expect the wages will be considerably less and the work performed greater; and that, at even the low prices charged, the deficiency of the past year will be more than overcome. The tenantry all seem fully alive to the advantages placed within their reach; they have been always anxious to enter into any proposed arrangement for using them economically, and have already reduced in some cases their horse-power. The difficulties contemplated in arranging to satisfy the desire of the tenantry to have the use of the tackle when the land belonging to several was ready at the same time, have, up to the present time, been met by rules laid down by me before, and approved of at, a meeting of the tenants held for the purpose of considering them; which are as follows:—

1st. The tenant whose crop is first off and ready for autumn ploughing, and who has given notice to Mr. J. A. Clark, his Grace's manager of the plough, that his land is ready, shall be entitled to the first use of it, so as to plough at least one field, or not exceeding 30 acres, after which it shall go to the next nearest farm (provided the tenant shall desire to have it), to plough at least one field, or not exceeding 30 acres; and so on to the next nearest farm, doing a similar quantity of work.

2nd. Should more than one tenant be ready for the plough at the same time, so many as shall be ready (having given the notice before-mentioned) shall cast lots for the first use of it. After the tenant has by that means obtained the first use of it, the next adjoining tenant shall have the first offer of it; but in each case of refusal it shall go to the next nearest, so that the engines may have as short a distance to travel between farms as possible.

3rd. The tenant of the land first dry and fit for cultivation in spring to have the use of the cultivator and harrows, provided he has given the before-mentioned notice to the manager; but in no case shall they remain longer than three days on one farm, except when the manager has not received notice of their being wanted elsewhere.

4th. Should more than one tenant have land ready for cultivation in spring at the same time, and notices as before-mentioned have been given to the manager, the tenants having land so ready shall cast lots for the first use of them. After the tenant has by that means obtained the first use of them, the next adjoining tenant shall have the offer of them, and in each case of refusal they shall go the next nearest (as before decided in the case of the autumn ploughing); but in no case shall they remain longer than three days with one tenant, except when the manager has not received notice of their being wanted elsewhere.

5th. These rules, having been adopted at a meeting of the tenants interested, held at the Estates Office, Alnwick Castle, on the 1st of September, 1869, shall not be altered unless at a similar meeting, held by notice, for the purpose of altering or amending the same.

As I understood it was your Grace's wish that a copy of my first report should be sent to the Secretary of the Royal Agricultural Society of England, it may be satisfactory to all interested in the progress of steam-cultivation that the present report should accompany it, to show the result of the first year's experience upon it.

I have the honour to remain

Your most obedient servant,

JOS. SNOWBALL.

To His Grace the Duke of Northumberland.

V.—*The Potato in Jersey.* By C. P. LE CORNU.

[PRIZE ESSAY.]

IT is generally said that the potato was first introduced into Europe from North America, though by some it is reported to have been originally found in the neighbourhood of Quito, and brought therefrom by the Spaniards in the early part of the sixteenth century.

Regarding its first appearance on British soil, some slight difference of opinion also exists. We read that about the year 1584, on the occasion of his voyage to North America, Sir Walter Raleigh, struck with its usefulness as an article of food, brought home the potato, and made known its value. On the other hand, we find the potato mentioned as having been brought to this kingdom by Hawkins in 1565, and that it was known in Ireland previous to Sir Walter's expedition; but writers on this subject seem to agree that to Sir Walter Raleigh is due the credit of having been among the first who cultivated the plant to serve for human food. At this period it was distinguished from the sweet Spanish potato—*Discorea batata*—by the name of Virginian potato; this is mentioned by Gerarde, in his 'Herbal,' 1597. In the following century we find the Royal Society, at its Meeting, May 18th, 1662, taking measures to promote the planting of potatoes in all parts of the kingdom, so as to provide food for the people, should famine or a failure of corn visit the country; Evelyn makes mention of this at the close of his 'Sylvia,' but thinks little of their culture, as he says, "plant potatoes in your worse ground." In England potatoes were first extensively cultivated on the western coast of Lancashire, a locality still famous for their growth; and it was not until forty years after their introduction, that they were grown in the neighbourhood of London, and even then with no idea of their utility. In Scotland we find the potato mentioned as being, in 1732, one of the crops then in the common system of tillage; but, through some mistaken superstitious notion, it was abandoned and condemned as a sinful plant, because no mention of it was made in the Bible. It does not, however, appear that these ideas extended themselves beyond that country, or yet that they continued long there. No doubt the superstitious notions gave way as the loss of the esculent became felt, and they were for ever dispelled when the importance of the plant placed it prominently on the rolls of agricultural produce, as one of the most useful sources both of human and of animal food.

With regard to the exact date of its first introduction to Jersey, we have no information other than that traditionally handed to us by the oldest growers of the present times, from whose accounts we gather that the first coming of the potato to this island must have been about the period 1772—5. In 1788 an article appeared in the 'Gazette of Jersey,' from the tenor of which it is clear that the potato was then taking root in this island, though it is equally credible that its earliest cultivation was only on a very small scale, in all probability rather as an object of curiosity than otherwise. To those who understand how difficult it is at any time to introduce anything novel to the farmer, or, rather, that which he has not been wont to see practised by others before him, it is easy to believe that the potato was not at once seized upon and cultivated by our farming ancestors, without at least some years of consideration. Still it would appear that the leading agriculturists of those days were not behindhand in bringing the potato into general cultivation, for, in 1791, we find a quantity, said to be of superior quality, offered for sale at the rate of 1*s.* for 40 lbs. weight.

Quayle, in his book published in the year 1812, has the following notice on the potato in Jersey, which we reproduce, as the best existing account of those times; and, moreover, because copies of the work are very scarce, and the work itself unknown to many. The writer says—"Though this root is comparatively of modern introduction, not having been admitted into ordinary field-culture till within thirty years, though it has had to struggle with the favourite parsnip, and does not agree with the application of the no less favourite article of improvement, sea-weed, in substance, yet the culture of potatoes is general and extending; their quality nowhere superior, and this is the only field product which is at present exported. No plant needs better tilth; on land which has previously been a corn crop the great plough is constantly employed, on grass land the spade, by which it is trenched deeply. Stable-muck, which in this country it is not usual to turn or clump, is applied at the rate of 8 or 10 cart-loads, containing each about 20 or 24 Winchester bushels per vergée.* Potatoes are always grown in drills, distant 1 to 2 feet, generally 1 foot 4 inches. The sort preferred is called '*gros-yeux*,' round, moderately sized, thin-skinned, white with a yellow cast. These have the valuable property of producing few potatoes of a small size. It has been observed in a good crop, that not a cabot of small potatoes were raised to a vergée. The planting is usually in April, the muck laid above the set. On this plant alone horse-hoeing or hand-hoeing is employed; weeding between rows is also practised with the small fork.

"The summer consumption of potatoes in the town being considerable, the tops of those raised at that period are given by some farmers to their cows as a regular article of food. In France also the practice seems not unusual.

"In 1811 an experiment was made by Mr. Le Marquand, of St. Peter's parish, to grow on the same land two crops of potatoes in the year. An early species was planted in January, which succeeded. The crop being taken up and successively carried to market in July, the ground was again drilled, manured, and planted with the common species, which produced an average crop in quantity, in quality they were watery; but no sets of a species fit for late planting were then to be procured. In these islands, where the frosts are not rigid in spring, or early in arriving in autumn, whilst there is a good market for the first raised potatoes, it is probable that this practice will be extended.

* Two and one-quarter vergées are exactly equal to one English acre.

" The application of sea-weed, in near contact with the sets, has been found here, as well as elsewhere, to communicate to the potato an unpleasant taste, and make them scabby, besides having the effect of rotting part of the sets. It has been recommended, by a most intelligent cultivator, to draw on sandy land a deep furrow, in which the sea-weed is to be placed, to bury this by means of a lighter furrow ; next to lay the sets, which are to be covered with long muck or fern, and then earthed as usual.

" Potatoes are taken up with the three-tined fork. In the form of this an improvement has been made by a gentleman near St. Helier ; the tines are somewhat extended in length, then bent, so as to form a right angle, as in the Suffolk muck-croom. By striking the teeth into the ground beyond the plant, and drawing the tool forwards, the whole root is at once drawn up ; and by raking the land afterwards, every potato extracted. They are rarely preserved in covered heaps or pies, but usually under cover.

" The produce stated to be obtained in Jersey is large, each cabot,* when taken up weighs on an average 40 lbs. avoirdupois. On a Jersey perch, which consists of 484 square feet, 12 and 14 of the cabots are often obtained. From 300 to 400 cabots on the Jersey vergée, consisting of 40 perches, appear from concurring accounts to be the ordinary return ; 600 have been obtained. Taking the produce of 10 cabots on the Jersey perch, or 400 on the vergée, as a full average crop, on that computation the produce amounts to 36,000 lbs. to the statute acre.

" In the spring of 1811, a perch of land immediately behind the country residence of General Don was fenced off by way of experiment. The soil is a rich loam, and received an excellent manuring of stable-muck. In April, potato sets were placed in drills 1 foot 4 inches apart, and kept constantly and carefully weeded till the meeting of the tops prevented it. In October they were taken up and measured as raised. The produce was fourteen cabots ; it was besides stated to General Don that the ground was not perfectly picked. In the present year he has ordered the experiment to be repeated in the same spot, under the same management. Potatoes are sometimes dug up by contract, the grower giving to the labourer a tenth. The price of potatoes varying, as it here does, with the quantity, the season, and the demand in a market at present high, but governed by peculiar circumstances, it is difficult to fix an average. Speedily after Midsummer new potatoes fetch at St. Helier's about 5*s.* per cabot ; they decline in October or November to 1*s.*, rise again in March to 3*s.* 6*d.* In August, 1812, the

* The standard weight of this potato measure is equal to 40 lbs. Jersey weight. 112 lbs. English are exactly equal to 103 lbs. 14¾ oz. Jersey.

price was from 1*s.* 8*d.* to 2*s.* Of late an annual exportation takes place of 40 or 50 cargoes of potatoes in vessels of about 50 tons' burthen; some are sent to Portugal, and successive cargoes to Guernsey.

"In the spring of 1812, the States of the Island thought fit to pass an ordinance forbidding for a given period the exportation of potatoes, and imposing penalties on the contravener. The privation of his market, and the reduction of price of his commodity, is still more unjust and injurious to the grower of potatoes than of corn. The latter has an option whether he will sell or retain to another year: this the potato grower has not; before the crop of 1812 was brought to market the ordinance had expired. Good care seemed to be taken by some persons to raise and ship off this year's potatoes before another ordinance forbade it. The root could hardly be sufficiently matured for keeping in the month of September, in which month, and even in August, several cargoes were dispatched. Such ill-advised measures as embargoes thus produce the evil they are meant to avert. The domestic consumption in various purposes is increasing. The peasantry here never entertained any prejudices against their use in human food. From the introduction of different species succeeding each other, the supply is now constant throughout every month in the year. Hogs are fatted with the root, at first given raw, afterwards boiled with bean and oat meal during the last fortnight. The meat of the animal thus fatted is not held in equal repute with the parsnip-fed pork; to horses some boiled potatoes are given, and with their aid cows are usually prepared for the butcher, bean and oat meal being added in the last period. There is no dissenting opinion to this being an exhausting crop. The effect they have in drawing the land, as it is termed, must be exerted principally near the surface; and, in fact, it is invariably observed, that the wheat crop succeeding them, *cæteris paribus*, is inferior to that succeeding parsnips.

"When followed by barley, the land only receives a seed furrow. No experiments are known to have been made in order to obtain varieties by seed."

Such is the account given by Quayle, based, as he says in the preface to his work, upon the information given him by some of the most competent men in the island.

That the potato flourished, and was for a long succession of years the leading crop of the farmers, is well known, and will be best understood by referring to the export returns appended to this Report. It was not until its universal failure that this island felt, in common with the rest of the kingdom, the effects of its loss.

In 1844 the first signs of disease became manifest in several parts of both hemispheres; accounts came in from various sides that the crop was partially, if not wholly, cut down; causes without number were attributed, and remedies without end were offered, but all seemed powerless; and for a time the plant was despaired of as if doomed to succumb and disappear from among the fruits of the earth.

Although prevailing throughout England in the season of 1844, the potato disease was not observed in this island till the latter end of June of the following year, when a few cold nights checked the flow of sap and paralysed the plant, that disease immediately set in with awful rapidity; and so virulent was it, that when the time arrived for clearing the ground, in some places every tuber had rotted away, and in others one-half of the crop was injured. Although the loss was severely felt in this island, it was comparatively nothing when compared with the dreadful consequences which befel the agricultural people of Ireland, whose sustenance all but wholly depended on the returns of their potato crop. The famine which prevailed in that country at this period is still fresh to our memory. The numerous cases of destitution and of deaths through starvation which filled the papers are indescribable.

Though we say that the position of the poorer inhabitants of this island was not to be compared with the agonising state of the Irish, we can recal a moment when the loss of the potato, coupled with the high price of corn, influenced the price of provisions to that extent, that in all probability more cases of want have not here existed within the present century, than did exist during the winter of 1847-8. Happily, better times followed. Although the disease prevailed in the following years, its type was less malignant; still the crop was very short of its former produce; 2 or 3 cabots per perch were now the average returns of the general crop; and although prices increased consequent upon the scarcity, the markets were dull, and operations very limited. As may be supposed, a few successive years like these made a change in the *modus operandi* of our farmers. Feeling that a continuance in the old routine would soon tell unsatisfactorily on the return of their labour, the country people diligently sought another article to replace what so long had been to them a small mine of prosperity. The growth of the parsnip increased, and the fattening of stock partially took the place of potato cultivation: but this was found to answer only as a temporary relief. Favoured by soil, by climate, and by daily communication with England, it was not long before a few discovered that by devoting their attention to potatoes of early sorts, they could compete with particular advantage for the early supply of London, and of other large towns in the kingdom, and by this culture derive a highly important and lucrative employment. This change in the cultivation of potatoes in Jersey was first practised some 10 years after the manifestation of disease in the late crops, when the success of the undertaking became so apparent, that it was not long before all the sheltered portion of the south coast of the island was devoted to the plant, and new life again restored to that which some years before was, as it were, lifeless. Now, not only do we see the early potato flourishing in these exceptional sheltered nooks, but also the broader fields on the high lands teeming with the luxuriant vegetation of these early crops, and the produce standing pre-eminently with that of the sister isle among the earliest and best in the provision markets of London.

Let us glance for a moment at the changes which have taken place in its mode of culture since the first introduction of the potato to Jersey. We have observed that, originally, the potato was cultivated possibly more as an object of curiosity than otherwise. It is, therefore, perfectly natural to conjecture that the cultivation was proportionately roughly attended to ; small patches in the corners of the then abounding orchards * were occasionally met with ; frequently these patches were irregularly planted, and the tubers dug out as required ; indeed the whole affair managed, as we now see, in the out-of-the-way corners of a garden, a bed of Jerusalem artichokes, or what is known as the lazy-bed system. We must also bear in mind that the varieties of potatoes then existing were very unlike those which are now in use. They were large, knotty, and coarse ; and it was only after years of improved cultivation and treatment that this tuber became the palatable article which it now is. In the article written by Quayle, which we have quoted, is well described the attention which the potato received after it may be said to have been thoroughly established as a field crop in the island. To the culture of this plant is certainly due the system of drilling, or, rather, of lineal planting in our husbandry; nor must we forget the introduction of deep ploughing, so well known here as "*la grande charrue.*" Neither let us overlook the feasts, nor the political discussions which at one time accompanied the work. The system of deep ploughing must have wrought a wonderful change in our fields ; we are told that before that, the potato was a dirty and ill-cared-for crop. We can well conceive that the use of "*la grande charrue*" has tended much to bring the state of our soil to that degree of productiveness which it now possesses ; and we can also readily imagine that in its work it has cleared many a field of those net-works of roots from the

* Orchards are said to have then occupied one-fourth of the arable land.

trees of neighbouring hedges, which, traversing the soil, devoured its richness, to the detriment of the crops.

The culture of potatoes prior to the manifestation of the disease may be thus described. In general, the crop followed turnips. In the early part of the year the ground received a light ploughing, from 3 to 4 inches deep; it was then harrowed, and manure carted at the rate of 8 or 10 tons per vergée. In many cases, especially in the vicinity of the coasts, quantities of sea-weed were used as manure. Sometimes the manure was ploughed in some few inches, but generally it was allowed to remain on the surface, and a double furrow having been opened down the centre of the piece, the whole was left in readiness for "*la grande charrue*," which generally took place in March and April. Although somewhat digressing from the object in view, we may perhaps better describe what is known in this island as *un jour de grande charrue.* It is this: a day fixed upon, for some weeks beforehand, for a number of farmers, generally neighbours, and more frequently political friends, to join in ploughing their land intended for potatoes, parsnips, mangolds, and carrots. This work always progresses cheerily, the good hostess never failing in her department to make everything agreeable to her friends; nor do the younger members of the family or party the least enjoy themselves; many look forward to these occasions for a little enlivenment; it is, in fact, a day of recreation for the young, as well as of work for the elders. Each in his, or we may be permitted to say, also in her way, has a share in the conviviality and merriment attending these ploughing parties. Returning to the actual work, and to the period about which we were treating, let us say that as now 2 ploughs were used for this work, the smaller with 3 horses, and the larger with 8, and frequently 9 or 10 horses. The smaller plough taking the lead, with a furrow some 16 inches wide, and 4 inches deep, started from a headland, and going down the piece, turned the manure and crust into the hollow of the opened furrow; when the large plough, following in its wake, brought up mould a foot or more in depth, and upheaving it over the crust and manure, left a clean and well-pulverised surface, which, when levelled and harrowed, was ready to receive the plant. The planting of potatoes was effected, as now, commonly by means of a small plough drawn by 1 horse. The drills or rows were usually about 18 inches wide; and the sets, generally cut to one eye, were placed about 9 inches distant in the rows. The average quantity of plant used at these distances would be about 20 cabots per vergée. Shortly before the potatoes made their appearance above ground, a gentle harrowing was given to loosen the surface; and as soon as the young plants attained some 6 or

9 inches in height, the small hoeing-up plough was driven between the rows. This done, the piece was left until the fall of the year, when the tubers were raised for sale, or for store, as the case might be. The produce averaged from 8 to 10 cabots of saleable potatoes per perch. The markets were then chiefly the mining districts of England, Portugal, the Mediterranean ports, and Brazil. Instances are on record when the produce has reached the almost fabulous return of 16 cabots per perch. The varieties cultivated in those palmy days were commonly known as "*Les degenerées*" and "*Les Blues*." The "Stayner" also, brought to the island by a gentleman of that name, was at one time extensively grown. Some varieties were raised from seed; among these is a red potato, still well known in St. Ouen's, which was raised at Vinchelez-de-Haut, which, although not large, is of a remarkably good flavour, and has the important property of keeping good late in the season. The late Mr. James Hammond also successfully raised an early and good variety. Besides these, the York kidney and the York red were introduced to the island, but one and all suffered from the disease, though some varieties felt it more than others did. The once famous Jersey Blue all but disappeared, and a coarse late potato, which here went under the name of "pink eye," succeeded it. For some years this was grown solely because it seemed to withstand the disease better than the generality of other varieties. The Regent next followed, a potato which never attained a large size, but which was of superior quality; although now cultivated by a few, the late fluke may be said to have taken its place.*

We can remember, before the setting in of the potato disease, having seen the haulms rise above ground nearly as high as the surrounding hedges; and on the 1st October, when shooting-parties went through the fields, the dogs run completely hidden between the rows, as through a furze-brake. Even after all vegetation had ceased, so strong was the haulm that it remained standing and dried up like so many sticks. The haulm was made into faggots, and stored away for fuel. As may be imagined, no sort of weed could possibly live in a piece of potatoes like this. Everything was smothered by the vigorous habit of the plant. But when the providential visitation on the potato took place, and the disease broke out in its worst form, how different was the aspect of those fields. The strong haulm was no more seen, for as early as the first week of July the leaves began to blacken and fall, then the stalks rotted, and with a most disagreeable smell entirely disappeared, and left the

* At present the cultivation of late potatoes is small. In the winter-season French-grown produce partially supplies the towu-population. The introduction of French potatoes to the island began about 1856-57.

land to be overridden with weeds; and lastly, when the tubers were raised, instead of measuring out the cart-loads of good healthy fruit, a miserable half-rotted crop was the return, which in many places did not yield the original quantity used for sets in planting. Such is the difference of the potato-crop before and after the disease; but, as we have observed, a new era has taken place in their culture here, and, God be praised, plenty smiles again upon our fields. With the present system, viz., the growth of early potatoes for the London and other principal English markets, a variety of changes has followed, some of which it is necessary to mention. Let us first consider how the cultivation is carried on, and afterwards cursorily examine its effects. The selection of suitable land is the first consideration. If the soil be what is termed of a warm nature, and with a gentle declivity southwards, so much the better. The next important point is the preparation of the soil; we do not now find it necessary to cultivate so deeply as was formerly the practice. The ploughing is carried on very much in the same manner as that before described, but the application of the manure is different. When the ground has been ploughed and well harrowed, it is the general custom to spread well-made stable-manure on the surface, at the rate of 10 tons per vergée, no sea-weed is used, but a much more powerful agent has taken its place, namely, guano. The potato rows are now closer than formerly; the planting takes place on large pieces, in the manner before explained, with the use of a small plough for making and covering the drills. As will be noticed, the manure in this manner is ploughed in with the sets; then, in addition to this, guano is used, very frequently at the rate of 200, or even 300 lbs. per vergée. Those unacquainted with the growth of early potatoes will be amazed at this apparent extravagance of fertilizing power; but extravagance it is not, as will be by-and-by perceived. The preparation of the plant intended for sets is of the utmost importance. Kidney potatoes as a rule are planted whole, and the round varieties are planted in strong sets, with eyes from the crown of the plant. The kidney varieties commonly planted are the Ashleaf, the Prolific, and the Winford, alias Early Fluke. The round varieties most esteemed are the Cherbourg *Trois Mois*, the Dalmahoy, and the Early Regents. Potatoes intended for plant should be dug before the haulm is entirely dried up: when dug they should be allowed to harden by exposure to the air and sun, occasionally turning them. Then at the fall of the year, if they are stowed away singly in layers on wooden floors it will retard too early a vegetation, which otherwise is frequently the case. By a little attention the tuber in this way is checked in its habit of early growth, and when the moment arrives for planting it can, if required, be forced; but it is not often that any forcing is required, the eyes will break out into vigorous shoots, and when they are fully developed, say about half an inch in length, the tubers may be planted, taking care to place the shoots uppermost. In this manner one month at least may be gained in bringing the potato out of ground. The preparation of the sets must be viewed as of primary importance, taking care always to select plants of good and of early habit; this, together with a suitable and well-manured piece of ground, forms in fact the only secret in the culture of the early potato.

The planting commences in January, and is usually all finished by the end of the next month. The next operation is the forking-up, or loosening of the ground between the rows; this is performed when the plants are fairly out of ground, either with the prong, the crook, or with a small implement in the form of a horse-hoe, usually drawn by two men. The soil being thus well opened, if not checked by frosts, which unfortunately is sometimes the case, the plants will grow quickly, so that by the middle of April they are all hoed up. In the early sheltered places some are much more forward, while in the later ground others are less. The first lot of any importance is usually sent up to the London markets about the end of April. As time advances the business rapidly increases, so that by the end of May, or the commencement of June, in ordinary years great activity prevails in connection with this trade. There is no season throughout the year in which the farmer is so busy as during the sale of his early potatoes. A day is frequently of the greatest importance in the market value of the goods, and therefore no sooner do they approach maturity than all hands are fork in hand at the work. Many consign their produce to salesmen in London; the goods are packed in baskets or barrels, and forwarded by the steam-vessels which daily ply between this island and the English ports, and thence on by railway to their destination. Others sell to the merchants here, who also export in the same manner, but on a larger scale. These, with the rest of the community, have the advantage, by means of telegraphic communication, of knowing hourly, if necessary, the state of the London markets.

So much said respecting the time, the mode of culture, and the sale of the potato, let us look back at the fields whence the potatoes have been dug, and see what is there being done. Another crop is being sown to follow. It may be, if on a piece of ground which was cleared off early, that a late crop of potatoes is being set; this certainly is only the exception, the rule is to have a succeeding crop of either swedes, mangolds, or turnips; we have also seen barley sown, but rarely with advantage. It will now be understood that the heavy dressing of manure used for the potato is again to be called upon to supply nourishment to the succeeding crops, and what splendid produce of roots do we often see. During our experience in these matters we have invariably noticed that some of the heaviest and best returns of roots have been in immediate succession to early potatoes.

In our remarks on the manure employed we have mentioned guano; we would observe that this article, so valuable to the farmer, was first brought to this island from Ichaboe in 1844, when its worth was much questioned and its use very little known; it is indeed comparatively only of late years that it has been extensively employed: its effects are surprising; we have seen on the same piece of ground two plots, one dressed with good farm-yard manure, the other dressed and treated precisely in the same manner, but with the addition of guano at the rate of 300 lbs. per vergée, and the two planted in fluke potatoes, when a difference of more than 50 per cent. resulted in favour of the piece where guano had been applied. We have also observed that where the potatoes were allowed to remain long in the ground, the haulm on the plot where the guano had been applied continued longer to vegetate than on the other; and finally, the haulm dried up somewhat in the manner before described. In 1867 there were imported to this island 379 tons of guano, and in 1868 the quantity amounted to 496 tons. It will be seen by this how much guano is now valued, and as its particular employment is for the culture of the potato, some approximate idea can be made of the quantity used for the crop. At the same time we must guard against drawing definite conclusions hastily on this point, as we know that guano is coming greatly into favour, and is used by many for grass-land in lieu of sea-weed; and in a general way, if the farm-yard cannot produce a sufficient supply of manure to meet the farmer's wants, he has frequently recourse to guano to make up the deficiency.

By reference to the returns made here last year for the information of the Board of Trade, we learn that potatoes occupied 5129½ vergées of our land; and as the whole superficial area of the island is calculated at 64,613 vergées, it follows that nearly one-twelfth part of the island's surface was devoted to the crop. Let us next see what has been the quantity of the produce exported from the island, and endeavour to compute what is the gross amount returned to the growers of potatoes by the export of the last year, 1868.

From the collective statements kindly placed at our disposal by the Custom-house authorities, the agents of the Steam-packet Companies, and merchants, we find the exports to have been as follows:—

In packages, by steam-vessels to Southampton, Weymouth, and Littlehampton, 5458½ tons.

The first package left the island on the 19th of March; this was followed by another on the 24th; by four more on the 26th; by two on the 7th of April; by forty-three on the 21st of April, when the season may be said to have opened. On the 30th of the month the number swelled up to one hundred and forty-three packages.

In loose cargoes by sailing-vessels, there were shipped for the following ports:—

	Tons.
Plymouth	31
Newport	276½
Southampton	100¾
London	469½
Cardiff	505
Lymington	10
Swansea	917¼
Liverpool	2½
Caernarvon	6
Gloucester	32
Sercq	1
Barbadoes	80
	2431½

Thus giving a total of 7890 tons, the value of which we deduce from statements of returns to have been as follow:—

	£
Produce shipped in packages	44,131
Produce shipped in loose cargoes	11,442
Total	55,573

In taking into consideration the produce of the land on which the early potatoes have been cultivated, we must not omit to add to the amount exported (which shows a gross return of more than 17*s.* 6*d.* per vergée on the whole area of the island for the export of potatoes only), the quantity left in the island for the supply of nearly 60,000 inhabitants, and also the plant for the ensuing year. These two items must be very considerable. Moreover, we must add to the produce of the same ground the successive root-crops to which we have alluded, which enable the farmers to keep more of their holdings in grass, and consequently to increase the number of their stock. Furthermore, let us not lose sight of the wonderful activity prevailing in these ports during the potato season. Commerce, the twin sister of agriculture, is not without its share of benefit. Steam communication is doubled, and its advantages are extended to passenger as well as to cargo traffic. In a word, the whole machinery of business is at work, and its good effects conspicuously felt through every channel of the insular trade.

We close this Report with the following tabular statement of exports, taken from published returns, of several preceding years, commencing with 1807, when potatoes were first exported:—

Years.		Tons.	Years.		Tons.
1807	..	600	1845	..	3822
1808	..	1407	1846	..	5461
1809	..	849	1847	..	6428
1810	..	1362¼	1848	..	5990
1811	..	1400¾	1849	..	4992
1823	..	3689	1851	..	5662
1824	..	5747½	1852	..	3354
1825	..	5836	1853	..	3776
1826	..	2558¼	1854	..	4330
1828	..	8364	1855	..	4197
1829	..	3963	1856	..	7236¾
1830	..	9289	1857	..	4960
1831	..	2986	1858	..	3093
1832	..	5436	1859	..	2211
1833	..	1859	1860	..	2677
1835	..	1396	1861	..	2969
1836	..	3701	1862	..	2803
1837	..	10,951	1863	..	3908
1838	..	12,032	1864	..	6705
1839	..	14,041	1865	..	3216
1840	..	17,648	1866	..	4080
1842	..	18,560	1867	..	6251

Trinity Manor, Jersey.

VI.—*Report of the Consulting Chemist for* 1869.

The duties of the chemical officer of the Society are of a twofold character. They are connected, in the first place, with the analytical work referred to him by individual members of the Society; and, secondly, they embrace special experiments and researches with which the consulting chemist is charged by the Chemical Committee of the Royal Agricultural Society.

With regard to the first division of my duties, I have the satisfaction of reporting that during the past season the members of the Society availed themselves of the privilege of obtaining analytical reports at the Society's fixed low rate of charges more frequently than in any preceding year.

A considerable increase in the number of analyses took place in 1868, being then larger than the total number of analyses recorded in any previous year, and exceeding that of 1867 by 91.

In 1869 again the analytical work increased, and as many as 465 analyses were made for members of the Society. The appended summary shows that this increase is chiefly due to the larger number of guano and oilcake analyses which were issued from the Laboratory.

The supply of Peruvian guano of best quality unfortunately is diminishing from year to year, and the rise in the price of guano has encouraged to a larger extent than formerly the fraudulent practices of unprincipled dealers.

In the spring of the year several highly adulterated guanos were sent to me for analysis; but the timely warning given in my reports in most cases guarded the sender against imposition, and loss of money and crops. It has come under my notice that guano has been offered for sale by auction, professing to be equal in quality to samples analysed by me, and represented in the analyses shown at the public sale as good guanos. The bulk on delivery, however, has been found to have only a remote resemblance with the guano as represented in the analysis handed round at the public sale. The transaction was so cautiously managed, however, that no legal remedy could be applied to recover damages, and several farmers who purchased the guano on the strength of my analysis, were grossly deceived. I would, therefore, strongly urge upon agriculturists on no account to purchase guano which is offered for sale by auction. Besides adulterated Peruvian guanos, artificial mixtures, resembling in appearance guano, were brought under my notice last season, professing to be peculiar kinds of phosphatic guanos. Such mixtures generally contain a little real guano, and the bulk consists of earthy matters of little or no fertilising value. These manures do not profess to be Peruvian guano, but to come from some island or the other, the existence of which often occurs only on paper; and as these guanos are always sold at a low figure they find purchasers, although no guarantee as regards composition is given. In all cases in which guano is sold without an analysis, the purchaser runs the risk of being imposed upon.

Compound artificial manures which are offered for sale at a low price, varying from *3l.* to *5l.* a ton, in most cases are not worth one-half or one-third the money which is asked for them; and in some instances brought under my notice during the past season the manures sent to me for analysis were not worth the carriage to a distance of 10 miles.

Particular caution ought to be used by intending purchasers in cases in which artificial manures are offered for sale at a low figure under the names of British guano, blood or fish manure, or a similar enticing name. Frequently such have nothing in common with guano, or with fish, or blood, except the name.

In illustration of these remarks I may give the analysis of a sample of Pound's British guano, which was sent to me last spring by a member of the Society:—

Composition of Pound's British Guano.

Moisture	18·97
*Organic matter and water of combination ..	20·27
Oxide of iron and alumina	2·21
Sulphate of lime and a little carbonate of lime ..	55·11
Sand	3·44
	100·00
* Containing nitrogen	1·09
Equal to ammonia	1·32

This so-called British guano, it will be seen, yielded only $1\frac{1}{3}$ per cent. of ammonia, and contained no phosphate of lime whatever, nor any akaline salts. On the other hand, it contained a good deal of water and a high percentage of gypsum. In point of fact, the sample of Pound's British guano analysed by me was nothing else but a mixture of gypsum and some rather strong-smelling organic refuse matter. It was sold at 5*l.* 5*s.* a ton, but is scarcely worth more than 30*s.* a ton.

It is to be greatly feared that with the near approach of the time when the supplies of best Peruvian guano from the Chincha Islands will be finally stopped, inferior descriptions of guano will find their way into the wholesale guano trade, and be eagerly bought up for the purpose of mixing with best Peruvian guano.

. I have recently analysed two samples of guano from the Guanape Islands, and find that both, representing large cargoes recently imported into England, were much inferior to Chincha Island guano, as will be seen by the subjoined analysis:—

Composition of Guanape Guano.

	No. 1.		No. 2.
Moisture	17·79	....	20·10
*Organic matter and ammoniacal salts ..	42·62	....	38·67
Phosphates of lime and magnesia (bone phosphates)	25·45	....	32·53
†Alkaline salts	11·92	....	5·97
Sand	2·22	....	2·73
	100·00		100·00
* Containing nitrogen	10·04	....	7·87
Equal to ammonia	19·19	....	8·95
† Containing soluble phosphoric acid	4·75	....	3·19
Equal to tribasic phosphate of lime	10·37	....	6·98

These samples, especially the second, were much damper than best Peruvian guano, and much poorer in ammonia. No. 2, indeed, only contained about half the amount of ammonia which occurs in best Chincha Island guano. The preceding analyses, moreover, show evidently that the guano from the new guano islands (Guanape Islands) is not uniform in character. If these samples fairly represent the general character of the Guanape guano, and there is reason to fear they do, it is evident that the guano on the Guanape Islands is deposited in a region which is visited by occasional rains or heavy dews, which, I need hardly say, wash out the most valuable constituents of guano.

A considerable number of samples of nitrate of soda were sent to the Laboratory last spring, and of these several were found to be largely adulterated with common salt.

The demand for superphosphate of lime, dissolved bones, and similar artificials is increasing from year to year, and, generally speaking, most manures of that description are well worth the price at which they are offered for sale. More than 100 samples of phosphatic manures were analysed by me last season, and most were found equal to the guaranteed analyses by which they were sold..

With respect to feeding-cakes, I am glad to be able to report that a decided improvement has taken place in the cake transactions. Several firms, who formerly sold only mixed cakes, have recently begun to make pure linseed-cake. Best decorticated cotton-cake is again obtainable at a fair price in the English market, and some excellent samples have been remitted for analysis. In speaking of decorticated American cotton-cake I would reiterate the remark made on a former occasion, that this cake is too rich in nitrogenous or fleshforming matters to suit unmixed the health of herbivorous animals. It should always be given together with some food rather poor in nitrogenous matters, and but in moderate quantities during the summer period of the year. During cold weather in the winter it may more freely be given to stock than during the summer months, and at all times it is desirable to give with it an abundant supply of succulent root-feed, or, in the absence of roots, some bulky food, such as chaff, and food rather poor in nitrogenous matter, such as palm-nut meal or Indian corn.

Green German rape, or Rubsen cake, has much risen in price, and is difficult to obtain quite free from mustard. In buying rape-cake it is always desirable to have it tested whether it is free from any injurious amount of mustard-seed. Several samples of rape-cake sent for analysis were found to be quite unfit for feeding purposes.

Adulterated linseed-cakes are still found in the market, though less abundantly than formerly. A novel kind of admixture to linseed-cake I found to be the admixture of cocoanut fibre. Cocoanut fibre, I need scarcely say, possesses no nutritive properties. The expressed pulp of the cocoanut, on the contrary, contains as much oil as linseed-cake, and is a useful feeding material, as the following analysis of a sample recently examined will show:—

Composition of Cocoanut Cake.

Moisture	8·97
Oil	11·44
*Albuminous compounds (flesh-forming matters) ..	20·75
Gum, mucilage, sugar, and digestible fibre	39·41
Woody fibre (cellulose)	14·27
Mineral matter (ash)	5·16
	100·00
* Containing nitrogen	3·32

Cocoanut cake, which is largely produced in the manufacture of cocoanut oil, rarely passes into the hands of the farmer; and, judging from its presence in mixed linseed-cakes, it is probably bought up by oilcake makers and used for adulterating linseed-cake.

With the sanction of the Chemical Committee I instituted, as in former years, a number of field experiments on—1. Root-crops: mangolds and swedes; 2. On potatoes; 3. On artificial grasses; 4. On permanent pastures. The following printed list was forwarded to a number of agriculturists residing in different parts of the country, and a larger number of reports have been received than in former years.

Experiments.

Field Experiments on Roots: Mangolds, Swedes, Turnips, and Carrots.—The following experiments are recommended with a view of ascertaining what is the best root-manure on different soils; each plot to be one-twentieth of an acre:

Plot.				
1.	No manure.			
2.	Mineral superphosphate ..	16½ lbs.,	or at the rate of	3 cwt. per acre.
3.	Mineral superphosphate ..	16½ lbs.	,,	3 ,,
	Potash salts	11 lbs.	,,	2 ,,
4.	Mineral superphosphate ..	16½ lbs.	,,	3 ,,
	Peruvian guano	5½ lbs.	,,	1 ,,
5.	Peruvian guano	16½ lbs.	,,	3 ,,
6.	No manure.			
7.	Mineral superphosphate ..	16½ lbs.	,,	3 ,,
	Potash salts	11 lbs.	,,	2 ,,
	Sulphate of ammonia	5½ lbs.	,,	1 ,,
8.	Rotten dung	1 ton	,,	20 tons per acre.
9.	Mineral superphosphate ..	16½ lbs.	,,	3 cwt. per acre.
	Potash salts	11 lbs.	,,	2 ,,
	Nitrate of soda	5½ lbs.	,,	1 ,,
10.	Rotten dung	½ ton	,,	10 tons per acre.
	Mineral superphosphate ..	8¼ lbs.	,,	1½ cwt. per acre.
11.	Bone dust	16½ lbs.	,,	3 ,,
	Mineral superphosphate ..	8¼ lbs.	,,	1½ ,,
12.	No manure.			

Samples of the Experimental Fields are desired to be sent to Dr. Voelcker, 11, Salisbury-square, Fleet-street, London, E.C.

Field Experiments on Potatoes.—The following experiments are specially recommended on light soils; each plot to be one-twentieth of an acre:—

Plot.				
1.	No manure.			
2.	Mineral superphosphate ..	22 lbs.,	or at the rate of	4 cwt. per acre.
	Crude potash salts	11 lbs.	,,	2 ,,
	Sulphate of ammonia	11 lbs.	,,	2 ,,
3.	Good rotten dung	1 ton	,,	20 tons per acre.
4.	Mineral superphosphate ..	22 lbs.	,,	4 cwt. per acre.
	Crude potash salts	22 lbs.	,,	4 ,,
5.	No manure.			
6.	Mineral superphosphate ..	22 lbs.	,,	4 ,,
	Crude potash salts	11 lbs.	,,	2 ,,
	Nitrate of soda	11 lbs.	,,	2 ,,
7.	Peruvian guano	22 lbs.	,,	4 ,,
8.	Mineral superphosphate ..	22 lbs.	,,	4 ,,
	Common salt	22 lbs.	,,	4 ,,
9.	Good rotten dung	1 ton	,,	20 tons per acre.
10.	No manure.			

The artificials should be first mixed with ashes, burnt clay, or dry earth, and then dug in, or ploughed in, quite early in spring, when the dung is put on the land and when the potatoes are planted.

Experiments on Artificial Grasses.—Each plot to be one-twentieth of an acre:—

Plot.		
1.	Nitrate of soda	22 lbs.
2.	Sulphate of ammonia	22 lbs.
3.	Mineral superphosphate (dissolved coprolites)	22 lbs.
4.	Common salt	22 lbs.
5.	No manure.	
6.	Muriate of potash	22 lbs.
7.	Sulphate of potash	22 lbs.
8.	Sulphate of lime	56 lbs.
9.	Mineral superphosphate	22 lbs.
	Nitrate of soda	22 lbs.
10.	Mineral superphosphate	22 lbs.
	Muriate of potash	22 lbs.
11.	No manure.	

The manures should be applied not later than the end of February, and the first crop, as well as the aftermath, be weighed green. The produce of each crop should be weighed directly it is cut.

Experiments on Permanent Pasture.—Each plot to be one-tenth of an acre:—

Plot.		
1.	Quick-lime	10 bushels.
2.	Quick-lime	10 bushels.
	Common salt	56 lbs.
3.	Fine bone dust	$1\frac{1}{2}$ cwt.
4.	Mineral superphosphate	56 lbs.
	Crude potash salts	56 lbs.
5.	No manure.	
6.	Common salt	56 lbs.
7.	Peruvian guano	56 lbs.
8.	Crude potash salts	56 lbs.
9.	Mineral superphosphate	56 lbs.
	Peruvian guano	56 lbs.
10.	No manure.	

The effect of the manures should be observed for at least four successive seasons. The experimental acre should be hurdled off from the rest of the pasture-field, and the whole produce be carried off and weighed every year, and not be fed off by stock.

In reviewing the field experiments which, for a number of years, I have instituted with special reference to the conditions under which the land is benefited by the direct supply of potash in the shape of salts of potash, I have come to the conclusion, as far as my present experience goes, that these salts may often be applied with advantage to potatoes, clover, beets, and turnips.

In several experiments, tried on poor sandy soils during the past season, the addition of crude potash salts to superphosphate of lime had a very marked and decidedly beneficial effect on the potato-crop and also on swedes. Even when applied alone, crude potash salts benefit materially root crops growing on poor sandy land. The same beneficial effect, I find by direct experiments, cannot be obtained by the application of common salt, showing that soda is a much less valuable fertilising constituent than potash, and incapable of replacing the functions of the latter in the vegetable economy.

Hitherto the price of potash has stood in the way of its being employed on an extended scale in agriculture. Even in its cheapest form—that of crude German potash salts—potash was too dear for practical application in agriculture. But as potash will, no doubt, be extensively used in agriculture if it can be had at a cheap rate, I have pleasure in directing attention to a mineral called Kainite, which is found in the neighbourhood of Stassfurth, in Saxony, and which, in round numbers, contains 24 per cent. of sulphate of potash and 12 per cent. of sulphate of magnesia. This saline mineral can now be obtained in England in a finely-ground condition, ready for mixing with other artificial manures, at about 3*l.* 3*s.* per ton, and probably less when considerable quantities are required. From 3 to 4 cwts. of ground kainite, mixed with an equal quantity of superphosphate of lime per acre, has been found of great utility in the sugar-beet-growing districts of North Germany; and I have no doubt it will be found equally useful in England, where root crops are intended to be raised upon naturally poor or upon exhausted sandy soils. The crop, however, most likely to be greatly benefited by this potash manure is the potato.

On light soils, I would strongly recommend, as a manure for potatoes, the following mixture:—

4 to 5 cwts. of kainite (crude German potash),
4 cwts. of Peruvian guano, and
4 cwts. of superphosphate of lime.

In buying kainite as a source of potash, care should be taken to have a sample of the bulk tested for the amount of potash which it contains; for not only are some of the samples offered for sale very poor in potash, but some scarcely contain any potash at all. Quite recently, one of the members of the Society sent me a sample of so-called kainite for analysis, which contained a mere trace of potash, and was found to be composed of impure sulphate of magnesia, dried hard and partially deprived of its water of crystallization, and then ground fine.

Good kainite should contain about 13 per cent. of potash, and should dissolve in water without leaving any considerable residue.

The following analysis may be taken as fairly representing the

Composition of a Good Sample of Kainite.

Moisture (loss at 212° Fahr.)	3·36
Water of combination	10·88
*Sulphate of potash	24·43
Sulphate of lime	2·72
Sulphate of magnesia	13·22
Chloride of magnesium	14·33
Chloride of sodium	30·35
Insoluble siliceous matter	·71
	100·00
* Containing potash	13·20

The cultivation of sugar-beets in England is more and more attracting the attention of agriculturists; and considering the importance of the subject, I have, during the past year, undertaken a research on the chemistry of Silesian sugar-beet, and am still occupied in further pursuing this interesting inquiry. A protracted research into the composition of drainage-water has occupied much of my time during the past season, and is now sufficiently advanced to be ready for publication.

In the past season I had the honour to deliver before the members of the Society a lecture on my recent laboratory researches and published in the pages of the Journal the following papers:—

1. On Field-experiments on Clover-seeds and Permanent Pasture.

2. On the Chemistry of the Silesian Sugar-beet.

Analyses made for Members of the Royal Agricultural Society, December, 1868, *to December*, 1869.

Guanos (natural)	44
Artificial guanos and similar compounds	23
Superphosphates and dissolved bone-manures	104
Bone-dust	12
Refuse manures	9
Nitrate of soda and sulphate of ammonia	23
Marls, limestones, and other minerals	34
Soils	20
Oilcakes	106
Feeding meals	24
Vegetable productions	26
Waters	27
Milk and butter	6
Examinations for poison	7
Total	465

Having been requested by the Council to submit to the Monthly Council in March, June, and December, a Report on the various samples of adulterated manures and feeding-cakes forwarded to me for analysis by members of the Society, so that such Report, together with the names of the dealers who supplied the substances analysed, shall, if the Council think fit, be published in the Agricultural Journals, at the Monthly Council meeting held on December 8th I presented the following Report in accordance with the above request.

Analysis No. 1 represents the composition of a sample of guano which I analysed for Mr. C. C. Hamilton, Harlstone. This analysis was produced by Messrs. Perkins and Sons, auctioneers, of Southampton, at the time of the sale. No. 2 shows the composition of a material sent to me as a sample of the bulk, bought by auction by Mr. Horace Leggatt, Brownwich, Titchfield, Hants:—

	No. 1.	No. 2.
Moisture	15·28	4·66
*Organic matter and salts of ammonia	46·41	22·22
Phosphate of lime and magnesia (bone earth)	24·65	8·28
Oxide of iron and alumina (clay)	..	11·84
Sulphate of lime	2·28	43·52
Carbonate of lime	..	·70
Alkaline salts	8·71	1·70
Insoluble siliceous matter	2·67	7·08
	100·00	100·00
* Containing nitrogen	12·06	1·99
Equal to ammonia	14·66	2·42

Instead of $14\frac{1}{2}$ per cent. of ammonia, as in the analysis No. 1, No. 2 barely contained $2\frac{1}{2}$ per cent. The latter further contained scarcely one-third the amount of phosphates which is found in genuine Peruvian guano, and appeared to be principally made up of gypsum and a yellowish-coloured loamy soil.

The next illustration of a spurious guano was furnished in a sample sent for analysis by Mr. Alexander Howden, Marston Court, Pembridge, Herefordshire, who informed me that he bought it of Messrs. G. C. Dobell, and Co., of Liverpool. These gentlemen maintain that this is guano genuine as imported. This may be quite correct, for they may have imported a spurious article; nevertheless, it is not a genuine guano, but a compound resembling guano in external characters, and having but little else in common with that fertiliser.

Spurious Guano sent by Mr. Alexander Howden, Marston Court, Pembridge, Herefordshire.

Moisture	11·53
*Organic matter, salts of ammonia, and water of combination	9·51
†Phosphoric acid..	13·07
Lime	2·96
Oxide of iron and alumina	14·64
Alkaline salts	traces
Insoluble siliceous matter (fine clay and sand)	48·29
	100·00
* Containing nitrogen	·73
Equal to ammonia	·89
† Equal to tribasic phosphate of lime.. ..	28·53

These analytical results do not require any explanation.

The latest case was brought under my notice by Mr. H. Barneby-Lutley, Brockhampton Court, Worcester :—

Composition of a Sample of Adulterated Guano marked "Feathers," sent by Mr. H. Barneby-Lutley, Brockhampton Park, September, 23.

Moisture	7·27
*Organic matter and salts of ammonia	14·31
Phosphate of lime (bone phosphate)	5·83
Oxide of iron and alumina	6·42
Carbonate and a little sulphate of lime	10·98
Alkaline salts	4·33
Insoluble siliceous matters (sand)	50·86
	100·00
* Containing nitrogen	2·34
Equal to ammonia	2·84

It will be seen that this so-called guano contained only $5\frac{3}{4}$ per cent. of phosphate of lime in round numbers, instead of 22 to

25, the percentage found in genuine Peruvian guano; and that it yielded not quite 3 per cent. of ammonia, instead of 16 per cent., which is the average percentage in good guano. Adding together the worthless matters in this feathery compound—for it was nothing else but a mixture of a yellow sandy loam with a little Peruvian guano and plenty of guano-bird feathers—we have no less than 75 per cent. of useless materials, and only 25 per cent. of fertilising constituents. On inquiry, I find that the "feather manure" was sold as Peruvian guano, at 14*l.* a ton, by a Mr. Weekes, of Bromyard, Herefordshire. Its real value cannot be put higher than 2*l.* 10*s.* or 3*l.* at the most.

AUGUSTUS VOELCKER.

VII.—*Field Experiments on Mangolds.* By Dr. AUGUSTUS VOELCKER.

IN laying down a manuring scheme for root-crops, I had mainly in view to ascertain, by direct experiments, what influence potash exerts on mangolds and swedes when grown on light land, and, if possible, to find out in what combinations, with other fertilising matters, potash should be employed in a root-manure intended for light land in order to produce the most beneficial effect.

For field experiments on root-crops one-twentieth of an acre is a convenient and sufficiently large size for each plot. Each experimental one-twentieth of an acre piece should be divided, if possible, in such a manner that it will be occupied by 4 rows of plants.

In the following experiments this plan was adopted, and the field divided into 11 plots of one-twentieth of an acre each, which, as regards manure, were treated as follows:—

Plot 1	Was left unmanured.				
2	Mineral superphosphate ..	16½ lbs., or at the rate of		3 cwts.	per acre.
3	Mineral superphosphate ..	16½ lbs.	„	3 cwts.	„
	and				
	Potash salts	11 lbs.	„	2 cwts.	„
4	Mineral superphosphate ..	16½ lbs.	„	3 cwts.	„
	and				
	Peruvian guano	5½ lbs.	„	1 cwt.	„
5	Peruvian guano	16½ lbs.	„	3 cwts.	„
6	Left unmanured.				
7	Mineral superphosphate ..	16½ lbs.	„	3 cwts.	„
	potash salts	11 lbs.	„	2 cwts.	„
	and				
	and sulphate of ammonia	5½ lbs.	„	1 cwt.	„

Plot 8	Rotten dung	1 ton, or at the rate of	20 tons per acre.	
9	Mineral superphosphate ..	16½ lbs.	,,	3 cwts. ,,
	potash salts	11 lbs.	,,	2 cwts. ,,
	and			
	nitrate of soda	5½ lbs.	,,	1 cwts. ,,
10	Rotten dung	10 cwts.	,,	10 tons ,,
	and			
	Mineral superphosphate ..	8¼ lbs.	,,	1½ cwt. ,,
11	Bone dust	16½ lbs.	,,	3 cwts. ,,
	and			
	Mineral superphosphate ..	8¼ lbs.	,,	1½ cwt. ,,

In this scheme, it will be seen, provision is made for testing the effects of potash in conjunction with mineral superphosphate, and also for ascertaining what the effect is likely to be if to the mixture of potash salts and superphosphate a small quantity of sulphate of ammonia or of nitrate of soda is added.

In previous years I applied potash salts alone to a variety of crops; but having found that, in most cases, potash salts without any other fertilising agents did not do much good, whereas in conjunction with superphosphate their application to light land had a most beneficial effect, I omitted from the present scheme potash salts to be tried by themselves.

In order to make the experiments comparable with ordinary farm practice, one plot was reserved for a full dressing of rotten dung, and another received half a dressing of dung and a very moderate dressing of mineral superphosphate. Two plots were left unmanured; one right through the middle of the experimental plots, and the other at one end. A third unmanured plot was left at the other end of the experimental field; but as the weighings of the produce on this plot gave quite an abnormal result, no furthur reference need be made to it. The foregoing manuring experiments were tried last season on mangolds by my friends Mr. R. Campbell Ellis, at Iver Moor, near Uxbridge, Middlesex, and Messrs. J. Coleman and J. Hull, Escrick Park, near York, and I have now the pleasure briefly to communicate to the readers of this Journal the results of these experiments.

Field Experiments on Mangolds made by Mr. R. Campbell Ellis, at Iver Moor, near Uxbridge, Middlesex.

The mangold seed was sown on the 27th April on the flat. The different artificial manures were sown with some ashes, to secure their uniform distribution on the land, and harrowed in.

The seed came up well, and a regular plant was obtained on all the plots.

The roots were taken up on the 2nd November, 1869, topped, tailed, and weighed, when the following results were obtained:—

Results of Experiments on Mangolds at Iver Moor, near Uxbridge.

Plots of $\frac{1}{25}$ of an acre.	Manure per Acre.	Produce per Plot of $\frac{1}{25}$ of an Acre.			Produce per Acre.		
		Tons.	cwts.	lbs.	Tons.	cwts.	lbs.
1	No Manure	1	1	84	21	15	0
2	Mineral Superphosphate 3 cwts...	1	3	56	23	10	0
3	Mineral Superphosphate 3 cwts... and Potash salts .. .. 2 cwts...	1	5	0	25	0	0
4	Mineral Superphosphate 3 cwts... and Peruvian Guano .. 1 cwt. ..	1	5	56	25	10	0
5	Peruvian Guano .. 3 cwts...	1	8	0	28	0	0
6	No Manure	1	3	0	23	0	0
7	Mineral Superphosphate 3 cwts... and Potash salts .. .. ..2 cwts... and Sulphate of Ammonia ..1 cwt. ..	1	10	60	30	10	80
8	Rotten Dung .. .. ..20 tons..	1	7	0	27	0	0
9	Mineral Superphosphate 3 cwts... and Potash salts .. .. ..2 cwts... and Nitrate of Soda .. ..1 cwt. ..	1	10	0	30	0	0
10	Rotten Dung .. .. ..10 tons.. and Mineral Superphosphate $1\frac{1}{2}$ cwt...	1	6	0	26	0	0
11	Bone-dust .. .. ..3 cwts... and Mineral Superphosphate $1\frac{1}{2}$ cwt.	1	4	0	24	0	0

The rest of the field (5 acres) was manured with 5 cwts. of Proctor and Ryland's mangold-wurzel manure, and yielded on an average 28 tons of mangolds per acre. On looking over the results of the preceding experiments, several points are likely to arrest the reader's attention :—

1. The land, although light, appears to have been in a good agricultural condition; for the unmanured plots yielded at the rate of 21 tons 15 cwts., and 23 tons, or on an average 22 tons $7\frac{1}{2}$ cwts. of mangolds; or, in round numbers, 22 tons.

2. Mineral superphosphate applied at the rate of 3 cwts. per acre gave but the slight increase of 1 ton $2\frac{1}{2}$ cwts. over the average yield of the two unmanured plots.

3. The addition of 2 cwts. of potash salts to 3 cwts. of superphosphate had a good effect; for it produced an increase of nearly 3 tons, or nearly 2 tons more than mineral superphosphate alone.

4. The mixture of 3 cwts. of mineral superphosphate and

1 cwt. of guano, practically speaking, had the same effect as 3 cwts. of superphosphate and 2 cwts. of potash salts.

5. 3 cwts. of Peruvian guano yielded an increase of 5 tons per acre, and appears to have had a better effect than either a full dressing of farmyard manure or half a dressing and 1½ cwt. of superphosphate.

6. Lastly, it will be noticed that the addition of a small quantity of nitrogen to the mixture of mineral superphosphate and potash salts produced a considerable increase.

On Plot 7 we have the same quantity of superphosphate and potash salts as on Plot 3, with the addition of 1 cwt. of sulphate of ammonia per acre, and the effect of this addition of sulphate of ammonia was to raise the produce to 30 tons 10 cwts. in round numbers, or to give 5½ tons more than the superphosphate and potash salts without ammonia.

Practically speaking, the same effect which the sulphate of ammonia produced in conjunction with potash and superphosphate was obtained on Plot 9, on which the nitrogen was applied in the shape of nitric acid instead of that of ammonia; for both the Plots, No. 7 and No. 9, the addition of nitrogen to available phosphates and potash has proved very beneficial to the mangold crop, producing an average increase of 8 tons in round numbers.

Experiments on Mangolds at Escrick Park, near York, in 1869.

The mangolds were sown on 11th May, 1869, on a barley stubble in 1868. The soil of the experimental field was of a light sandy character, and, though naturally poor, it was in a good agricultural condition, as the produce from the unmanured plot showed.

The mangold crop was taken up, topped, tailed, and weighed, on the 11th November, 1869, when the following results were obtained:—

Results of Experiments on Mangolds at Escrick Park, near York, 1869.

Plots of $\frac{1}{20}$ of an acre.	Manure per Acre.	Produce per Plot of $\frac{1}{20}$ of an Acre.			Produce per Acre.		
		Tons.	cwts.	lbs.	Tons.	cwts.	lbs.
1	No Manure	1	2	56	22	10	0
2	Mineral Superphosphate 3 cwts...	1	3	56	23	10	0
3	Mineral Superphosphate 3 cwts... and Potash salts .. .. .. 2 cwts...	1	9	28	29	5	0
4	Mineral Superphosphate 3 cwts... and Peruvian Guano .. .. 1 cwt. ..	1	6	0	26	0	0

Experiments on Mangolds at Escrick Park (continued).

Plots of $\frac{1}{25}$ of an acre.	Manure per Acre.	Produce per Plot of $\frac{1}{20}$ of an Acre.			Produce per Acre.		
		Tons.	cwts.	lbs.	Tons.	cwts.	lbs.
5	Peruvian Guano .. .. 3 cwts...	1	4	84	24	15	0
6	No Manure	1	1	0	21	0	0
7	Mineral Superphosphate 3 cwts... and Potash salts .. .. .. 2 cwts... and Sulphate of Ammonia .. 1 cwt. ..	1	10	28	30	5	0
8	Rotten Dung .. .. 20 tons ..	1	10	56	30	10	0
9	Mineral Superphosphate 3 cwts... and Potash salts .. .. 2 cwts... and Nitrate of Soda .. .. 1 cwt. ..	1	11	84	31	15	0
10	Rotten Dung .. .. 10 tons .. and Mineral Superphosphate $1\frac{1}{2}$ cwt ..	1	14	28	31	5	0
11	Bone-dust .. .. .. 3 cwts... and Mineral Superphosphate $1\frac{1}{2}$ cwts.	1	7	84	27	15	0

The preceding tabulated results exhibit several points of interest, on which a few observations may be offered :—

1. In the first place, it will be seen that the two unmanured portions of the experimental field yielded a fair crop of mangolds. One of these plots produced $22\frac{1}{2}$ tons per acre, and the other 21 tons; or, on an average, the unmanured plots produced $21\frac{3}{4}$ tons of mangolds per acre. The difference in the weights of the crops on Plot 1 and Plot 6 is not greater than can be expected in field experiments. The experimental field thus was tolerably uniform in character and well adapted for the trials.

2. Mineral superphosphate alone gave only an increase of $1\frac{3}{4}$ tons, and thus appears not to be the kind of manure which ought to be employed for mangolds on light land.

3. The addition of 2 cwts. of salts of potash to 3 cwts. of mineral superphosphate proved very successful, inasmuch as it raised the produce to $29\frac{1}{4}$ tons, and gave an increase of $7\frac{1}{2}$ tons over the average yield of the unmanured portions of the field.

4. In these experiments, the addition of 2 cwts. of salts of potash had a better effect than the addition to superphosphate of 1 cwt. of Peruvian guano, or than 3 cwts. of Peruvian guano alone.

5. Peruvian guano alone answered better than mineral superphosphate applied by itself, but did not appear to be the best artificial manure that can be used on light land for mangolds.

We may learn from this that neither the exclusive use of a purely mineral phosphatic manure, nor a manure containing, like Peruvian guano, an excess of nitrogenous compounds, produces the best crops of mangolds on light land.

6. A moderate amount of an ammoniacal salt, or of nitrate of soda, added to a manure composed of available phosphates and salts of potash, appeared to be very useful.

The mixture of 3 cwts. of superphosphate, 2 cwts. of salts of potash, and 1 cwt. of nitrate of soda, it will be seen, produced 31¾ tons of mangolds, which, considering the natural poverty of the soil, must be considered a very good crop indeed.

The same mixture, it will also be observed, had a better effect than 20 tons of farmyard manure; for, whilst Plot 9 gave an increase of 10 tons over the unmanured plots, 20 tons of rotten dung per acre produced only an increase of 8½ tons.

7. A heavy dressing of dung proved to be less beneficial than the addition of some superphosphate to a moderate dose of dung. The best crop, it will be noticed, was obtained by 10 tons of rotten dung and 1½ cwt. of superphosphate.

On the whole, the results obtained at Escrick agree well with those described in the series of experiments which were tried by Mr. Ellis at Iver Moor. Both sets plainly show that potash salts are very useful to mangolds, and that, in order to obtain the best economic results from their use for this crop, they should be mixed with superphosphate and a small quantity of either sulphate of ammonia or nitrate of soda.

I have repeatedly observed that a small quantity of nitrate of soda helps on the mangold plants in a striking manner, provided other fertilisers are used at the same time, or the land is in a high agricultural condition. The mixture of 3 cwts. of superphosphate, 2 cwts. of salts of potash, and 1 cwt. of nitrate of soda per acre, can be recommended, both as an economical and beneficial artificial mangold manure for light land.

Laboratory, 11, *Salisbury-square, Fleet-street, E.C.*,
January, 1870.

VIII.—*On Beet-root Pulp.*—By Dr. Augustus Voelcker.

In manufactories of beet-root sugar the roots, after having been topped and tailed, are thoroughly washed with cold water, and then passed through a grating machine, driven by steam-power, which reduces them to a fine pulp. This pulp, with the addition of a little water, is next placed into woollen bags; a number of these, separated from each other by thin plates of sheet-iron, are placed under presses in piles, and submitted to a gradually increasing strong pressure. There are other plans of extracting the sugary juice from beet-root, but in most manufactories of beet-root sugar the juice is extracted by pressure of the grated roots. The residue left in the bags after pressure, or the fibrous portion of the roots, is the refuse which, under the name of beet-root pulp, is used extensively on the continent for feeding purposes. Beet-root pulp is much valued in Belgium, France, and Germany, for its fattening properties. In several places in Belgium, recently visited by myself and Mr. Jenkins, we saw fattening beasts kept almost exclusively upon beet-root pulp; although the beasts at the time of our visit were not in a fat condition, they were evidently doing well upon that food.

The manufacture of beet-root sugar, most readers are aware, has recently been taken in hand in England with a fair chance of ultimate success. There is every likelihood that in another year Silesian sugar beet will be grown much more largely than in the past, and probably at no very distant period beet-root sugar manufactories will spring up in various parts of England, and the refuse pulp be placed at the command of the stock-feeder in abundance. For this reason it seemed to me desirable to make an inquiry into the composition of beet-root pulp, and to place before the readers of the Journal the results, which I trust will enable them to form a correct view of the nutritive properties of beet-root pulp, and the uses to which it may be applied.

The material from which the subjoined analysis was made was obtained from Mr. James Duncan's beet-root sugar manufactory at Lavenham.

The pulp here made is sold to the farmers, who supply the roots at the rate of 12*s.* per ton. The pulp is tolerably dry, and is greyish white in appearance. It has, when fresh, a rather insipid, or but slightly sweet taste, and rapidly turns faintly acid on keeping. The pulp is obtained at the manufactory in the form of thin press-cakes, which can be readily broken in pieces and mixed without difficulty with straw-chaff, meal, and such like materials.

In its natural state the pulp contains from 70 to 72 per cent. of moisture, and thus it embodies a much larger percentage of solid feeding matter than the roots from which it is obtained, and still more than ordinary mangolds, in which the proportion of water amounts on an average to about 88 per cent.

On submitting the Lavenham refuse pulp to a detailed analysis I obtained the following results:—

Composition of Beet-root Pulp from Lavenham.

Moisture	70·11
*Albuminous compounds (flesh-forming matters) ..	2·25
Sugar	3·39
Mucilage and pectinous compounds	1·93
Digestible cellular fibre	15·13
Woody fibre (cellulose)	5·32
Mineral matter (ash)	1·87
	100·00
* Containing nitrogen	·361

We learn from the preceding analytical results:—

1. That this pulp contains, in round numbers, 30 per cent. of dry feeding matter.
2. That an appreciable amount of sugar is retained in the pulp.

More sugar probably was left in this residue than is usual, owing to the circumstance that the roots were rather flabby when they were worked up for sugar, and in that condition could not be grated so thoroughly as fresher beets, and the juice in consequence could not be squeezed out so completely as from more perfectly rasped beets.

3. That a large proportion of the fibre is readily digestible; and
4. That beet-root pulp contains a considerable proportion of albuminous or flesh-forming matters.

The next analysis was made from a specimen of French pulp, which yielded the following results:—

Composition of a Specimen of Beet-root Pulp produced in France.

Moisture	70·88
*Albuminous compounds (flesh-forming matters) ..	2·38
Mucilage, pectinous compounds, and a little sugar	6·59
Crude cellular fibre	16·43
Mineral matter (ash)	3·72
	100·00
* Containing nitrogen	·382

It will be seen that the French pulp resembled closely in composition the English specimen. Both contained about the same percentages of water and of flesh-forming compounds, and both may be regarded as equally useful for feeding purposes.

In a second specimen of French pulp, which evidently had been kept for a considerable length of time in an unsheltered place, I found a good deal more water, as will be seen by the subjoined analysis:—

Composition of Second Sample of French Beet-root Pulp.

Moisture	77·10
*Albuminous compounds (flesh-forming matters) ..	1·93
Mucilage, pectinous compounds, and a little sugar	1·19
Lactic acid	1·12
Crude cellular fibre	16·07
Mineral matter (ash)	2·59
	100·00
* Containing nitrogen	·39

This refuse pulp thus contained nearly 7 per cent. more water than the preceding one. Its taste was strongly acid, and on examination I found that the sour taste was due to lactic acid, of which the pulp contained fully 1 per cent.

When beet-root pulp is kept for any length of time it turns decidedly acid, and in that state is quite as much relished by cattle and sheep as when fresh. Practical feeders with whom I came in contact maintain that old pulp is superior to new for fattening purposes. Be this as it may, the lactic acid which is generated during the time of keeping, certainly has the effect of preserving the feeding qualities of the pulp and of rendering it more digestible.

Except in its more acid taste old pulp differs but slightly in its appearance and general characters from new. The plan of preserving beet-root pulp in a good condition for feeding purposes is extremely simple. All that is necessary is to dig a trench in the earth, to place in it the pulp, and to pile it up in the same way as a heap of mangolds or swedes, and to cover the heaps with the earth from the trench. In this way the residue may be kept for years in a good condition.

On the occasion of our journey to Belgium I brought home with me a sample of old pitted pulp which had been kept for about one year, and submitted it to a general analysis. When it was analysed it yielded 61·74 per cent. of water; but as it no doubt lost some water on the road, it will be more appropriate to represent its composition in the same state of moisture as the specimen of English pulp, which, in round numbers, contained 70 per cent. of water.

This specimen of old Belgian pulp accordingly had the following composition:—

Composition of Belgium Beet-root Pulp one year old.

Moisture	70·00
Albuminous compounds (flesh-forming matters) ..	2·43
Digestible fibre, pectinous compounds, &c.	18·67
Woody fibre (cellulose)	6·48
Mineral matter (ash)	2·42
	100·00
* Containing nitrogen	·39

Like all old pulp it contained a sufficient amount of lactic acid to give it a strongly acid taste.

In all other respects the Belgian pulp did not differ materially in quality from the specimen of English pulp, the analysis of which is given above.

Some years ago I published in this Journal two analyses of the pulp from common mangold-wurzel, which was obtained as a residue in the distillation of spirit from mangolds. One of the distillery pulps yielded 90·78 per cent., and the other 91·84 per cent. of water, and both were much inferior in nutritive properties to the residual pulp from beet-root sugar manufactories. In preparing spirit from beets, the soluble constituents are more thoroughly removed than in sugar factories, and, in consequence, distillery pulp has not the same feeding value as the pulp from beet-root sugar works.

In the opinion of several French authorities beet-root pulp is equal, if not superior, in nutritive properties to the roots from which it is obtained. On the other hand, there are many persons who doubt the correctness of this view, because in the presses of the sugar manufacturer the sugar, which is the most fattening constituent of the roots, passes almost entirely into the juice, and is lost to the pulp. Beets without the sugar, it is said, surely cannot be so fattening as with it. This is self-evident; however, the statement that pulp is more nutritious than the roots from which it is obtained as a refuse, does not imply that a ton of sugar-beets is less nutritious than a ton of the same roots, minus the expressed sugary juice, but it means that weight for weight, beet-root pulp is equal, if not superior, in feeding properties, to common mangolds, or to sugar-beets. The advocates of the view which ascribes a very high nutritive value to pulp are very confident of the correctness of their statements, which they say are the result of their practical experience in feeding cattle upon pulp. As far as I know, however, there exist no records of any trustworthy practical feeding experiments, from which might be gathered what is the real comparative nutritive nature of pulp, and the roots from which it is obtained.

In the absence of such direct experiments, which would give us the most satisfactory information on this subject, the analyses of common mangolds, sugar-beets, and pulp, supply us with data which will enable us, if I am not mistaken, to form a tolerably correct opinion with respect to the value of these three articles of food.

In making comparisons between vegetable products, such as roots, or different kinds of green food, it is well to remember that their composition as well as their nutritive value varies exceedingly. Soil, climate, the character of the season, the manures employed, and a variety of similar circumstances, it is well known, greatly affect both the quantity and the quality of the produce. For this reason we should be on our guard when we compare the nutritive value of different kinds of roots, and not make more of such comparisons than they deserve. By singling out exceptional cases, and using them for special purposes, many well-established facts might readily be disproved. Proceeding in this way I should find no difficulty in proving that mangolds are no better than common turnips, for I have more than once analysed ordinary turnips which contained less water and more sugar, and other solid feeding materials, than mangolds grown in an unfavourable season. Again, I have analysed swedes which were superior to mangolds, and mangolds which were more nutritious than swedes, and might prove by isolated instances either the superiority of the one or the other.

In all comparisons of that kind care should be taken to avoid extremes, and fairly to represent the average composition of the materials under discussion. It may not always be easy to do so, and I experienced the difficulty in endeavouring to draw up figures which may be regarded as fairly representing the average quality of common mangolds and Silesian sugar-beets, both grown in this country. The following tabular statement, however, I believe represents correctly, and in round numbers, the composition of English common mangolds and sugar-beets of fair average quality:—

Composition of Common Mangold and Silesian Sugar-beets of fair average quality grown in England.

	Common Mangold.	Silesian Sugar beets.
Water	89·0	84·5
Sugar	5·5	9·5
*Albuminous compounds (flesh-forming matters)	1·5	1·5
Crude fibre	3·0	3·5
Mineral matter (ash)	1·0	1·0
	100·0	100·0
* Containing nitrogen	·24	·24

Speaking generally, the Silesian sugar-beets grown in this country contain the same amount of nitrogenous compounds and mineral matters as ordinary mangolds, and from 4½ to 5 per cent. less water, and nearly double the amount of sugar which is found in common mangolds. The average percentage of dry matter in sugar-beets is 15·5, and in common mangolds 11. A ton of the former therefore contains 347 lbs. of dry feeding substance, in round numbers, and a ton of the latter only 246½ lbs.

Allowing only little for the superiority of sugar as a fattening element of roots, the case is far from overstated if 1 ton of English sugar-beets is considered as equivalent in nutritive properties to at least 1½ ton of common mangolds. In the next place, let us compare the preceding analyses with the average comparison of the refuse pulp from beet-root sugar manufactories. In round numbers this may be stated with sufficient accuracy as follows:—

Average Composition of Beet-root Pulp (Refuse Pulp of Sugar Manufactories.)

Water	70·0
Sugar	1·5
*Albuminous compound (flesh-forming matters)	2·5
Crude fibres and a little lactic acid	24·0
Mineral matter (ash)	2·0
	100·0
* Containing nitrogen	·40

In 100 parts of pulp it will be seen there are 30 per cent. of dry matter, whereas 100 of sugar-beet from which it is obtained contain only 15½ parts of dry substance, and common mangolds but 11 parts.

A ton of beet-root pulp accordingly contains 672 lbs. of dry matter, or 325 lbs. more than a corresponding weight of the roots, and 425½ more dry matter than 1 ton of common mangolds. In other words, 1 ton of pulp contains not quite, but nearly, the same amount of solid substances as 2 tons of Silesian sugar-beets, or 3 tons of common mangolds.

Nobody probably will dispute the fact that the dry substance of a sugar-beet or a mangold is more valuable for feeding and fattening purposes than the dry substance of the pulp. The question, however, which requires to be settled is, not whether the perfectly dry pulp is less valuable than perfectly dry roots from which it is made, but whether the 672 lbs. of solid matter contained in a ton of pulp are worth more or less than the 347 lbs. of solid matter present in a ton of sugar-beets, or 246½ lbs. of the solid matter of which common mangolds consists.

A further comparison of the preceding analyses shows that, weight for weight, the pulp contains more albuminous (flesh-forming) matter, much more fibre, and but little sugar. On the one hand we have in sugar-beets an excess of 8 per cent. of sugar, and in common mangolds an excess of 4 per cent. over the amount of sugar in the pulp; and, on the other hand, we have 24 per cent. of fibre in the pulp against 3½ in beets, or 3 per cent. in common mangolds, besides an excess of 1 per cent. of albuminous matter in the pulp.

The question thus resolves itself into this: are 4 lbs. of sugar (the excess in 100 to common mangolds), or 8 lbs. of sugar (the excess in 100 lbs. of sugar-beets), worth more or less than 1 lb. of albuminous or flesh-forming matter and $20\frac{1}{2}$ lbs. or 21 lbs. of the finely-grated fibre, which constitute the excess in 100 lbs. of the pulp.

As the difference in the amount of nitrogenous matter in the pulp and in the roots is comparatively small, we need not lay any stress upon the excess of albuminous matter in the pulp, and for simplicity's sake may throw it togetherwith the excess of fibre. We thus obtain in every 100 lbs. of pulp $21\frac{1}{2}$ lbs. more of the solid matter of which the pulp mainly consists than we give to cattle if we fed them upon the same quantity of sliced beet-roots; but against this a set-off has to be made in the excess of 8 lbs. of sugar in the beets, or 4 lbs. when compared with common mangolds.

There can be no doubt that 1 lb. of sugar is worth more as a fattening material than 1 lb. of the vegetable fibre which constitutes the bulk of beet-root pulp. Whether 8 lbs. of sugar are worth as much as $21\frac{1}{2}$ lbs. of crude fibre, we question very much, and have no hesitation in subscribing to the opinion that 22 lbs. of the fibre go further in supplying food than 4 lbs. of sugar. In support of this view of the matter it may be stated that neither common mangolds nor Silesian sugar-beets are ever left in the ground until they become over-ripe, which would have the effect of changing the soft and delicate fibre which forms the cellular and vascular tissues of the bulbs into hard and indigestible woody matter; and it may be further mentioned that the young and tender cellular fibre of sugar-beets, when digested with weak alkalies, and with dilute acids, is quickly transformed into sugar. There can, therefore, be no reasonable doubt that the gastric juice and other secretions in the alimentary canal of ruminating animals, more especially, will render available for the purposes of nutrition or deposition of fat a very large proportion of the soft and finely comminuted fibre of which the pulp mainly consists.

Taking all circumstances into consideration, I am inclined to think that accurate feeding experiments probably will prove that a ton of fresh beet-root pulp, as it comes from the presses, or old pulp not containing more water than fresh, is worth as much for feeding purposes as $1\frac{1}{2}$ tons of the roots from which it is obtained, or as much as 2 tons of common mangolds. I speak, of course, with reservation; still, I think the preceding analytical data, and the considerations which have been laid before the reader, justify the assertion that, weight for weight, beet-root pulp, containing not more than 70 or 72 per cent. of water, is more valuable for feeding purposes than common mangolds and even sugar-beets.

In Belgium fattening beasts are sometimes fed upon nothing else but the refuse pulp of sugar manufactories. Considering the state in which stock is usually sold to the butcher in that country, it may answer the purpose of the manufacturer, who frequently keeps a number of fattening beasts, to dispose of his refuse pulp in this way; but for the requirements of the English meat market I believe it would not be possible to get fattening beasts in a sufficiently good condition by feeding them exclusively upon pulp.

Beet-root pulp is rather deficient in flesh-forming compounds, and hence the admixture of some meal or cake to pulp suggests itself as appropriate for supplying this deficiency. Cotton-cake in particular can be strongly recommended as an additional food for beasts fed upon pulp, for it not only makes up for the deficiency of flesh-forming matters in the pulp, but its binding properties are particularly useful in counteracting the tendency of the pulp to scour.

Milch-cows may also be fed with advantage upon pulp and bean-meal, or pulp and cotton-cake. Indeed, a fair allowance of bean-meal or cotton-cake, and as much pulp as the cows will eat, produces both abundance of milk and milk of good quality.

Pigs are fond of old pulp, and they do well upon it if they receive at the same time barley or pea-meal, or a mixture of both meals.

Beet-root pulp, selling at 12*s.* a ton, unquestionably is a cheap and valuable food, which may be used as a good substitute for roots. At that price, and even at a somewhat higher figure, I doubt not the refuse pulp of sugar manufactories will always command a ready sale in England.

Laboratory, 11, *Salisbury Square*, *Fleet-street*, *E.C.*,
January, 1870.

IX.—*Report on Cheshire Dairy-Farming.**
By H. M. Jenkins, F.G.S.

Twenty-five years have elapsed since Mr. Palin's Prize-essay on the Farming of Cheshire was published in the fifth volume of this Journal (pp. 57-111); and in the interval it does not appear

* This Report was unavoidably omitted from the series to which it belongs, published in the last Number of the Journal. Mr. Statter, of Stand Hall, Whitefield, Manchester, accompanied me in the visit of inspection paid to the farms described.

that the agriculture of the county generally has undergone much alteration. There are, however, some farms which exhibit features not fully described in that Report, and to two of these attention is particularly drawn in the following pages. Good cheese-making is by no means a consequence of good farming, any more than good bread is an invariable product of good wheat; and it therefore frequently happens that the dairymaid is unskilful, while the farmer himself is much further advanced than his neighbours, or *vice versâ*.

The method of making Cheshire cheese was described in detail by Mr. White * twenty-four years ago; and thirteen years later, in 1858, he gave a most interesting report on the Exhibition of Cheese at Chester,† in which will be found additional information on the subject, particularly with regard to modern improvements. It is, therefore, unnecessary for me to describe the process again, more especially as it does not appear sufficiently near the standard of perfection, as a labour-saving process, to render it probable that it will be imported into other districts.‡

Modes of Cultivation.

There are two systems of farming pursued by Cheshire dairymen. The simpler method is that of permanent grass and arable land, in varying proportions, but entirely distinct from each other; the other method is that of "convertible tillage," where each portion of the farm is in turn laid down with seeds for a series of years, and broken up in rotation—there being comparatively little or, in some cases, no permanent grass. Both the farms which are described in the following pages are examples of the latter system of dairy-farming; they were selected as types of a practice which is not so common as the other, and which has not been so frequently described. The report on them will convey some idea of the effect of the cattle-plague on the agriculture of a county which suffered more than any other, by bringing into relief the methods resorted to for the purpose of substituting, at any rate temporarily, some other farming practice in the place of dairying.

One example of the "convertible tillage" system is seen on Crouchley Farm, near Lymm, in the occupation of Mr. Whitlow. The outside measurement is 263 acres, but the actual extent of workable land is a trifle under 240 acres. Of this area, previous to the cattle-plague, one-fourth, viz. 60 acres, were annually in

* 'Journal of the Royal Agricultural Society,' vol. vi. p. 102.

† *Ibid.*, vol. xix. p. 400.

‡ Mr. Willard, of Herkimer County, New York, considered it half a century behind the American process.—*Vide* 'Report of the Department of Agriculture,' 1866, p. 373.

tillage, 84 acres in permanent pasture, and the remainder in seeds, which remained six or seven years until broken up in rotation, according to the shift adopted. Since the cattle-plague, although the same principle of farming has been adhered to, the area of land under tillage has been increased to 80 acres, the number of dairy-cows has been reduced, and more sheep have been kept in their stead. The seeds having been broken up, the rotation on this farm is the following: (1) oats; (2) early potatoes, followed by swedes transplanted from a seed-bed; (3) wheat; (4) oats, with seeds which remain several years. Mr. Whitlow now has his landlord's permission to break up his permanent grass—a course of tillage being likely to improve the sward.

Mr. Jackson's farm at Tattenhall, near Chester, is the other example selected. It is the property of Robert Barbour, Esq., of Bolesworth Castle, and consists of about 330 acres, which are divided into three portions of a little more than 100 acres each. One-third is permanent pasture and irrigated meadow, not allowed to be ploughed up; a second third is worked on a double four-course system, followed by seeds which remain eight years; and the remaining third is cropped on a double five-course system, the last course being seeds which remain during the next ten years. To make these systems perfectly intelligible, I will at once give the details of the courses of cropping. The four-course 100 acres are divided into eight fields, half of which are always in seeds laid down for pasture; on the other half we have the following: (1) oats; (2) wheat; (3) beans and roots; (4) barley, with clover; then the course is varied to (5) clover; (6) wheat; (7) beans and roots; (8) barley and seeds remaining eight years, oats being omitted. Thus, with the exception that oats are replaced in No. 5 by clover, we have a double four-course followed by seeds remaining eight years in pasture. The five-course 100 acres is similarly divided into ten fields, half of which are cropped as follows: (1) oats; (2) wheat; (3) beans and roots; (4) barley; (5) seeds, which is repeated exactly, the seeds of the second rotation remaining another ten years in pasture.

The peculiarity of management illustrated by Mr. Whitlow's farm was noticed by Mr. White, in his Prize-essay already quoted. He observed that it was "almost peculiar to a district of the county which borders on the Duke of Bridgewater's Canal, between Runcorn and Altrincham; the principal object of the farmer being to raise early crops for the Manchester markets, as he has the double advantage of canal-carriage for his produce and of bringing back manure to his farm at a reasonable cost—no tonnage-dues being levied, and only a small charge for wharfage." Mr. Whitlow gets about 300 tons of stable-manure from Manchester every year; but as the means of communication have been so greatly developed of late years, probably the profit of supplying that market is not so great as it was twenty-five years ago, when a larger proportion of tillage-land in the district was devoted to potatoes, carrots, &c., for sale in the populous neighbouring towns.

The two farms are on different geological formations. Mr. Jackson's is on the great sheet of boulder-clay which so generally masks the Cheshire new red sandstone; when taken by the present tenant it was studded with the marl-pits characteristic of the country; but by levelling these, and grubbing up old fences, the productive area of the farm has been increased by twelve acres. Mr. Whitlow's farm is situated on the lighter land of the Keuper sandstone, which may explain why, like other farmers in the district, he takes oats after turnip-land wheat, instead of wheat after oats on an old ley.

The following description of the tillage operations is taken from Mr. Whitlow's practice, except when it is stated to the contrary:—

1. *Oats.*—The old seeds are broken up in January or February, the plough going to the depth of six or seven inches. In March five bushels per acre of yellow Poland oats are sown and harrowed in, and the land rolled. Harvesting is done by a reaper, the crop being sheafed and stooked by daywork since the reaping-machine has been used. When dry enough the sheaves are stacked in skeleton barns, which are merely long sheds on wooden pillars, and with slated roofs. These structures, better known as Dutch barns, are very generally used in the county.

2. *Roots.*—Soon after harvest the land receives a deep ploughing with four horses, and is then left during the winter. An early kind of potato is grown for the Manchester market, and although a white sort, they are locally known as "red bags." The system of cultivation is somewhat intricate. Mr. Whitlow has 700 sprouting baskets, holding half a bushel each, in which the potatoes, of a size adapted for sets, are laid in August. They remain in a light and ventilated place until Christmas, after which both light and air are excluded as completely as possible until the sprouts are between two and three inches in length, when daylight is readmitted, so as to harden and "green" them. Early in the spring farmyard manure, to the amount of 20 tons per acre, is laid in drills 25 inches apart, and immediately before planting 2 cwt. of guano per acre is sown on the manure. Upon these stimulants the sprouted sets are planted whole, in March or April, 9 inches apart; the ridges are then split with a double mould-board plough, the land is subsequently harrowed, and the potatoes again ridged.

About the end of June or beginning of July the potatoes are got by fork-digging. This is done by Irishmen, who come every year; the price paid for digging, washing, packing in hampers, and loading the carts, being 1¼*d.* per score of yards along each ridge. As the land is cleared it receives a dressing of 5 cwt. of ground bones and 1 cwt. of guano per acre, and the ridges are then split with the double mould-board plough. In the meantime swedes—either Skirving's Purple-top or Lord Derby—had been sown thinly in seed-beds about the first week in May, and left until the potato-land was prepared for them, as above. They are then drawn, the ends of the roots nipped off, and planted in drills, 25 inches apart, the plants being 12 inches asunder in the rows. Nothing else is done to them until they are pulled at the slack time of the year.* They are topped and tailed, and put in long narrow heaps (locally "hogs"), covered with straw and a small quantity of soil, except the ridge, which is left open until severe weather sets in, when it is covered with stable-litter. Both planting and getting are done as daywork.

White turnips are not grown, unless a piece of potatoes is more backward than usual.

Mr. Jackson sows one-half of his root-course with beans. The wheat stubble is scarified and ploughed 6 inches deep in the autumn; later in the season the land is dressed with from 15 to 20 tons per acre of farmyard manure, and again ploughed; and in February or March, 2 bushels of beans per acre are drilled in rows 1 foot apart. They are twice hoed by hand, at a cost of 8*s.* per acre; or if horse-hoed, they get one hand-hoeing at a cost of 5*s.* per acre. They are cut with a reaping-machine, lie three or four days, and are then sheafed and stooked, and finally stacked in skeleton barns.

For swedes the wheat stubble is scarified, harrowed, and ploughed 6 inches deep in the autumn; in the spring 20 tons per acre of farmyard manure and 4 cwt. of superphosphate are applied, the land is ploughed, and the seed immediately drilled on the ridges. Previous to putting in the farmyard manure the subsoil plough is passed 9 inches deep between each ridge. Hoeing twice and singling, which is done with the hoe, cost 12*s.* per acre, the plants being set out to 12 inches apart in the rows. From 3 to 4 acres of mangolds (a mixture of yellow globe and long red) are grown every year, the quantity of seed used being 4 lbs. per acre. Both mangolds and swedes are pulled, topped and tailed, and stored in buildings, no "hogs" being made on

* Compare with Mr. Le Cornu's description of the cultivation of early potatoes followed by swedes in Jersey, *suprà* p. 137.

this farm. Mangolds are chiefly given to breeding-sows in the summer, but some are used for the dairy-cows in March and April.

3. *Wheat.*—The tillage operations for this course exhibit a characteristic Cestrian custom, termed "sowing under-furrow," but this old practice of sowing under furrow is now generally substituted for the Suffolk drill with coulters 6 inches apart. After the swedes are off, the land is merely harrowed; about 3 bushels per acre of woolly chaff wheat is then sown broadcast, and covered by a shallow ploughing. No top-dressing is applied, the land being considered already highly manured; and it is said that the woolly chaff wheat is preferred on account of its standing better than other sorts on land in such high condition. In the spring, weeding is done by hand, and harvesting is done in the same manner as already described for oats. Mr. Jackson, however, pays 8*s.* per acre for labour, finding horses, reaping-machine, horse-rake, &c.; this sum covers the cost of cutting, sheafing, raking, &c., without beer or food.

4. *Oats and Seeds.*—The wheat stubbles receive a shallow ploughing (about 3 inches) in the autumn, and remain in this state until the spring. About the first week in April the tillage operations are carried on in succession as fast as possible. A grubber is first put through the land, which is then harrowed, and afterwards ploughed to the depth of 9 inches. Five bushels per acre of yellow Poland oats are then drilled, and harrowed in. A flat roller is then used, and a mixture of seeds sown and lightly harrowed in, after which the land is again rolled. Nothing more is done until harvest, which is carried on as previously described.

5. *Seeds.*—The mixture of seeds sown in the oats is the following, per acre:—5 lbs. red clover, 2½ lbs. white Dutch, 2½ lbs. alsike, 2½ lbs. plantain, 2½ lbs. trefoil, ½ bushel Italian rye-grass, and ½ bushel perennial rye-grass. Immediately after harvest the seeds are dressed with 10 cwt. per acre of ground bones. The first year two cuttings are got, the first in June and the second in August—a mowing-machine being used, and the men working day-work. After the first year they are grazed by dairy-cows, and if at any time they appear to be losing in quantity or quality, a half-dressing of ground bones is applied.

Mr. Jackson lays down with seeds upon barley, as will be seen by reference to his courses of cropping; the mixture consists of 5 lbs. red clover, 2 lbs. cowgrass, 2 lbs. white Dutch, 2 lbs. trefoil, 1 lb. alsike, ½ bushel Italian rye-grass, and 1 peck perennial rye-grass. For the course of seeds which stands only one year, the white Dutch clover, the alsike, and the perennial rye-grass are omitted, the other seeds remaining the same. On this farm, also, the seeds are not sown until the barley shows above ground. Barley is not harvested in sheaves, but is mown by machine in swathe, at 2*s.* per acre without beer or food.

Permanent Grass.

Mr. Jackson's farm comprises 100 acres of permanent grass, 20 of which are irrigated meadows. Previous to the cattle-plague this portion of his farm was more extensive by 30 acres, which have been broken up, and he believes that some of the existing pasture might be broken up with advantage. During the last 30 years the permanent pasture has twice received a dressing of 10 cwt. per acre of boiled bones. The meadows are well drained, and are irrigated in succession from three streams which run through the farm, as often as the supply of water will allow. The grass is mown in June, and the aftermath is fed off by cows. Irrigation is under the care of the shepherd, but so much attention is not paid to it now as formerly, because it is found that the temperature of the water is not generally higher than that of the atmosphere. Grass is mown by machine at a cost of 1*s.* per acre for labour, the farmer providing machines and horses, and the men finding their own beer and food.

Labour.

The price of labour varies according to the distance of the farm from the manufacturing districts. Mr. Jackson pays his daily labourers 12*s.* per week, and Mr. Whitlow 15*s.*; but the latter obtains the services of Irish labourers from the beginning of March to the end of the season, at 12*s.* per week. Women are employed for weeding, planting potatoes, and the lighter descriptions of farm-labour generally, at a cost of 7*s.* per week by Mr. Whitlow, but women are rarely employed in Cheshire field-work.

Stock.

Cattle. — Before the cattle-plague Mr. Jackson kept 80 milch-cows, and Mr. Whitlow 60. Since that time the numbers have been reduced to 60 and 30 respectively; but this is not the whole difference. Mr. Jackson's original stock was shorthorn, but now is chiefly the produce of Ayrshire cows and a shorthorn bull; and the gap left by the cattle-plague has been only partially stopped by the purchase of the best heifers that offered, instead of being entirely filled up with heifers of his own breeding. Mr. Whitlow's dairy-cows were what are known as the Yorkshire dairy cross; not having enough pure shorthorn blood in them to entitle them to a place in the herd-book, but still the produce for years back of pedigree shorthorn bulls and Yorkshire cows. His stock was kept up by rearing all the heifer-calves considered good enough, generally from 15 to 20 every year; but at the time of our visit (spring of 1869) he had not reared any for two years, and his dairy stock then consisted only of the 30 cows already mentioned, and 21 two-year-old heifers. Future requirements will be met by purchase, Cheshire farmers generally being still fearful of attempting to rear their own stock, and thus increasing their risk of losses by a rinderpest epidemic, pleuropneumonia, and the other ills that cattle-flesh has become heir to.

The treatment of dairy-cows varies in detail on different farms, but the principle generally remains about the same. When they have nearly done milking, about the beginning or middle of November, they are brought into the shippons. Mr. Jackson then gives them straw-chaff and turnip-tops until the latter are finished, generally about the middle of December, when they are replaced by sliced turnips, until just before calving—say the end of February or beginning of March. The food is then changed to a mixture of hay and straw chaff, crushed Indian-corn and oilcake (from 1 to $1\frac{1}{2}$ lb. each per diem), and sometimes a little bran, the quantity of roots being diminished as that of other food is increased; and the cows are kept in this manner, with the exception that mangolds are substituted for turnips after calving, until they are turned out to grass. All the food is steamed as soon as cut, in the manner that will be described presently under the head of "Farm-buildings." Previous to turning out in the spring and taking up in the autumn, the cows are kept out by day and taken home at night, according to the weather. A great portion of the pasture necessarily consists of seeds of greater or less age. Calves are allowed to suck the first week—then they are fed on new milk for about a week, after which a little oatmeal gruel is given; and when they reach the age of a month or five weeks, the food is altered to skim-milk, linseed, and gruel. When about six weeks old they are sold to the butcher, unless the best heifer-calves are reared; these are kept as before, until they go on grass in May or June. Mr. Whitlow gives his cows crushed tailed corn and Egyptian beans, consuming of the latter about 100 sacks per annum.

Sheep.—The flocks on Cheshire farms have been increased on a scale similar to that on which the herds have been diminished. Before the cattle-plague Mr. Whitlow kept 40 breeding ewes; since then he has increased the number to 70. The ewes are Shropshire Downs, bought in October at Shrewsbury Fair;

they are put to a Lincoln tup as soon as bought, and run at large on grass-land during the winter. The lambs, which average between 40 and 50 in excess of the number of ewes, are sold fat, and drawn at intervals for the Manchester market as fast as they can be got ready. They are generally sold to one hand to be cleared by the end of July, and the ewes are disposed of in the same manner, to be cleared in October, so as to make room for the new flock. Mr. Jackson's flock is usually from 100 to 200 Cheviot hoggs and breeding ewes.

Pigs.—Mr. Jackson's arrangements for pig-feeding are extremely good, the whey from his dairy being conveyed to a convenient cistern, as will be described presently. He keeps from 6 to 8 breeding-sows, generally of the Yorkshire or Cumberland breed; and in summer he has, on the average, about 60 pigs, reckoning that it is most profitable to feed as many pigs as he has dairy-cows. Pigs are fed on whey and Indian meal, and, with the exception of a few young ones, got rid of in the spring; they are sold fat in July, August, and September, weighing about 14 or 15 score.

Cart-horses.—Mr. Whitlow buys 3-year-old colts, and works them on his farm for two or three years, after which he sells them for dray and other work in the towns of the district. He gives them chopped straw and hay, with pulped turnips and crushed corn, and sometimes a little cake, all the year round.

Fences.

On both the farms described in this Report, the fences were remarkably good, and very much above the average of the county. Mr. Whitlow's were made by double-trenching to the depth of 2 ft., dressing with farmyard manure, and planting, on the flat, with about six 3-year-old quicks to the yard, which were cut close to the ground immediately. Mr. Jackson ploughed out two furrows in the line of the fence, and then put the subsoil-plough between them, in the line where the fence was required. The land was then manured with farmyard manure and a few ground bones, which were ploughed under. A gardener's line was then fixed in the position required, against which a boy placed the quicks—one man on each side being employed to earth them up with a spade. Six quicks, of three or four years old, were planted to the yard on the flat; they were allowed to grow one year, then were cut down to a height of 4 inches, and afterwards allowed to grow untouched for about four years. On both farms the fences were trimmed to a height of about 4 ft. 6 in., and a width of 4 ft. across the bottom. Trimming is generally done as daywork, and cleaning at 1*d.* per Cheshire rod of 8 yards. In this manner Mr. Jackson has replaced the crooked and untidy original hedges with about 9 miles of straight quick fences, which are both uniform and compact.

Mr. Jackson's farm-buildings have for several years enjoyed a well-merited reputation; they have been beautifully illustrated by Mr. Bailey Denton, from whose work * we extract the following description:—

"The buildings were erected in the year 1860. Exclusive of house and piggeries, the haulage of materials, the formation of roads, and the making of the necessary approaches, they cost 1600*l.* This sum does not include a small portion of old materials used in them. The arrangements were designed by the tenant; Mr. J. Harrison, of Chester, acting as architect.

"The dairy-cows, 80 in number, occupy the principal building (the cow-house), in close proximity with which are the food-chambers, machinery, and barn. The cows are placed on each side a central feeding-passage, along which the cut food is carried by a truck to the troughs; while a constant stream of water passes along the two lines of stalls, and furnishes each with an ever-fresh supply. The central portion of this large building is higher than the two ends, and contains a hayloft, into which hay is brought direct from the field, and there stored. Ventilation is gained by an air-shaft, in the shape of a central cupola, and by side-openings.

"There is accommodation for 14 calves, and 12 store-stock in addition to the dairy stock.

"Stabling is provided for 9 working horses, besides which there is a nag stable with three stalls, a loose box, and a hospital for cows.

"The piggeries, which are supplied with whey by means of a pipe-drain direct from the dairy, are fitted up for about 50 breeding store and fatting pigs, and are very complete.

"The machinery consists of a portable steam-engine, with a thrashing apparatus; also a small 6-inch cylinder fixed steam-engine, which drives a chaff-cutter placed in the straw depôt, and a root-cutter and cleaner in the room below. The latter is supplied by the engine-boy from the adjacent store, and the roots, when cut, are taken by elevators and mixed with the chaff; the whole being sprinkled with hot water, or oilcake gruel, as it descends to a chamber, the floor of which is perforated in order to allow the waste steam from the engine to ascend and sweeten the whole. The cows are kept on this steamed food throughout the winter; as spring approaches an addition of oilcake, bean-meal, and a little chopped seeds and clover, is made to it.

"The milk, when brought from the cow-house, is collected into two cheese-tubs or vats, placed on the kitchen-floor, and capable of containing 240 gallons. Each tub is provided with a $\frac{3}{4}$-inch plug, and a strainer guards the opening through which the whey, when separated from the curd, passes into one of four slate cisterns. When all the cream has been removed from the whey, a valve is raised, which allows of the escape of the refuse whey into any or all of the pig-troughs, a little meal from the corn-flour being added to it. The curd, when separated, is passed through the curd-mill. It is then salted, vatted, pressed into the proper cheese shapes, and elevated into the cheese drying-room; and after four months' detention the cheeses are lowered by the same contrivance, and sent to the London market.†

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* 'The Farm Homesteads of England' (1864), pp. 70–73.

† A cheese factory is being fitted up at Tattenhall, in a situation that offers great facilities for water and a supply of milk, promoted in order to test the American improved mode of factory cheese-making (see next page).

"The buildings are drained into two large liquid-manure tanks, the contents of which serve to irrigate about 14 acres of meadow-land.

"The rain-water, and the wash of the house, is conducted to suitable reservoirs, and is made to flow over a small meadow at pleasure.

"The buildings are supplied with water from a pond, which receives the drainage-water from about 15 acres of land.

"The corn crops are well housed in skeleton barns, having clay floors, the crops being preserved from contact with the clay by means of an intervening layer of brushwood.

"In addition to this homestead, which has the disadvantage of being at the corner of the holding, 24 cow-stalls, a food-house, and labourer's cottage have been erected at a distant part of the farm. At this steading the barren cows are fatted and the calves are kept, the latter being supplied with roots and fodder. By this means much cartage is saved, and manure is made where it is wanted.

Mr. Jackson exhibited a model of this homestead at Manchester, and was awarded the prize of 10*l.* for hay and corn sheds. The following extract from the Report of the Judges gives their opinion of the steading:—

"In this commendation they especially refer to the Dutch barns, erected in connection with the homestead, for stacking corn in sheaf at harvest time, and which would also serve for storing hay and straw. They unanimously disapprove of the arrangement of placing hay in the loft over the cows in the shippon, though the exhibitor has made special provision for ventilation by a shaft through the hay and roof from the shippon below, as well as by perforations in the walls just under the loft."

On this point Mr. Jackson remarks, that "to put hay over all the cows is one extreme, and to put all the cows in sheds open to the roof is the other." He therefore advocates the middle course, of sheds at each end for half the cows, and hay over the centre portion; by this plan he considers that the extremes of heat and cold are avoided, while it secures the most convenient stowage for hay, which is of better quality than if kept by stacking, as it is said usually to come out as green and sweet as at harvest.

X.—*Report on the Cheese-Factory System, and its Adaptability to English Dairy Districts.** By H. M. Jenkins, F.G.S.

American cheese has been imported into England for many years, but until recently it has not much excited the attention of

* On July 1st, 1868, the Council, on the motion of Lord Vernon, requested the Journal Committee to obtain information as to the working of the Cheese factory system in America, and its adaptability to the dairy districts in England. Various causes have since combined to defer the publication of the Report; but as, in the meantime, public opinion on the question has become more matured, it is hoped that this delay has not injured the cause in which the inquiry was undertaken.

English farmers. Two causes combined to produce and foster this indifference: one was the bad quality of the article when first imported; and the second, which was to a certain extent the consequence of the former, was the prejudice which induced consumers to buy, even at an enhanced price for worse quality, the native rather than the foreign production. But the cattle-plague commenced and continued its ravages, and English cheese became not only dear and difficult to obtain, but also inferior in quality. Dealers were therefore compelled to purchase American samples, and thus the ice of prejudice was broken. It was soon found by purveyors and consumers that good American factory cheese was equal, and often superior, to any English produce but that of the very best dairies, while its price was considerably below that at which even moderate samples of English cheese could be sold. Hence at last arose a real demand for American cheese, and, as the demand increased, the price of the commodity rose in obedience to the economic law of supply and demand. American dairymen saw the tide turning, and, with the shrewdness characteristic of their nation, watched and took advantage of every chip which showed the course of the current of public opinion. They also took every means in their power to ascertain the wants of the English cheese-markets, and especially to find out what were considered in England the defects of their produce. Their agents collected opinions on every imaginable point—the defects in size, shape, colour, flavour, &c.; and, as each was indicated, every exertion was made to remedy it. By these means it is that American cheese in large consignments can now be sold at a price which comparatively few English dairies can command. In London at the present time (December, 1869) American Factory-cheese made in September is selling at from 70*s.* to 74*s.* per 112 lbs.—equal to from 75*s.* to 79*s.* 3½*d.* per 120 lbs.—figures the importance of which dairy-farmers can easily appreciate.

In the following pages I shall first describe the rise and progress of the system by which the American dairymen have been enabled to achieve this result, and afterwards endeavour to estimate its adaptability to English dairy districts. The first part of my report will consist almost entirely of *verbatim* extracts from American publications; and as the essays from which they are taken were written for the benefit of American dairymen by authors of the highest reputation, I believe that every reliance may be placed on their accuracy. As a pendant to these extracts I shall print without alteration four replies which I have received from eminent practical men in answer to questions contained in my letters to them. Finally, it will be my endeavour to place before the members of the Society the English view of the question, as obtained by me during visits made for the purpose to the most important English dairy districts.

The origin of the American Cheese-factory system is ascribed by Mr. X. A. Willard * to Mr. Jesse Williams, a farmer living near Rome, Oneida County, New York, under the following circumstances:—

"Mr. Williams was an experienced and skilful cheese-maker at a time when the bulk of American cheese was poor. His dairy, therefore, enjoyed a high reputation, and was eagerly sought for by dealers. In the spring of 1851, one of his sons having married, entered upon farming on his own account, and the father contracted the cheese made on both farms at seven cents per pound, a figure considerably higher than was being offered for other dairies in that vicinity. When the contract was made known to the son, he expressed great doubt as to whether he should be able to manufacture the character of cheese that would be acceptable under the contract. He had never taken charge of the manufacture of cheese while at home, and never having given the subject that close attention which it necessarily requires, he felt that his success in coming up to the required standard would be a mere matter of chance. His father, therefore, proposed coming daily upon the farm, and giving the cheese-making a portion of his immediate supervision. But this would be very inconvenient, and while devising means to meet the difficulties, and secure the benefits of the contract, which was more than ordinarily good, the idea was suggested that the son should deliver the milk from his herd daily at the father's milk-house. From this thought sprung the idea of uniting the milk from several neighbouring dairies and manufacturing it at one place."

The above quotation gives the true origin of the existing system of associated dairies; but a few years previously another system had been tried, and found inefficient, in the State of Ohio. Therefore, for the purpose of showing English dairy-farmers what to *avoid*, I quote the following paragraph from a paper by Mr. A. Bartlett,† of Ohio:—

"So long ago as 1848 a system of cheese manufacturing was in operation in some parts of Trumbull and Ashtabala counties, and in the course of the next few years was largely extended. The plan of operations under this system was briefly as follows: some person or firm would erect suitable buildings or fixtures, and purchase the *curds* of the surrounding farmers, haul the curds to the factory and weigh them, paying a stipulated price per pound. . . . . The system had radical defects, the chief of which was that the curds, being made by the several different farmers who furnished them, there was, of course, almost as many different qualities of curds as there were farmers furnishing them; and it is impossible to make a prime article of cheese from a curd that has been mismanaged during its first stages."

This attempt, therefore, failed; and in the spring of 1862, after a visit to the factory of Mr. Jesse Williams, who founded the rival system, Mr. Bartlett introduced into the State of Ohio the

* 'Report of the Commissioner of Agriculture for the year 1865,' pp. 432, 433.

† 'Twentieth Annual Report of the Ohio State Board of Agriculture for the year 1865, pp. 170, 171.

first cheese factory on the New York principle. In the meantime that principle had, slowly but surely, obtained a footing in the Empire State, and by the end of the year in which the Factory-system was first established in Ohio, no less than eighty factories were in operation in New York.

The original factory of Mr. Jesse Williams stood alone from 1851, the year in which it was erected, until 1854, when four were established. For some years after the system progressed slowly, the number of new factories having been two in 1855, three each in 1856 and 57, and four each in 1858 and 59. The number of new factories annually erected then suddenly increased coincident with a very remarkable expansion of the export trade. Thus in 1860 there were seventeen, in 1861 eighteen, and in 1862 twenty-five. This may be considered the second epoch in the history of Associated Dairies, the third and last period being that in which private dairies were practically abandoned, and nearly the whole of the milk sent to factories. Therefore we find that in 1863 the large number of 111 factories were erected in the State of New York, while in 1864 the enormous increase of 210 new establishments was reported. But there is a limit to the possible number even of cheese factories in one American State; accordingly only 52 were erected in 1865, and 46 in 1866. Thus three years ago no less than 500 cheese-factories were in full operation in the State of New York alone; and, taking the average number of cows supplying each with milk at only 400, we get the enormous total of 200,000 cows, the milk of which is thus manufactured into cheese. These facts are sufficient to give an idea of the *importance* and *success* of the system, but they do not represent the whole magnitude of the business; for what has been achieved in this way is not confined to the State of New York, nor even to cheese-factories. The associated dairies now comprise a very large number of butter-factories, and the principle of association is in full operation in every State in the Union where dairying forms a prominent branch of agriculture, as well as in Canada, and even in Sweden.

The methods resorted to when it is required to establish a factory are briefly the following:—A certain number of dairymen, keeping, in the aggregate, from 300 to 1000 cows, having agreed to "turn in their dairies," that is, to send their milk to the factory, one of two systems is adopted. One system is carried out by a committee of dairymen being appointed to collect information on the mode of procedure in successful factories, to select a site, &c., and then to report to the members of the Association. The preliminaries having been arranged, directors are chosen, and rules drawn up and agreed to; the necessary arrangements are then made for the erection of the factory-building according to an approved plan, and for the engagement of a competent superintendent. The alternative system is, that some manufacturer proposes to erect a factory on his own account, and to manufacture and take care of the cheese at a fixed price per pound. In this case each farmer, or "patron," contracts to supply the milk of a certain number of cows for a definite period, and the manufacturer agrees, on his part, to "run the factory."

The site chosen for the erection of a factory should be convenient of access to the dairies which are to supply the milk, and it should possess an abundance of good water. The conveyance of the milk to the factories is a most important consideration. In America three systems are in operation: either each patron conveys his own milk every day, or the patrons take it in turn to convey the whole of the milk, or some carrier conveys it regularly at a certain fixed charge.

The factory having been erected, the machinery purchased and fixed, the workpeople engaged, and the milk delivered, the process of manufacture next demands description. For this purpose I have transcribed the following descriptions of two factories by Mr. A. Bartlett, of Ohio, as they give a very good idea, not only of the method of cheesemaking, but also of the factories and their fittings. The first establishment is Mr. Bartlett's original factory (the first erected in Ohio), as described by him in a letter to the secretary of the Ohio State Board of Agriculture.*

"The factory buildings are: a workshop, 26 by 26 feet; a salt-room, 10 by 22 feet; a press-room, 12 by 40 feet; a boiler-room, 12 by 15 feet; receiving-room, 13 by 16 feet; and kitchen, 13 by 24 feet. These buildings all stand contiguous to each other, and are connected together. The curing-house is 30 by 100 feet, 3 stories in height, and will store for curing about 2500 cheeses of the size we are now making, viz., 15 inches in diameter, and 10 inches high. The milk is hauled to the factory in tin cans of different sizes, holding from 125 to 500 pounds of milk each, and are hoisted from the wagons by means of a crane and windlass, and the milk dumped into the receiving-cans, of which there are two standing on scales. It is then weighed, and, by means of a gate, is let off through a tin conductor into the vats below. A careful account is kept of the milk delivered by each man every day. The vats are 3 feet 6 inches wide, and 16 feet long, and hold 5000 pounds of milk each. There are four of them standing in the workshop, made of tin, and each standing in a wooden vat, with a space around and under the bottom of the tin for water.

"At night, when the milk is received, it is run into the vats, and a stream of cold spring-water set running into the wooden vat around the milk, which is left running all night to keep the milk cool, and prevent it from souring, the milk being stirred for a while to hasten the cooling when first put in.

"In the morning the cream which has arisen on the milk is dipped off and poured

* 'Twentieth Annual Report, for the year 1865,' pp. 174–176.

back through a cloth strainer, and thoroughly mixed and incorporated with the milk; the morning milk is then added, and heat applied by running steam from the boiler into pipes in the water under the tin vat, and the temperature raised, in warm weather to 82 degrees, and in cool weather to 84 or 86 degrees Fahr. Extract of anotta is added, sufficient to give a golden cream colour to the cheese, and prepared rennet sufficient to produce perfect coagulation in from 40 to 60 minutes. The milk is then stirred up, and thoroughly mixed for about ten minutes, and then kept stirred on the top to keep the cream from rising until it begins to thicken, which should not be less than 15, nor more than 25 minutes from the time the rennet is added. It is then covered over with a cloth and allowed to stand, until the curd is sufficiently consolidated to begin work upon, which may be known by lifting a portion on the fingers, and should have a compact feeling, like a good custard, and break with a clean fracture over the finger as it is lifted. A knife with twelve steel blades, three-fourths of an inch apart, and 20 inches long, is put in perpendicularly, and run through the vat each way, so as to divide the curd into columns, three-fourths of an inch square, and then allowed to stand a few minutes, while the curd settles an inch or two, and the whey rises on the top. The knife is then put in again, and held at an inclination of 45 degrees, and drawn across the vat, beginning at one end, and proceeding to the other; then reverse the inclination of the knife, and go through in the same way to the other end of the vat, thus dividing the columns of curd made by the first cutting.

"One person, then, on each side of the vat goes to work, and very slowly and carefully with their hands turn the curd over, bringing the bottom to the top; and as soon as the curd will move freely in the whey the steam is let on, and the temperature gradually raised to 88 or 90 degrees, all the while keeping the curd turning over, in order to keep the heating as uniform as possible; great care being taken not to let any portion of the curd settle, and pack on to the bottom of the vat, and thus become overheated, which, if allowed, will greatly injure the cheese. After the heat is cut off, the curd is kept stirred up until it becomes sufficiently compact in the particles not to pack and adhere together when left to settle. It is then allowed to settle, and a cloth strainer is spread over the vat, a syphon inserted, and the whey drawn off, leaving only enough to cover the curd. A wide board, just long enough to reach across the vat, and pressed down as hard as two persons (one on each side of the vat) can press it, and thus proceed to the other end of the vat, pressing down all the curd alike. The strainer is then removed, and the curd pressed down with the hands, giving it a quick, strong pressure, and going carefully over the whole. Keep repeating this operation until the curd becomes separated, and will flow freely about in the whey; then put on the steam; keep the curd stirred to heat evenly; raise the temperature to 94 or 96 degrees, but be sure and not have it go above 96 at any time. Keep it stirred enough to prevent it from packing together, and let it stand for the development of the acid.

"The development and action of the acid must be kept in view throughout the whole process, for the quality and flavour of the cheese depends almost entirely upon how this is attended to. When the acid is sufficiently developed, the curd is dipped out into a sink on a cloth strainer; and, when sufficiently drained, salt is added at the rate of 3 pounds for each thousand pounds of milk used. The drainer stands on wheels, and is now run into the press-room, and the curd dipped into the hoops (which are 15 inches in diameter, and 16 inches deep), and put in the presses. For pressing, a stout wrought iron screw is used; the cheese is pressed gently at first, and the pressure gradually increased; and after being pressed about an hour, is taken from the press, and a bandage of bleached cloth is put upon it, and then it is replaced in the press with a cap of stout cloth on each end, and the pressure applied until the next day, when it is removed from the press, the caps taken off, and the bandage turned back over the corners; and if any edge is pressed up by the follower not exactly fitting in the hoop, this is neatly and evenly trimmed off, a coating of grease applied, and the bandage plaited down neatly. It is then placed on what is called a "turning cover," which is like a common cheese-box cover, placed on the inside, and then carried to the curing-house, when it is turned and rubbed every day until cured, which takes from 20 to 30 days.

"After the cheese is sold, the cost of salt, bandage-cloth, rennet, anotta, and cheese-grease, together with the commission of the manufacture, which is generally one-tenth of the amount of sales, is deducted, and the net cash is then divided, pro rata, among those who have furnished the milk, according to the amount of milk furnished by each, in proportion to the whole amount.

"The whey is run off, a long distance from the factory, into a wooden vat, from which it is fed mostly to hogs. We have fed, during the past season, about fifty calves on whey, and we are very much gratified with our success, having made some very nice calves; and I think it pays better than feeding to hogs."

The following description of the Munson factory, Ohio, is by the same author, and is extracted from the 'Transactions of the New York State Agricultural Society,'*, where it occurs as a reprint from the 'Second Annual Report of the New York State Cheese Manufacturers' Association'† for the year 1864.

"Whole number of cows, 645; average number of cows, 550; number of pounds of green cheese, 192,934; number of pounds of cured cheese, 183,403.

"Two sizes of cheese have been made during the past season—part 22-inch, weighing about 120 pounds cured; and part 15-inch, weighing about 68 pounds cured. The average weight of all is 81 pounds to the cheese. The average shrinkage is 4·94-100 per cent. Number of pounds of milk to one pound of green cheese, 9·28-100, or 9 pounds 4½ ounces; and for one pound of cured cheese, 9·76-100 pounds, or 9¾ pounds of milk.

"Our patrons nearly all sold their milk at prices ranging from 10 to 23 cents per gallon. The cheese belonging to the balance was sold in two lots. What was made prior to the 23rd May was sold in June for 16 cents per pound, and the balance sold in September for 26 cents per pound. Boxing is all done by machinery. The cost of bandage, salt, colouring, and rennet, to the 100 pounds of cheese, 42 cents. The bandages used were 39-inch cloth, bought of H. W. Mitchell, of Rome, Oneida Co.: the price got for making is 1·50 dollars per hundred. The ordinary vat and a steam-boiler is used for heating; the vats hold 500 gallons each. Wood has been used for heating, and about fifty cords during the season.

"The whey has been fed to hogs, for which we had 10 cents a week per hog. The kind of salt used is Syracuse factory filled, and 2·8-10 pounds to the 100 pounds of green cheese. Of anotta, we used 21 pounds dissolved in lye in the fore part of the season, and during all the latter part we used Jones' preparation, of which we used 91 gallons, and I consider Jones' preparation a superior article for colouring, as the colour is better than that obtained any other way. In cool weather we heat the milk to 84 or 86 degrees, but in warm only to 82, when we apply the rennet and want a firm coagulum in from 40 to 60 minutes. When sufficiently firm we cut with a steel-bladed

* Vol. xxiv., 1864, pp. 374, 375.

† Since enlarged, and known as the American Dairymen's Association.

gang-knife, so as to have the largest pieces about one-half, or three-fourths of an inch square, as near as may be, or so that it may be moved freely in the whey; then begin to raise the heat moderately, keeping the mass stirred so as to heat uniformly, and raise the heat to 86°, and when the heat is fairly equalised, spread on a strainer and draw the whey down to the curd (unless the acid is too strong, in which case we carry the heat at once to 94°, or, if the acid is very sharp, we stop the heat at 90° or 92°, then draw the whey and dip out and salt as soon as the acid is right); then, before removing the strainer, we press the curd down firmly, after which we remove the strainer, and by pressing on the curd with the hands it becomes separated, and as soon as it will move freely in the whey we apply the heat, and let it run up to 94° or 96°, being careful not to have it go above 96° at any time; it then stands until the acid is sufficiently developed, which varies according to the state of the milk and the amount of acid used, when it is dipped out of the vat into the drawer, and salted at the rate of three pounds of salt to the thousand pounds of milk used. We have no definite rules as regards time, being altogether controlled in that respect by the development and action of the acid.

"Pressure is applied immediately after the curd is put in press, gently at first, increasing afterwards; and we are nowise particular about the curd being fine when it goes to press, but aim to have the salt thoroughly incorporated and evenly mixed. I prefer to have the milk perfectly sweet when the rennet is applied, and endeavour to have it so if possible. We add sour whey when the milk is very sweet, and frequently add sour whey after the last heat is applied, to hasten the development of the acid. We have never tried mixing alkali with the milk when sour.

"The curd is put into the hoop warm, as appears above. We use the screw-press, and press one day, but are confident two days' pressure would be better. From one to two hours after the cheese is put in the press it is taken out and dropped from the hoop on a round stool, half-an-inch smaller than the hoop, the bandage is then slipped on by means of a tin socker, turned over, replaced in the press, and powerful pressure applied. We have used, during the past season, tin hoops, 15 inches diameter and 16 inches deep, but do not like them, as they are not strong enough to bear the requisite pressure.

"With present appliances for heating, ventilation, &c., I am not able to keep the curing-house at anything like an equal temperature, except the basement-room—aim to keep the temperature of the basement from 50° to 60°, as nearly as possible. I prefer to have cheese in higher temperature during the first two weeks than ever afterwards. The curing-house is ventilated by ventilators in the roof, trap-doors in the floor, and windows at the sides. Stirring the milk at night and cooling as rapidly as possible prevents the cream from rising in a measure; what rises is mixed with the milk by dipping through a strainer and stirring.

"We prefer to mix the night and morning milk together, and, after mixing the rennet, we prevent the cream from rising by agitation until coagulation begins, which is from 15 to 25 minutes from the time the rennet is put in, and I am not able to discover that double the usual amount of rennet has any other effect than to hasten the process, provided the rennet is good and putrefactive fermentation has not commenced in it."

The cost of manufacturing, curing, salt, bandages, anatto, boxes, &c., may be estimated at not more than 1*d.* per lb. Some factories charge about ½*d.* per lb. for making, and a proportionate amount of the cost of everything else, according to the number of cows which a farmer keeps, or the quantity of milk which he sends to the factory. In any case 1*d.* per lb. may be considered sufficient to cover every expense.

With regard to the profit which such a charge will leave to the proprietors of the factory, we cannot do better than quote the following statement given by Mr. Willard in his paper already referred to:* —

"To run a factory using the milk of 600 cows will give constant employment to at least four persons, half or more of whom may be females. Before the war, when prices had not become inflated, the actual cost of manufacturing the milk from 600 cows was about 700 dollars for the season. This sum does not cover interest on capital invested for buildings and fixtures, but was the amount paid for labour, board, fuel, &c.

"From these data it will be easily estimated what amount of money can be realised from the business of manufacturing. Allowing that the 600 cows produce, on an average, 400 lbs. of cheese each, there will be in the aggregate 240,000 lbs. The cost of a well-constructed factory will not be far from 3000 dollars.

"We have, then,—

		£.
240,000 lbs. at one cent.†		480
Cost of running factory	£140	
Interest on buildings, &c.	42	
Annual wear and tear, or depreciation of property ..	40	
		222
Profit		£258

"Now, for 300 cows, nearly the same expense would be incurred, and the factory account would stand thus:—

		£.
120,000 lbs. of cheese at one cent.		240
Expense of running factory	£140	
Interest on capital invested	42	
Annual depreciation of property	40	
		222
Profit		£18

"We do not pretend to give the exact figures in the above estimate, but it will be seen that a factory manufacturing the milk of a less number than 300 cows will not be a very paying business, unless the manufacturer can have most of the work performed by members of his own family."

It therefore seems tolerably clear that there is a limit (in America the limit is about 300 cows) below which a cheese-factory will not be self-supporting; but there is another limit, above which the factory becomes unwieldy, too much for the supervision of one superintendent, and requiring the milk to be drawn from too large an area; but this latter element must vary with the nature of the roads and the means of conveyance. Of late years, therefore, what is known as the "Branch factory system" has been established in many localities. It is well

* 'Report of the Commissioner of Agriculture, 1865,' pp. 442, 443.

† I have translated dollars into pounds sterling throughout this article, in round numbers, at the rate of 4*s.* per dollar.

described in the following address delivered by Mr. L. N. Brown before the American Dairymen's Association in 1866: *—

"In regard to the question of branch cheese factories, I will state that, for the last four years, I have been in business which led me from one factory to another through the principal dairy region of this State. In taking this broad view of the factory system, I have seen certain objections, which, if carried out, will soon cripple it in its infancy. The first and greatest objection is the expense and trouble of carrying milk long distances. I therefore introduced and put into practical operation two years ago, and to a greater extent one year ago, the plan of working the milk at different points, and drawing the cheese together instead of drawing the milk. For this purpose I erected cheap buildings, some 18 by 24 feet, furnishing them with all the apparatus and conveniences of a nice factory, with ranges to hold ten or fifteen cheeses—or a load—which were boxed and drawn to the dry-house. I prepared the rennet, anotta, and bandages at the dry-house, sending the required amount to the branches when the team went after the cheese. I have closely followed up the experiment for the last two seasons, and found the plan to work admirably, even beyond my expectations. The advantages are greater and the objections less than I expected. The first advantage is, that it gets a large amount of cheese together, by drawing the milk but a short distance; and there is not only a saving in distance, but, as there are but few teams to deliver at one of these branches, the patron can drive up and unload at almost any moment, thus saving much time from the disadvantage of waiting his turn at a large factory. Another advantage is, that as the milk is drawn but a short distance, it is delivered earlier in the day and in better condition—two considerations which will be appreciated by all practical cheesemakers. In many instances, when milk comes in bad condition, had it been delivered an hour or an hour and a half sooner, it would have caused no difficulty in its manufacture. As it will be admitted by all that the quality of the milk has much to do in determining the character of the cheese, these facts will argue a superior dairy in favour of the branch system, to say nothing of the increased amount of the product.

"The third advantage is the facility with which the patron can obtain his share of the whey, having to draw it but a short distance, on his return home from carrying his milk. In brief, the branch system secures to the farmer all the advantages of a large factory in his own neighbourhood.

"By giving the farmers these advantages and conveniences, I think the permanency of the factory system will be established; but as I am led to believe that the day of drawing milk long distances is nearly over, it is my opinion that, unless the branch system be adopted, the large factories will break up into smaller ones, which will fail to be sufficiently profitable to stimulate individual enterprise. They will then be built by a few farmers, in convenient localities, and managed, to save expense, much like the old private dairies. As they have learned something from the present factory system, they will undoubtedly make better cheese than of old; but there will be an end to all that progress in cheese manufacture which has, within the last few years, given American cheese the first place in the world's market. Indeed, the quality of American cheese will be generally lowered; for, while few excel or equal the present standard, many will fall below it, from lack of that interest which is felt by the individual who makes cheese-making not only his business but his study.

"As to the manufacture of cheese in branch factories, they can be so placed as to get the milk from 200 to 300 cows into a single vat, which can be

* 'Second Annual Report,' pp. 62–65.

worked by one hand without any additional help. I hired a hand the past season, who ran a branch with 236 cows without receiving the least assistance from any source.

"As the help has but one vat to watch, the work can always be done in season. Not so in the large factory, with a combination of vats; for, in case two or more vats need dipping at the same time, which is often the case, one of them is obliged to wait, to its injury.

"These considerations argue two points against large factories, and in favour of the branch systems:—

"1st. The milk will be delivered at the branch earlier and in better condition.

"2nd. The work can always be done at the branch in the proper time.

"One objection brought against this system by many is, that there will be as many kinds of cheese as there are places of manufacture. My experience does not sustain this objection. Distance has nothing to do with the result. If the same rennet and anotta are used, and the same rules are observed in the process of manufacture, what difference can it make whether the vats be two feet or two miles apart? The conditions being the same, I see no reason why the result would not be the same. Facts and observation show that it is. During the past season I visited a large number of factories, and nowhere did I find a more uniform lot of cheese than was produced under the branch system.

"As regards the amount of help, I think a dairy of 1000 cows could be manufactured nearly as cheaply at four branches, with 250 cows each, as if the milk were all delivered at one place. I am now speaking simply of making. The additional expense and trouble would be in drawing the cheese together. Still this is less than the extra expense and trouble of drawing the milk long distances. There is not only more weight, but the milk has to be delivered in season, whatever may be the weather, while the cheese can be left over, in case of bad weather or hurry.

"When the milk is all drawn to one large establishment, the entire care is commonly thrown upon one person, the rest feeling little or no responsibility, and not working with the interest required in the successful performance of such delicate business. But when the milk is worked by the branch system the care is divided, and not only a feeling of responsibility but a spirit of rivalry is awakened; consequently, the labour is more carefully and thoroughly performed.

"Another objection raised against the branch system is, that it will require all experienced hands. But, as the milk comes in better season and condition, and there is only one vat to watch, with the rennet and anotta prepared and furnished ready for use, it will readily be seen that, with frequent visits from the overseer, it will not require as much experience and skill as it would to manage a large factory. I have found no trouble with hands of little experience. In one case, I hired a hand who was totally unacquainted with cheese-making, and he run a branch through the season with the best of success. There is an effort among the hands to excel each other; and should any of them have bad luck, as each branch has its own mark, the superintendent will readily detect it, when a visit to the branch will enable him soon to put everything right.

"Farmers at a distance would generally choose to pay for drawing their milk rather than to draw it themselves. But, if a branch were erected in their neighbourhood, the general opinion is that each would rather draw his own milk than be obliged to get it ready for the milk-wagon, at just such a minute, every night and morning. Admitting this to be so, the branch system would save to many the sum paid for drawing their milk to a large factory, it, on an average, costing 2 dollars 50 cents per cow. Allowing it to cost 25 cents per

100 lbs. more to work up milk under this plan, then, as a cow will make 400 lbs., which would make the additional expense 1 dollar per cow, the saving to the farmer would be 1 dollar 50 cents on each cow, which, with other advantages mentioned, would throw the argument in favour of the branch system.

"In conclusion, I will say to those who are about to build, unless you adopt the branch system, do not build too large. I have been on the road for the last three months, and have exchanged views on this point with a large number of manufacturers. It is the prevailing opinion that the day of drawing milk long distances is rapidly coming to a close. From a mile and a half to two miles is as far as it will be found feasible to draw it. This, as a general thing, will get together the milk of from 200 to 300 cows."*

The foregoing extracts show with tolerable clearness the salient points in the economy of cheese-factory management, but as there still remain unexplained several points of detail in the organisation and working of a cheese-factory, I endeavoured last February to obtain the required information from practical men in America, with regard to one or more well-managed factories with which they might be acquainted. In my letters I asked for information on the following subjects:—

1. Number of cows (average).
2. Size of buildings.
3. Cost of buildings.
4. Cost of machinery.
5. Capital invested.
6. Workpeople employed.
7. Quantity of milk received.
8. Distance (maximum and average) from which the milk is brought.
9. Pounds of cheese made per annum.
10. Charge for making—
    (*a*) the factory being owned entirely by the patrons.
    (*b*) the factory not being owned by patrons.
11. Disposal of the whey.
12. Average dividend to proprietors if other than the patrons.

The following letters from Mr. X. A. Willard, Mr. A. L. Fish, Mr. J. R. Chapman, and Mr. A. Bartlett contain very valuable information on these points; and I particularly desire to draw attention to Mr. Willard's admirable exposition of the particulars required, as it seems to cover nearly the whole ground required by those who desire to attempt the establishment of cheese factories in England:—

Little Falls, Herkima, County New York, March 19, 1869.

DEAR SIR,—I now take up your letter of February 10, and will try and answer your enquiries in the order in which they

* In England it would get together the milk from about 600 to 1000 cows at a moderate computation.—*H. M. J.*

are put. But first, let me say a word about the organisation of our cheese factories.

There are but few factories where the milk is purchased and business carried on wholly under control of one or more proprietors, thus making it a separate and distinct interest from that of patrons. The popular method of organising factories, and one which seems to give the best satisfaction, is to make them joint-stock affairs.

The ground is selected, an estimate made of buildings, machinery, and fixtures; then the whole cost is divided up into shares of 50 or 100 dollars each.* The neighbouring farmers, or those favourable to the movement, take stock in proportion to the number of cows from which they are to deliver milk. Officers are chosen, and the company managed on the joint-stock principle. Usually, some one of the party is selected as salesman, who makes sale of cheese at best prices, makes up the dividends, and pays over shares to patrons whenever a sale is effected, deducting, of course, the price of manufacturing, which is fixed at a point to cover any expenses, including 10 per cent. on cost of buildings and fixtures. A good cheese-manufacturer is employed as manager, either at a salary or at a certain price per pound of the cheese made. This manager employs his own labourers, and is at all the expense of running the factory, keeping record of milk delivered, entering it in books of the company, and on the pass-books of farmers; and also is to care for the cheese while curing, &c., &c. The milk is weighed at the factory as it is delivered, as experience has shown that every 10 lbs. of milk will, on an average, through the season make 1 lb. of *cured* cheese, firm, solid, and in good marketable condition. Each farmer thus has a daily record in his own pass-book of what his herd is yielding.

The manager is employed with the understanding that he is to make a good article, and his product is examined from time to time by committees of the company and experts, and by farmers, when they deliver milk as they choose, and hence any mismanagement is soon discovered. If his work is not satisfactory he is discharged, or held responsible for damages.

The stockholders and those delivering milk meet from time to time and deliberate as to sales, each voting according to his number of cows; and thus instructions are issued to the salesman.

But there is another method: one man, or a company, erects buildings, and is at all expense in running the factory, charging by the pound for manufacturing. In this case the farmers of

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* 10*l.* to 20*l.*

a neighbourhood bind themselves under contract to deliver milk at the factory for a series of years as an inducement for the investment of capital in the factory, &c. In this case the manufacturer, or proprietor of the factory, has no interest or claim upon the cheese which belongs to patrons. They appoint a salesman, and control the product precisely as in the first instance.

It will be seen that under this system of checks every one delivering milk is upon an equality, as each man if he choose can weigh his milk at home and compare it with the weight at the factory as entered on his pass-books. The company is responsible for milk delivered, the account being payable in cheese. In other words, the institution is a kind of bank where milk is deposited instead of money.

With these remarks I pass at once to your questions.

1. *Number of Cows (average).*—The number varies from 300 to 2000. Our experience shows that a factory with less than 300 cows does not pay expenses including interest on capital invested, unless an extra rate is charged for manufacturing.

Extremely large factories—say 1500 to 2000 cows—do not give the best returns to farmers. There is usually more waste: the milk comes from a long distance, is liable to be in bad condition, and the work at the factory is often hurried (perhaps sometimes from necessity) and slighted. I do not say that this is always so, but such is the general working of these large establishments.

The best results are obtained, both as to quantity and quality of product, where the factory uses the milk of from 500 to 800 cows, or, at least, not above 1000. Taking the average of factories, I think the number of cows will not exceed 500.

2. *Size of Buildings.*—Improvements are constantly being made in buildings. The first buildings erected were rude and cheap; now they are more substantial, but still without any attempt at architectural beauty. In this respect we here made a mistake. The plans should go into the hands of competent architects, and the exterior should be of a design pleasing to the eye. Buildings with some pretensions to architectural display cost but little more, but can be turned to good account in case they are abandoned for cheese-making.

In some of our factories the manufacturing department and "dry-house," or curing-rooms, are under one roof; in others, these departments are in separate buildings. Our system of marketing cheese is somewhat different from that in England. The cheese is not held in curing so long. We try to send our cheese to market at 30 to 60 days' old. There are few curing-rooms erected here with the design of holding cheese for the entire season. The Fairfield factory of Hirk County, and the Willow Grove, of Oneida County, send out cheese favourably known in the English market. They have for several years received top prices from English shippers.

The Fairfield factory is located 8 miles from Little Falls, the largest country cheese-market in America. This factory receives the milk of 1000 cows. The manufacturing department and curing-rooms are under one roof. The establishment is 148 feet long by 38 feet wide, 3 stories high. The second and third stories are the curing-rooms. The manufacturing-room is on the lower floor, and is 40 feet by 28 feet; press-room adjoining 35 feet by 31 feet. The boiler of 5 horse power stands in a separate building, and cost 450 dollars.*

The manufacturing-room is provided with double vats used for cheese-making. These vats are each 16 feet long, 3 feet 4 inches wide, and 18 inches deep, and each holds 600 gallons. I may remark here that this size is convenient for working the curds, &c., and are of the size and shape commonly used at the factories. They are double, the inner one of tin, encased with a wooden vat, leaving space of about 2 to 3 inches at the sides and bottom between the vats, where heat is applied, either steam or hot water.

The Willow Grove is in Oneida County, New York. The dry-house upon high stone piers. It is 100 ft. by 30 ft.; two stories. The manufacturing department is in a separate building, being 30 ft. by 28 ft., with press-room adjoining, 26 ft. by 14 ft. This factory has capacity for 1000 cows.

The Whitesboro factory (Wights), 4 miles from the city of Utica, Oneida County, was erected for 600 cows. Dry-house 104 ft. by 30 ft.; two stories.

Directly opposite stands the manufacturing department, 26 ft. by 50 ft., which includes press-room, where the cheese-presses stand in two long rows.

I send enclosed rough draught of factory, where the manufactory is on the lower storey, curing-rooms in 2nd and 3rd stories, cheese to be elevated from press-room through openings in floor above by machinery. It may help to give you a better idea of our factories.†

3. *Cost of Buildings.*—This of course will vary in different localities, and must be regulated according to taste in architec-

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* About 90*l.*

† These plans have already been published in 'The Farmer,' March 17, 1869, and in 'The Country Gentleman's Magazine,' vol. vii., No. 10, pp. 362 and 363, April, 1869. It is, therefore, unnecessary to reproduce them here, especially as they do not seem adapted to the requirements of the English climate, and to our appliances for regulating temperature. Two other plans are given on pp. 196 & 197.

ture, cost of material, labour, &c. Factories cost here now from 3000 to 10,000 dollars (600*l.* to 2000*l.*).

4. *Cost of Machinery.*—The principal cost under this head will be for steam-boiler, vats, presses, and hoops:—Steam-boiler, with fixtures, 500 dollars; milk-vats, 100 dollars each; screws for frames, say 5 dollars each; hoops, each 2 dollars.

From 1200 to 1500 dollars (240*l.* to 300*l.*) will fit up a factory of 600 cows in good running order.

Milk-vats, with heater attached, are used to some extent. These obviate the use of steam, and are furnished, 600 full size, for 200 dollars (40*l.*) each.

5. *Capital invested.*—If you add site or grounds, this question is answered in Nos. 3 and 4. Factory sites are usually leased at small rentals.

6. *Work-people employed.*—A factory of 600 cows will need five hands, and perhaps one more when curing-rooms are full:—The manager, or head-manufacturer, who gets from 800 to 1200 dollars salary for cheese-making season (9 or 10 months); second man to work in vats, put cheese to press, turn, &c., 30 to 40 dollars per month, and board; three or four women at 4 and 5 dollars per week, and board.

Boys and girls, or young persons of immature age, are not usually employed.

The manager of the factory is expected to "take off his coat" and work at every part of the business, as occasion requires.

7. *Quantity of Milk received.*—This of course will depend upon a variety of circumstances—goodness of the cows, pasturage, season, time of commencing and closing operations, &c.

The Week's factory, in 1867, had an average of 620 cows, and was in operation 209 days. Pounds of milk received, 2,481,615; green cheese made, 261,904 lbs.; cured cheese, 250,540 lbs.; shrinkage, $4\frac{1}{3}$ per cent. Pounds of milk for one of green cheese, $9\frac{48}{100}$; pound of milk for one of cured cheese, $9\frac{91}{100}$.

The gross receipts per cow (average for the season, exclusive of income from butter and cheese made before factory opened, and after its close) varies from 34 to 78 dollars (6*l.* 16*s.* to 15*l.* 12*s.*), the former being the poorest dairies, and the latter the best.

The cheese that season sold very low in America. The average sales of the Week's factory being only $14\frac{40}{100}$ dollars per 100 lbs. (69*s.* per 120 lbs.).

The receipts in other years have been much larger, but I suppose something of an average is what you desire.

Some of the factories in Herkima make an average of over 500 lbs. cured cheese per cow. At present prices of cheese, 20 cents. (10*d.*), this would give 100 dollars per cow (20*l.*).

8. *Distance (maximum and average) which Milk is brought.*—

The average distance which milk is brought in New York will not exceed $1\frac{1}{2}$ miles. Perhaps 4 or 5 miles may be given as the maximum. At the West, rare cases are mentioned where milk is carted 8 miles and more. This is regarded as altogether too far to carry milk with profit, at least on our American roads, which, for the most part, are bad during a considerable part of the year.

The cooling of milk at the farm before it is canned, does not usually obtain among our dairymen.

Great losses annually result from canning milk too warm, and then hauling it in this condition to the factory.

I commenced urging our dairymen to cool their milk at the farm several years ago, and especially since returning from my examination of European dairies in 1866.

I was employed that year by the American Dairymen's Association to visit the dairy districts of Europe, and report upon their dairy management. I went into the dairy districts of Great Britain, and made an examination of all the best English methods of manufacture. I found that in the matter of cleanliness, care of milk, treatment of stock, management of pastures, &c., the English were in advance of us, and my Report upon these points has effected a great change in American dairy practice. I am glad to say also that we are beginning to cool milk at the farm before canning. The result of all this, I need not say, has greatly improved the character of American cheese.

At the recent dairy conventions there were a great number of devices for cooling milk to 60° at the farm; and when they become universally adopted by farmers, factory cheese will be vastly better than now.

As to our factory system, excellence and uniformity of product is almost always certain when good milk is delivered at the factory. The machinery and appliance for manufacturing render cheese-making comparatively easy. Everything is arranged so as to be convenient, and avoid lifting and heavy work.

Our process is reduced to a system and rules. The managers employed must exhibit high skill in manufacturing, and they make cheese-making a study, and adopt it as a profession. We pay high wages for skill, and this induces manufacturers to great exertions for success.

9. *Pounds of Cheese made per annum.*—This has been answered under previous heads. I may remark, however, that a little less than 10 lbs. of milk is considered a fair average the season through for 1 lb. of cured cheese.

Some skilful manufacturers get a pound of cured cheese (average for the season) from a trifle less than 9 lbs. of milk.

10. *Charge of making.*—The usual charge for making is 75 cents (3*s.*) per 100 lbs. cured cheese. This includes cost of cheese until sold. If the factory is small a penny a pound is charged.

A large number of factories charge 2 cents (1*d.*) per pound, and furnish everything required, such as bandage, anotta, rennet, and the boxes in which the cheese is placed for shipping.

Cheese is never sold without being encased in a box, either for the home or foreign trade. The carting of cheese from the factory to the railway station is done by patrons.

11. *Disposal of the Whey.*—The whey is usually given to swine. Ample pens and yards are provided at the factory. Each farmer or patron is allowed to keep here 1 pig for every 5 cows.

He can have a separate pen if he chooses, or put them in the yards with others. The whey is conducted from the factory into large reservoirs near the pens, and when the hogs are to be fed a faucet is opened, and it runs to the troughs. At some factories the whey is carted home by patrons each day, as they return from delivering milk.

Quite recently a process has been invented for taking the butter from whey. The whey is run off, sent from the curds into a large copper vat (600 gallons) placed over an arch. Heat is applied until the mass is raised to a temperature of 180°. Acid (sour whey) is added at the rate of a gallon for every 50 of milk. The oil and albuminous matter rise at once, and are skimmed off and put in a cool place, and next day churned at a temperature of 56° to 68°.

About 20 lbs. of butter is thus obtained from 500 gallons of whey.

The butter is of good colour, and a good article for present use. When the process is properly conducted the fresh butter is not easily distinguished from that ordinarily made from cream, and is sold in the market at the same price.

At some of the factories the whey is considered a perquisite of the manufacturer, who purchases hogs and feeds them.

I should have remarked that when the butter is taken from the whey as above, the whey is used for feeding pigs. It is fed sweet, and in practice we find the pigs thrive upon it quite as well as when fed sour (the usual way), with butter retained.

Faithfully yours, &c.,
X. A. Willard.

In reply to a subsequent letter Mr. Willard says :—

All the factories make frequent tests for milk diluted with water. No tests are made for determining the proportion of caseine. The instruments in use are a set of cream-guages, and per cent. glass hydrometer, lactometer, &c. As the milk comes to the factory a small quantity is taken out and set in the cream-guages, and the quantity of butter determined. The cream is then removed, and the hydrometer applied, and if the sample fails to come up to the required standard, the matter is placed in the hands of the committee for settlement.

There are special laws enacted in the different states, punishing frauds on cheese factories with heavy fines, and making it a criminal offence.* A man who is caught watering his milk is considered but little better than a thief, and is despised. His connection with the factory is also broken. It has been found that there is but little variation in the standard of milk from time to time in the dairies of a neighbourhood. The different dairies test very nearly alike, notwithstanding there may be a very marked difference between the milk of single cows. Our courts have decided in some instances that a test by the instruments, when properly made, is good evidence in the case. With such a large number of factories as we have scattered over the country, frauds will occur from time to time, but as they are soon found out and punished, there is less trouble than many persons would imagine who were not acquainted with our system.

Faithfully yours,
X. A. Willard.

Dear Sir,—In reply to your letter of inquiry, I will say that I recognise in the cheese factory system—

1st. The milk of a class of dairies delivered to a factory having fixtures well adapted to making and curing cheese will turn out a better average quality (if worked with skill) than if worked up separately by different hands and fixtures.

2nd. Bringing a quantity together puts it under the control of better skill, and lessens labour of making in proportion to increased amount of milk, like other manufactures.

Requisites to success.—1st, access to plenty of pure cold water, with building-site shaped to pass off all surplus slops freely to prevent the influence of bad odours; 2nd, means by which the most perfect control may be kept of temperature in the process of making and curing cheese; 3rd, pure milk, salt, and rennet; 4th, skill to adapt the means to the ends desired. It is impossible for me to fix the cost of building, as that depends upon cost of material and labour, which varies with localities; the size of factory is proportioned to the number of

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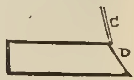
* See footnote to p. 199.

cows relied on for its support. Each 100 cows' milk will require 400 gallons room in vats to curd and work the milk; any number of milk-vats varying in size from 100 to 1000 gallons may be let by one pipe leading from heater, driving steam or warm water (water is preferable, as it makes a softer heat). Milk-vats are usually made of tin or galvanized iron, from 3 to $3\frac{1}{2}$ feet wide, from 16 to 20 inches high, and long enough to hold the desired amount; large vats are preferred to smaller ones, as one can work a large vat, but cannot work several smaller ones.

Each 100 cows' milk requires 1000 square feet of curing-room floor, unless cheese is sold young, to admit of presses standing convenient to curd-vats. The manufacturing-room should be 36 to 40 feet wide, which is also an economical width for curing-rooms, counting cost of building materials, as roofing is a prominent item in expense of building—the more curing-room floor it covers the less comparative expense in building. As I do not deem it proper to have one shelf for curing cheese above another, I would advise to build a factory several stories high, with curing-rooms 7 feet in the clear, and ventilated by shafts 12 inches square, of inch boards, leading from the first or lower room to the top of the building; said shafts to be placed through the centre of the curing-rooms, once in 10 or 12 feet, with a small door opening into the shafts at the top of each room, as it passes upwards through each room. Said doors to be opened and shut at pleasure, to admit of damp bad air passing out of each room upwards, while the cheese is not exposed to a current of air from without. The air drawn out of curing-rooms by said shafts is replaced by air from without coming into the rooms through small pipes, or boxes, 6 inches square, passing through the outer walls of each room at the floor, by which it does not strike the cheese on shelves, said boxes through the outer walls to be put through once in 10 or 12 feet. The inner end to be raised one inch to keep rain-water from passing into the rooms; the inner end sawed off aslant, so that a small trap-door C, when shut, will keep shut by its own weight, the outer end D, covered by wire-screen, if necessary, to keep out vermin, thus the air passes in at the bottom of the curing-rooms, and passes out at top without striking the cheese; with such fixtures for ventilation, no more windows are needed than to light the rooms. A part of lower floor may be used for manufacturing-room, if separated from curing-room by tight partition and tight floor overhead, if ventilated as before described.



I deem it essential to have the building so tightly covered over and around curing-rooms as to reject outside influences at pleasure, and to be prepared to create warmth and dry air within when needed. Such is the construction of a factory building that I built for my own and neighbours' convenience, which proved a success.

One person of sufficient skill to direct all the movements in a factory, with character to force obedience from others, will manage any sized factory from 500 to 1000 cows, with inexperienced labour of one hand to every 200 cows' milk; such hands of experience command from 50 to 100 dollars per month here, and raw hands from 2 to 4 dollars per week, and board found them.

The distance milk may be carried to a factory without injury depends upon condition of roads and facilities for quick conveyance. The time milk is on passage should be considered, as it is usually closed up tight in cans while warm from the cow, and started to the factory as soon as milking is done, in which state it is liable to injure if long *en route.* Experience has resulted in establishing several smaller factories in neighbourhoods where one large factory formerly took all of the milk, for reasons before stated. From 2 to 4 miles will cover the average distance that milk is now carried to factories here. Our factories are run from the first to middle of April, to first to middle of November; average weight of cheese per cow, 400 lbs.; average weight of milk for a pound of cheese (market weight) is 10 lbs.

The patrons owning no share of factory are charged one dollar per hundred for making cheese, and dispose of their own whey after it has been set 24 hours, and skimmed to get oil to grease the cheese. The patron pays all incidental expenses, such as rennets, salt, bandage, colouring, packing-boxes, paper, &c.

The owner of factory finding all, and delivering the cheese in boxes packed, when sold, the patron is charged 2 dollars per hundred, market weight. If the whey is set for table-butter, then the manufacturer has half of the table-butter, and the patron half; the whey then goes to the disposal of patrons, and is carried home to slop cows and swine, or fed to swine at the factory pens.

Dear Sir, having briefly outlined some points that have come under my observation, I must close, leaving a multiplicity of minor details that are involved in the intricate science of cheese-making.

Remaining yours most respectfully,

A. L. Fish.

Oneida Lake, Madison Co., New York, Feb. 17th, 1869.

Dear Sir,—I have the honour to acknowledge the receipt of your letter of the 10th of February, asking information about cheese factories. I can do so better by giving you general explanations mixed with statistical details, than by categorical answers. In the first place it makes no difference, pecuniarily or otherwise, to the patrons, whether a factory is founded on joint-stock principles, or owned and run by the cheese-maker. The cost to the patrons for making boxes, bandages, anotta, and the use of the factory, is never less than 2 cents per lb. sale weight, and sometimes a trifle more. When a stock company hires a cheese-maker, for labour in making, curing, and boxing, he receives from 75 to 90 cents per 100 lbs., the company finding buildings and machinery, rennets, anotta, boxes, bandage, &c., and charge the patrons 2 cents per lb.; and this leaves about half a cent per lb. for dividend upon the capital invested in the factory and fixings. A large factory of from 400 to 600 cows pays the maker 75 cents per 100 lb., and small ones pay more, some as high as 90 cents. The dividends in stock factories range from 10 to 20 per cent. per annum. I do not know when a stock company hires the head cheese-maker by the month or season, although it may exist; they invariably in my section let the making of the cheese to him, and he hires the help, which always consists of men and women, boys and girls being of no account in a cheese factory. The men-help receive from 20 to 25 dollars and board per calendar month; the women-help from 2 to 3 dollars per week with board. All our factories make cheese on Sunday throughout the season, thus making it a galley-slave business. At the ordinary price of cheese, it is usually considered by the patrons to take one day's milk in every week to pay the charges at the factory. In a factory of 400 cows, the curing-room of two floors is 80 feet long, 30 feet wide, and the side walls 15 feet high; the roof one-third pitch, and covered with shingles. The vat-room is 30 feet square, and 12 feet depth of side, with plenty of room for three vats, cooler, and presses. I think that a roof of thatch on curing-rooms would be preferable to any other, although I know of none so made; it would produce a more equable temperature. The total cost of a factory for 400 cows will be about 3000 dollars (600*l.*); 2000 dollars for buildings, and 1000 dollars for machinery. The buildings are of wood, and there would be three vats at 250 dollars each; twenty screw-presses, at a cost of 150 dollars; twenty hoops equal 60 dollars; and one cooler, equal 10 dollars. Vainnot Ralph's Patent Equalizer Vat is the best vat made in this country, because it is the simplest. The factory which I have been detailing, had on an average last season 387 cows; the maximum distance the milk was drawn was 3 miles, the average distance 1½ mile; it received during the season of 1868, 1,260,953 lbs. of milk, and made 126,453 lbs. of cured cheese; the whey was taken home every morning by the patrons in their milk-cans. Some factories have a yard adjoining the factory stocked with hogs, to whom the whey is fed at a small charge per week; but this hog-yard is an abominable nuisance, and none ought to be allowed to exist. We have a great deal of trouble in this country in getting good sweet milk to the factories, and this arises from a variety of causes, the principal of which is the retention of the animal heat in the normal condition of the milk, held there by the intense heat of the atmosphere, and tight milk can-slides. I am making experiments, and intend next season to test a can-slide, which will allow the animal heat to escape freely. There is also a general failure on the part of the patrons in keeping their milk-cans, can-slides, and pails clean and sweet. Tin pails ought invariably to be used. Milk might easily be cooled at the time of milking, by placing the can in a tub of cold water, changing the water two or three times. The best curing-rooms in this country are built of wood, and not plastered; whether it would be the best method of building them in England would be best determined by experiment. *I can make more even and fine flavoured cheese from a private dairy than I can from a factory, and I have personally tried both.* All the trouble with the English counties in making cheese is "*they don't know how.*" If they would use American vats, and adopt the American system in making, they would fully equal the famed Cheddar cheese. A Scotchman of the name of M'Adam made cheese last season in Herkima county, New York, on the Cheddar plan, and was beaten by a neighbouring factory in sale of cheese.

If you wish to put up a model factory I can send you next year a first class cheese-maker.

Your obedient servant,
JOHN R. CHAPMAN.

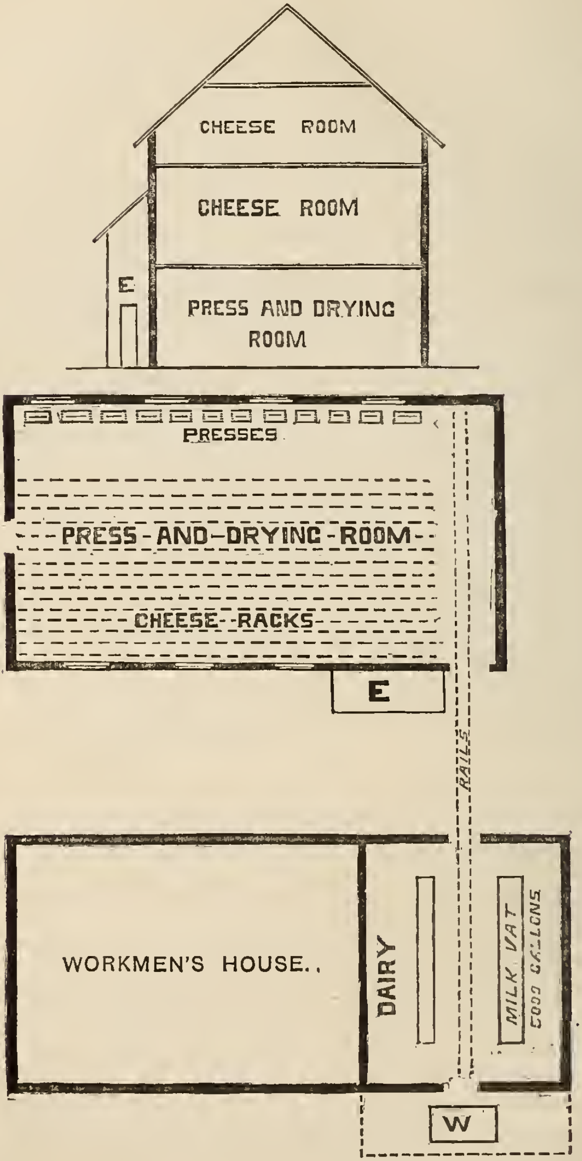
Greenwich, Huron County, Ohio, April 13, 1869.

MY DEAR SIR,—Your favour of the 10th February is received, having been forwarded to me at this place, where I shall be during the next eight months.

In reply I will give you the statistics of some factories of my acquaintance, so far as I am possessed of the items.

1st—Horr and Warner's Factory, Huntington, Lorain county, Ohio. Average number of cows 1000. Size of buildings—manufacturing-room, 30 feet by 40 feet; press-room, 14 feet by 50 feet; drying, or curing-house, 30 feet by 100 feet, two stories high, besides basement. Cost of buildings, 2000 dollars. Machinery, 1800 dollars, this includes vats, presses, boilers, &c. Capital invested about 6000 dollars, 1000 dollars of which is in land. Work people employed, four men at 8 dollars per week,

Fig. 1.—*Plan and Section of Mr. Moulton's Factory, Canda West, designed for* 1000 *Cows.*

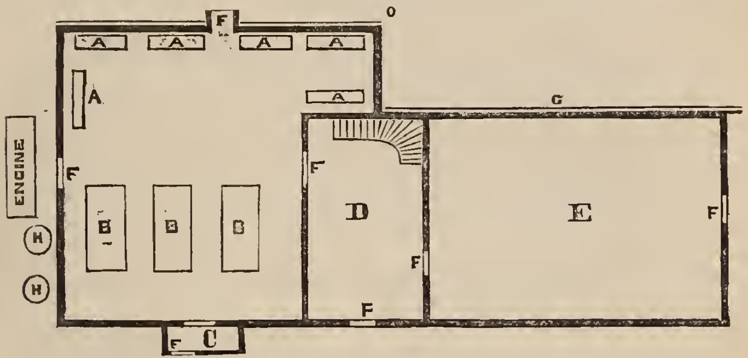


E. Engine-room. W. Milk-weighing machine with shed-roof over. Scale, 24 feet to 1 inch.

and four women at $3\frac{1}{2}$ dollars per week, besides board; the maximum distance from which milk is brought to this factory is 6 miles, average about $2\frac{1}{2}$ miles; factory not owned by the patrons; charge for manufacturing, and furnishing salt, bandage-cloth, colouring material, curing, and selling cheese, 2 dollars per 100 lbs.; whey fed to swine at the factory.

2nd—Peter Colbetzer and Co.'s Factory, in Spencer, Medina county, Ohio. Average number of cows, 700. Size of buildings, 20 feet by 100 feet, two stories high, with lean-to for press-room, 14 feet by 40 feet, and milk receiving-room, 10 feet by 12 feet; which also serves for an office. This is a very convenient factory.

Fig. 2.—*Plan of Peter Colbetzer and Co.'s Factory, Medina County, Ohio.*



A. A. Cheese-presses. B. B. Cheese-vats. C. Milk receiving-room and office.
D. Hall, used for salt, boxing cheese, &c. E. Curing-room. F.F. Doors.
G. Conductors for carrying the whey to the Hog-yard. H.H. Water-tanks.

The floor in the manufacturing and press-room inclines to the rear 14 inches, where a gutter is placed in the floor, which also inclines 4 inches, and discharges at O. The upper story is all devoted to curing cheese. Cost of building, 2200 dollars (440*l.*); machinery, engine, boiler, and other furniture and fixtures, exclusive of land, 2350 dollars; capital invested, 6000 dollars (1200*l.*); work-people employed—one man at 14 dollars per week, three men at 8 dollars per week, one boy at 5 dollars per week, two women at $5\frac{50}{100}$ dollars per week. Milk received, 2,130,500 lbs.; cheese made, 228,200 lbs. Maximum distance of transporting milk 5 miles, average a trifle less than 2 miles. Charge for making and furnishing salt and bandage-cloth, 2 cents (1*d.*) per lb., the factory not owned by the patrons. Whey fed to hogs; gross earnings of factory, in 1868, 5300 dollars (1060*l.*), net 2800 dollars (560*l.*)

I am, very truly your most obedient,

Anson Bartlett,
President, Ohio Dairymen's Association.

I have already stated the leading results which American dairymen have obtained by the aid of the factory system; but it is still open to question whether the same results might not be obtained by a more skilful system of manufacture in private dairies. That this could be done there is no doubt, provided that a sufficient number of first-rate cheese-makers could be hired; but here is the difficulty. The advantages which American dairymen have derived from the factory-system are thus described by Mr. Willard, in the paper already quoted from (p. 439):—

"The advantages claimed for the factory-system are superior quality, uniformity, higher prices, saving by buying at wholesale such materials as salt, anotta, boxes, &c, and finally relieving the farmer and his family from the drudgery of the manufacture and care of cheese.

"It is not pretended that a better quality of cheese can be made at the factory than in families, but that it is quite as fine as the best, and therefore above the average of that manufactured in small parcels. . . . .

"The agent or superintendent makes it his business to see that all parts of the work are properly performed. He employs skilful workmen, and his interest and reputation are at stake, prompting him at all times to do his best. He knows that neglect or mistakes will not be tolerated, and the desire to satisfy persons interested, so as to secure their patronage, stimulates him to make every exertion to build up and sustain a reputation for "fine goods." He has every convenience at hand for manufacturing to advantage and making the business a sole employment. He is not liable to be disturbed by other matters which might serve to call his attention away from time to time to the prejudice of the immediate work at hand.

"The same rule must hold good with him as among those engaged in other professions and arts; for he who gives his whole attention and energies in a certain direction is likely to become more skilled, and arrive nearer to perfection in his calling, than he who is striving to do many and diverse things at the same time—more especially in cheese manufacture under this system, as a high degree of skill is expected, and jealous and interested eyes are daily watching and noting every shortcoming. Uniformity and fine quality are more likely to obtain under this system, and whatever progress can be made towards improvement will naturally develop itself more rapidly here than among persons scattered over a broad extent of country, and who are so occupied with a variety of work as to have little time to spend in the improvement of any one particular branch.

"The factories, so far as we are acquainted, have acquired a high reputation for fine quality and uniformity.

"At some of these establishments we have seen a large number of cheeses, making in the aggregate more than a hundred thousand pounds, so uniform in appearance, as they lie on the tables, that the most practised eye could detect scarcely any difference in their manufacture. Such a quantity of cheese uniform in size and quality will usually command a higher price in market than that of single dairies, from the fact that in the latter an allowance is always made by the purchaser for unequal or imperfect cheese.

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"We come now to consider the most important advantage to farmers in this union arrangement. It is the relief from the drudgery of cheese-making and the constant care and attention necessary in properly curing and fitting the cheese for market. It would be difficult to estimate this in dollars and cents, since health enters into the account more largely than is generally suspected.

It is believed—and we speak advisedly—that the old method of cheese-making has done more to injure the health of women in cheese-dairying districts than any other cause. Much of the work about the dairies ought to be performed by men; but too often the manufacturing and most of the care of cheese are left wholly to females, overtasking their strength by hard and exhaustive labour, thereby laying the foundation of weakness and disease.

"As the same process has to be gone through with in manufacturing cheese, whether the quantity of milk be large or small, and as nearly the same time also is occupied, it will be seen that what requires the labour of a great many persons to do, when cheese-making is divided up in families, can be accomplished with but few persons on the factory-system—some five or six being sufficient to do all the work about an establishment manufacturing the milk of a thousand or more cows.

The objections which have been made by American dairymen to the factory-system are summed up by Mr. Willard, as follows (*loc. cit.*, p. 440):—

"The objections urged against cheese factories are—difficulty of detecting adulterated milk; the carrying of milk to the factory, and liability of sour milk, difference in quality of milk, arising from the manner in which cows are fed and managed; the loss of whey,* and the necessity of manufacturing the early and late cheese in the family. These are the principal objections urged by dairymen. As the milk is measured at the factory and each credited with the amount daily furnished, it is evident that, when there is a considerable quantity, a dishonest person could add water, and thus increase the number of gallons. Such cases have occurred, and the individuals cheating have been summarily expelled from the association. We know of no instrument or mechanical device that will detect, with perfect reliability, watered milk, and therefore a watchfulness on the part of the superintendent, and the exclusion from the association of persons of doubtful honesty, are the only means of meeting the difficulty.†

"Some object to the labour and trouble of carrying milk to the factory, and the necessity of keeping regular hours for its delivery under all circumstances of weather, &c., since no delay can be made at the factory for the milk of a single dairy without hazarding the acidity of a large quantity—at least that contained in one vat—besides deranging in some degree the regular factory-work. Others contend that, having the milk, the cheese can be made by the family with but little more trouble and labour than that of carting the milk, while one's own time and convenience can be studied at pleasure, and the cheese be at all times under immediate control.

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* This is no longer an objection, as will have been seen by Mr. Willard's letter.

† The following is the text of the State of New York Act relating to diluted milk:—"Whoever shall knowingly sell, supply, or bring to be manufactured to any cheese manufactory in this State, any milk diluted with water, or in any way adulterated, or milk from which any cream has been taken, or milk commonly known as skimmed milk; or whoever shall knowingly keep back any part of the milk known as 'strippings;' or whoever shall knowingly bring or supply milk to any cheese manufactory that is tainted or partly sour from want of proper care in keeping pails, strainers, or any vessel in which said milk is kept, clean and sweet, after being notified of such taint or carelessness; or any cheese manufacturer who shall knowingly use, or direct any of his *employés* to use, for his or their individual benefit, any cream from the milk brought to said cheese manufacturer, without the consent of all the owners thereof, shall, for each and every offence, forfeit and pay a sum not less than twenty-five dollars, nor more than one hundred dollars, with costs of suit, to be sued for in any court of competent jurisdiction, for the benefit of the person or persons, firm, or association or corporation, or their assigns, upon whom such fraud be committed."

"Without extra care and cleanliness as to the pails and milk-cans there is liability of sour milk from time to time, which, of course, would not be received at the factory, as milk only slightly acid would damage that with which it came in contact. The milk-cans for carrying the milk, it may be observed, are somewhat difficult to cleanse and to keep sweet; and the confinement of the milk, and its agitation while being carried in hot weather, render it susceptible to change, especially if there be the least taint of acidity about the cans.

"Dissatisfaction often occurs at the factory with regard to the condition of milk, the superintendent being certain that the milk is slightly and perhaps perceptibly changed, while the farmer stoutly insists that it is perfectly sweet; and he goes home in no pleasant mood, complaining that his cans were not perfectly cleansed, laying the fault of the sour milk upon some member of his family, or disbelieving that the milk was changed. If the milk is not received at the factory it is a loss to the stockholders. Hence it will be seen that more or less trouble is brought about on this account. Not unfrequently bad feeling is engendered on the part of the farmer and his family, and he withdraws from the association.

"Another objection is urged, and with some apparent reason, that the quality of milk varies with different persons, according to the manner in which the cows are supplied with food and are managed throughout the season. It is contended that clean, sweet, upland pasture, an abundance of food, and plentiful supply of pure water, cattle wintered well and receiving careful treatment in every respect, will produce a better quality of milk, from which more and better cheese can be made than when the reverse is practised. And yet the poor herd that has been wintered improperly, that is pastured on the coarse herbage of low lands, with general bad treatment on the part of the owner, is credited according to the quantity furnished on an equality with the better herd. It is not easy to see how this can be remedied without excluding such from the association."

The difficulties which cheese-factories must necessarily contend with are thus shown to be somewhat serious; but that they can be overcome has been proved by practical test in America.

It now only remains to endeavour to estimate the adaptability of the American cheese-factory system to England. The materials for this estimate I have collected chiefly by personal visits to dairy districts, and partly also by correspondence with influential dairymen. My enquiries have, I venture to think, produced a twofold result. In the first place they have afforded me material for the following estimate; and secondly, they have performed the much more important function of inducing a large number of dairy-farmers to make this estimate for themselves in their own individual cases. When the principal persons concerned in such a matter, where the question is one of superseding a custom sanctioned by the usage of generations, begin seriously to consider whether the new system may not be better than the one handed down to them by their forefathers, they have in most cases gone half way towards forming a correct judgment. In Derbyshire a committee of landlords and tenant-farmers, nominated by the Derbyshire Agricultural Society, are, at this moment, considering the desirability of starting an experimental factory in their own district. The chief cause of this movement is the increased and increasing relative price of American factory-cheese; but the knowledge of this fact has now another effect than the simple production of inert surprise, it has made the dairy-farmers consider the possibility of vanquishing their rivals with their own weapons.*

The first step towards forming a correct estimate of the adaptability of the system of one country to the practice of another, is to ascertain what conditions are alike in the two regions, and what are different; the second step is to show whether the differences are in favour of the introduction of the foreign system or are prejudicial to it.

Most of the essential conditions are different in America from what they are in England. Land is cheaper there, and labour is dearer; therefore there is more inducement to economise labour, while a somewhat smaller return is not felt so much as where the rent is a heavier burden. In England we make nearly all our cheese for home consumption, while in America a very large proportion is for export; therefore, American cheese is at the disadvantage of cost of transport, and deterioration in quality while *en route.* Our roads are better than those in the United States: the conveyance of milk should, therefore, be easier and (owing to the price of labour) cheaper with us than it is there. Our climate is more equable than that of America—the summers are not so intensely hot, nor are the winters so cold—so that we are more favourably situated for making good cheese and curing it properly than the Americans.

With the exception of the price of labour, which renders the factory-system of the highest importance in America; and the comparative cheapness of land, which enables American dairymen to compete in our markets notwithstanding the cost of transport, all the conditions are in favour of our making better cheese than they can across the Atlantic. We may also add the additional cleanliness of a private dairy as a very important item. But still the fact remains that the American cheese-makers are beating us in our own markets. This must be attributable either to the factory-system or the method of cheese-making; and I have therefore endeavoured to give an idea of both.

I have received a large number of letters, and have taken a mass of notes in reference to the question whether English dairy-farmers will be inclined to adopt the American factory-system. From this point of view English dairies may be divided into two classes, viz. (1) those in which the cheese is made by hired

* A cheese factory is also being established in Cheshire.

dairymaids; and (2) those in which it is made chiefly by the farmer's wife or daughters. With few exceptions the former class of dairy-farmers would, we find, be glad to send their milk to a factory under certain conditions, most of them preferring the idea of selling it at a fixed price per gallon. Their chief inducement is the difficulty of getting and keeping good dairymaids. This fact is also the reason why few such men are exclusively dairy-farmers, even where their land is better adapted for dairying than for feeding. The element of uncertainty prevents a dairyman from "putting all his eggs in one basket;" but remove that uncertainty, and the whole of the farmer's capital and energy would be embarked in the more profitable branch of his business. Again, hired dairymaids seldom make such good cheese as the farmer's wife, because they have no real interest in the result, so that in dairy districts it is proverbial that the only way to make good cheese is "to marry the dairymaid." Although the cost of cheese-making, curing, &c., would probably be somewhat reduced on such farms, this is altogether a secondary consideration, and may be regarded as unimportant when compared with the probably increased price obtained for the cheese, and the extension of dairying at the expense of feeding.

On the other farms we have a totally different and much more complicated question; and as they form the great bulk of those devoted more or less to dairying, its discussion deserves the most careful consideration.* The cheese being made either by the farmer's wife or one or more of his daughters, he considers that the labour costs him nothing; that the work is a duty in the former case, and a wholesome discipline in the latter. A servant is kept, who assists in the cheese-making; but if the milk were sent to the factory she would still be required for the house-work. In larger dairies, perhaps two, or even three, female servants are kept; but, it is urged, that if cheese were not made at home, and all but one of these discharged, an extra man would be required to take the milk to the factory. Such is the argument, and while those ideas prevail, it admits of no *direct* answer, except with regard to the conveyance of milk. If, as would probably be the case, the milk were taken to the factory by the carrier, the expense would be a trifle compared with the wages of an extra man; but, if not, a boy could do the work, and there are few farms from which this small additional daily labour could not be obtained from the existing staff. Discarding this objection as of no great weight, let us endeavour to estimate the money value

* I am much indebted to Mr. Joseph Aston, of Brassey Green, Tarporley, for a valuable suggestive letter on this portion of my subject; but that gentleman must not be held responsible for my statements.—H. M. J.

of the remainder of the argument, and ask whether it is a fair payment for the incessant drudgery and discomfort which inevitably accompanies family cheese-making.

Suppose a dairy of forty cows—a fair average size for the conditions of the case—each cow yielding 4 cwts. of cheese per annum, and presuming that the cost of anatto, salt, bandages, &c., would be the same at home * as at the factory, we have 8 tons of cheese per annum, the cost for manufacturing which at a factory in America, where labour is dear, would be ½*d.* per lb. If we say 5*l.* per ton would be the cost of making, the annual payment on this head would be 40*l.* per annum. But it is a proved fact that factory cheese sells at an average price of 10*s.* per cwt. (10*l.* per ton) above that made at private dairies, chiefly on account of its uniformity, but also to some extent on account of its superior quality, both attributes being the result of the employment of skilled labour. The extra receipts on this head would amount to 80*l.* per annum for all cheese but that of the very best dairy-farmers, and the household inconveniences would thus be got rid of, not only without cost, but with a considerable bonus into the bargain. Another advantage would be the saving of capital invested in dairy-apparatus, and the saving of annual outlay for repairs, &c.† Again, if the factory were established on the joint-stock principle, as sketched out in Mr. Willard's letter, the dairy-farmer would receive his dividend as a shareholder; and he might, not impossibly, find this branch of dairying as profitable as any other.

Having thus endeavoured to give an impartial description of the various aspects of this question, I leave it in the hands of English dairy-farmers and their landlords to consider whether their interest requires them to take any active steps with a view of establishing cheese-factories in England.

XI.—*On the Treatment of the Reclaimed Bog-land of Whittlesea Mere.* By W. Wells, M.P.

A Paper was written in the twenty-first volume of the Society's 'Journal' on the drainage of Whittlesea Mere, and in it, besides other matter, a short account was given of the process of spreading, upon a part of the surrounding tract of peat-bog, a coating of soil, of an average thickness of five inches, taken from the bed of the mere. From the point whence the soil was taken, to the

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* They would be somewhat more; the difference being that between retail prices and wholesale.

† A larger quantity of cheese would probably be obtained from a given quantity of milk than can be got under the existing system.

farthest point of delivery, the distance was nearly two miles, and the expense of the operation very great. The cost, indeed, has so far exceeded the estimate given in the paper alluded to, that this opportunity should be taken of giving the actual result, now that the work is finished, the plant sold off, and the account closed. The closest calculation, then, which it has been found possible to make, gives for the cost of claying to the depth of six inches from 18*l.* to 19*l.*, and for a depth of four inches between 15*l.* and 16*l.*

The land thus clayed lets readily for 30*s.* an acre, so that, even at the increased cost, it has proved a remunerative operation, especially when it is borne in mind that the land was previously in the state of rough bog, producing no rent whatever.

At a distance of two miles from the Mere, and near the village of Holme, a corner of the peaty tract runs up to the higher land of the surrounding country, and about 230 acres of this has been taken into a home farm, nearly 200 acres having been first covered with clay to an average depth of 3½ inches. The cost of claying this piece of bog-land has been small in comparison with that just referred to. Here the average distance to which the clay was carried did not exceed half a mile; the excavation was easier, and, after a short time, steam-power was called in; and an engine, traction-rope, and portable rails, were substituted for horses, the cost on the completion of the work being found to have been little over 9*l.* per acre.

It has been suggested that, as the operation was finished in the spring of 1866, sufficient time has elapsed to make it a matter of interest to record what the experience of nearly four years has shown to be advantageous or otherwise in the management of bog-land, recently reclaimed and clayed.

Of the 230 acres taken into the farm, although a small proportion had been more or less under cultivation, some for two or three years, and some for a longer period, by far the larger part consisted of the roughest kind of bog. Of the whole, about 190 acres have been clayed, and 40 remain unclayed. Of these 40 acres, about 15 had been for several years under cultivation, and 25 only for one or two years.

It would have been far better, doubtless, if, in anticipation of the claying, the rougher part could have been prepared, and brought into a state of semi-cultivation a few years previously, so that something like a top-soil should have been forming, with which the clay, when deposited on it, would have readily amalgamated in the course of the usual farming operations. As it was, however, circumstances made it necessary that the whole tract should be taken in hand at once, and the clay being spread, on an average, at the rate of half an acre a day, the whole 190 acres were covered within a very limited time.

The surface of the rough bog, though levelled and prepared for its coating of soil as well as was possible, consisted mainly of lumps of fibrous, and nearly wholly vegetable, peat, having no sand in it, and looking much like masses of dark-coloured tow or oakum. Beneath this upper covering of a loose dry growth of vegetable matter there exists, at a depth of a foot or so, a stratum of a hard, dry, red "moor," or peat in another form. This seam is from 10 to 18 inches in thickness, and is of such a nature that the roots of no plants appear able to penetrate it. Immediately below this obdurate band the character of the peat changes. It becomes soft, dark, and greasy, and, when reached in process of cultivation, is found to be very fairly fertile.

In that part of the farm which has not been clayed it is sought to get rid of this sterile seam of red "moory" peat by very deep subsoil ploughing. This process repeated at intervals brings more and more of the objectionable substance to the surface, where it is raked into heaps and burned, until at length the band is broken up, and the roots of the various crops are enabled to pierce into the softer and richer soil beneath. Where the land has been clayed the breaking up of the band will require considerable time, and can only be done very gradually; any extra deep ploughing being avoided for fear of the clay being lost. Implements, however, which, without subverting the top soil, will cut deeply into and so break up the hard stratum below would be useful.

Even after the four inches of clay had been spread on it there was no inconsiderable portion of the newly reclaimed land on which horses could not work without constant danger of being bogged, and having to be drawn out with ropes; and attention was consequently directed to cultivation by steam, which system has now been adopted over the whole farm. So perfectly satisfactory has been the result of its adoption, that, although the better drainage and better surface which now exists would enable horses to work anywhere, it is demonstrable that a return to horse-cultivation would be an unremunerative and retrograde movement. To the steam-engine, windlass, and wire-rope, which were used in the claying operations, there have now been added a Fowler's four-furrow plough, with wheels 12 inches wide, a Coleman's cultivator, covering 8 feet four inches of work, and a roller 8 feet in width; the last two implements being adapted to steam purposes, with a steerage apparatus—the joint contrivance of Messrs. Amies and Barford, and the bailiff, Mr. Crosbie—enabling them to turn with the utmost facility on their own ground on arriving at the headlands.

The management of that part of the peaty tract of land which had been for some time under cultivation needs little remark here. The three inches of clay bestowed upon it has produced excellent effects, and, readily amalgamating with the existing top-soil, has formed a rich and fertile mould.

The treatment of the rough bog, which had only just been levelled and prepared to receive the clay, has been, to a great degree, exceptional and experimental. It is unadvisable to attempt to bring land in this raw condition too quickly under the system or rotation of crops adopted in the case of land which has long been under tillage.

Next to the thorough drainage of the land, the complete amalgamation of the peat with the clay being all important, it has been found that, to this end, it was a mistake to sow, as was largely done for a first crop, either rye-grass and clover, or mixed grasses. It was proved to be a better plan, after giving the newly clayed land as much cultivation as could be fairly bestowed upon it previously, to sow coleseed, if possible, early in July; and, there being no sufficiency of straw as yet on the farm to make manure of, to feed it off with sheep requiring oilcake, that is to say, with fatting sheep or lambs, rather than ewes; to plough, as the weather might permit, in the winter, and in the spring to sow oats. These should not, however, be sown early, as experience proves that such lands, being generally low, are peculiarly liable to suffer from spring frosts. In May a mixture of red and white clover, timothy, parsley, trifolium, pacey, and Italian rye-grass, should be sown and hoed in. These seeds should remain only one year down. It is bad economy, with the land in such a crude condition, to keep them even a second year, for not only do they deteriorate quickly themselves, but a year of cultivation and mixing of the soil is lost.

In the former of the two cases mentioned, where grass was sown as a first crop, wheat, to a limited extent, was tried after the second, and even third year of the seeds being down; but, as might have been expected, with very poor results.

In the other case, where the cropping has begun with coleseed, followed by oats and seeds, it has yet to be proved what the wheat crop sown this autumn will be. The plant looks well at present, and the extra cultivation which the soil under this plan has received will doubtless tell its story at harvest time.

Speaking generally of the assistance to be derived from artificial manures for land of this quality and in this condition, it has been found that superphosphate of lime is by far the best to use, although phospho-guano, obtained from Messrs. Lawson of Edinburgh, has produced very good results. Peruvian guano has almost wholly failed, alike on the clayed and unclayed land. The phospho-guano is as nearly as possible double the price of the superphosphate used, the cost being 11*s*. 6*d*., and 6*s*. per cwt.

respectively; and, an equal money value of each having been repeatedly tried, the results have been found in almost every case to be as nearly as may be similar. It is doubtful whether in the case of a rough bog just reclaimed and clayed, it is remunerative to go to much expense in artificial manures for the first year or two, and until the clay has become incorporated with the peat. Dr. Voelcker was consulted as to this, and in his reply he says,—"I fear you will not reap the full benefit from the artificials named in your note by applying them on peaty land recently clayed. When the clay has become more mellowed, these artificial manures would, no doubt, give you a much better crop than they are likely to produce on the land in its present condition." This opinion has been amply confirmed. On the more advanced land the benefit of the artificials named has been all that could be expected, while on the more backward portion of the land, no results proportionate to the outlay have been realised.

Last year, on the unclayed peat land, the difference in the yield of two fields of oats, one of which had 3 cwt., and the other 4 cwt. of superphosphate, was estimated at 12 bushels per acre. The fields lie near each other, are of precisely the same character, and their previous treatment had been nearly identical.

Less than 4 cwt. of superphosphate, or its equivalent in phospho-guano has been found inadequate, whether for the corn, coleseed, roots and potatoes grown on the more matured land, or for the first two of these crops, which alone, as yet, it is thought prudent to grow on the more recently reclaimed bog.

An acre or two of the more backward of the clayed land was tried last season with kohl-rabi, and with such good results, that more will be sown with the same useful kind of root this year. In another year or two it is to be hoped that potatoes may be ventured on, seeing that already, in the somewhat more advanced clay land, very good crops have been produced; that of last season was at the rate of 8 tons per acre, the seed having been procured direct from Scotland, and sown with 4 cwt. of superphosphate to the acre.

A strong recommendation by Dr. Voelcker, to use burnt clay largely for mixing with the peat and raw clay, has not as yet been carried out on a scale large enough to make it worth recording the results, but judging from the little that has been done, it seems probable that the advice "by all means burn the stiff clay extensively, for you cannot possibly get a better material in quantities for improving your peat land" will be found—subject to the cost of the operation—to be worthy of being acted upon.

The 40 acres of unclayed peat-land, forming part of the farm, and lying side by side with the portion that has been clayed, afford excellent opportunities of comparing their respective value, and give abundant evidence of the superiority of the latter. The corn crops on the clayed land—speaking again of that part of it which is in a more matured state—are far better in quality; and, with the exception of one oat crop in a peculiar season, in quantity. The straw is better, especially for feeding purposes, the difference in value having been sometimes estimated at 5*s.* per acre. The liability to damage by spring frosts is very greatly lessened, and an earlier ripening of the crop is insured. In the case of potatoes, the yield, under circumstances other than that of clay or no clay precisely similar, has been found to be not far from double; while in the case of coleseed and root-crops—perhaps rather more in that of kohl-rabi than of mangolds—the great advantage in the admixture of the clay is conspicuously apparent in the increased produce.

These are, perhaps, the points most worth recording in the treatment and farming of this tract of bog-land recently reclaimed and clayed; but, in considering them, the nature of the bog or peat itself must not be forgotten. The almost total absence of sand distinguishes it in a marked manner from peaty districts like that around Bagshot, and in a less degree from the bogs of Ireland, for the improvement of which considerable modifications in the above methods of cultivation, and manures employed, would have to be adopted.

XII.—*Village Sanitary Economy.*—By J. Bailey Denton, M. Inst. C.E., Agricultural and Sanitary Engineer.

What is village sanitary economy? The sanitary economy of social and physical science in its application to villages means simply the maintenance of pure air within each dwelling, the provision of pure water for the inhabitants, and the preservation of a healthy condition of the surrounding atmosphere. When applied to crowded cities and manufacturing districts, the term seems appropriate enough, but when associated with those "bowers of innocence and ease" which the poet describes our rural villages to be, it appears in discord with one of the most hallowed of our national instincts, the love of country life.

Nevertheless, the statistics of public health collected by the Registrar-General go far to disturb the satisfaction we have been led to entertain, and to induce us to reject the prejudices of the past.

It is true that the annual reports of the Registrar-General maintain the views commonly held, that the degree of mortality amongst our rural population is much less than amongst that of our towns, for by comparing the death-rates of the 10 years ending 1866, it is found that the mean annual death-rate per 1000 persons in the chief towns of the kingdom amounts to 24·59, while that of an equal population living in small towns, villages, and scattered dwellings in the country reaches only 20·10, showing a difference of 4·49 per 1000 persons in favour of rural life. This comparison extended to 9,000,000 of people of each description.* It appears by the same authority that over like periods, though of earlier dates,† the average annual death-rate of 30 large town sub-districts was 28·01 per 1000 persons, while that of 63 selected healthy country sub-districts was as low as 17·53 per 1000, showing a maximum difference between large towns and rural districts of $10\frac{1}{2}$ per 1000 persons in favour of the latter. If we acknowledge this latter rate ($17\frac{1}{2}$ per 1000 persons) to be a fair standard of healthfulness under favourable natural circumstances, without resting to show that it might be further reduced by the aid of sanitary works, we have a means of testing the sanitary condition of all rural places, and may take it as a rule—subject, of course, to exceptions, in which local and special causes counteract human provisions—that those districts in which the rate of mortality is above $17\frac{1}{2}$ per 1000 are susceptible of sanitary improvements, and a reduction of mortality. To satisfy those who are disposed to regard with sympathetic interest the condition of our rural poor, that the mean of $17\frac{1}{2}$ per 1000 persons is not an extremely low death-rate, it will be presently shewn that many rural districts have a much lower rate. In the Farnborough district in Surrey, for instance, the death-rate is as low as 16 per 1000; Bromley, in Kent, 16; Cranbrook, 17; considerable parts of Sussex and Hants, 17; while Alresford, in the latter county, reaches only 16 per 1000, and Easthampstead, in Berkshire, has the same rate. In Northumberland and Cumberland the rates of mortality are as low as those of the southern counties, the Bellingham sub-district being 14 per 1000; Glendale and Rothbury, 15; and Bootle 16 per 1000. To appreciate fully the natural advantages possessed by the rural over the urban population, and the agricultural over the manufacturing classes, in a sanitary point of view, it should be understood that the number of deaths varies very considerably in different towns, increasing in number as the towns partake of

* See 'Thirtieth Annual Report of the Registrar-General,' 1869.
† See Supplement to 'Twenty-fifth Annual Report,' 1864.

a manufacturing character, whereby the risk to life is increased. In London, for instance, where the proportion of the manufacturing class is comparatively small, the annual mortality averages 24 per 1000, while that of Manchester is 32 per 1000; so that, compared with the average death-rate of the most healthy rural districts, the mortality of Manchester, our largest manufacturing town, is greater by 14½ per 1000 persons, and, compared with the average death-rate of the chief towns of the kingdom, is higher by 7½ per 1000 persons.

Again, although our rural poor suffer much from the cold and wet of the two winter quarters ending December and March respectively, the rate of mortality in towns indicates much greater suffering in the same periods of the year. In the three months ending December, the average death-rate in our chief towns is 24·78 per 1000, and in the March quarter 27·38 per 1000; while the average mortality of country districts in the same periods was 19·15 and 23·26 respectively.

But, satisfactory and encouraging to the rural classes as these comparisons may be, there is little to be said in favour of human providence to maintain the advantage, for it is a fact to be demonstrated by special local statistics that many of our villages are little better than nests of disease, showing even greater mortality than many of our large and crowded cities. The thatched roof, the low dormer windows, the cob walls,—graced as they frequently are by the ivy, the rose, and the jasmine,—the filthy ash-heap, the leaky cesspool, the excrement-sodden soil, the saturated subsoil, and the polluted well, are all conducive to fever, diarrhœa, diphtheria, and phthisis, and explain with irresistible force to the sanitary reformer, who has more regard to the statistics of the Registrar-General than the charms of the picturesque, why it is that in so many of our villages

> "Childhood's cheek no longer glows,
> And village maidens lose the rose."

It is, indeed, impossible to over-estimate the evils incident to and tacitly permitted in villages, because they are small in size, and the constituent dwellings are low in value, when it is certain that if those evils existed in large towns they would be summarily dealt with as nuisances of the worst character.

To bring home to the landed interest the fact that rural districts are suffering from the want of that proper sanitary treatment which has already reduced the mortality of many large towns, some further details from the returns of the Registrar-General are extracted.

England is divided into eleven registration districts, the mean death-rates of which are shown by the returns to be as follows:—

Registration District.	Area in Acres.	Population, 1861.	Density of Population. Acres per persons 1851-60.	Annual Death-rate per 1000, 1851-60.
London	77,997	2,803,989	·03	24
South Eastern	4,065,935	1,847,661	2·34	20
South Midland.. ..	3,201,290	1,295,515	2·53	20
Eastern	3,214,099	1,142,562	2·85	21
South Western	4,993,660	1,835,714	2·74	20
West Midland	3,865,332	2,436,568	1·69	22
North Midland ..	3,540,797	1,288,928	2·83	21
North Western ..	2,000,227	2,935,540	·74	26
York	3,654,636	2,015,541	1·92	23
Northern	3,492,322	1,151,372	3·29	22
Welsh	5,218,588	1,312,834	4·18	21
All England	37,324,883	20,066,224	1·96	22

To reconcile with these mean rates of mortality the death-rate of 17·53 per 1000, which has been shown to be the average mortality of the most healthy rural sub-districts, it is necessary to state that the several registration districts tabulated above include all *towns* situated within their limits, the death-rates of which, varying from 21 to 33 per 1000, are much higher than the mortality of the rural districts by which they are surrounded, and that the 63 healthy sub-districts referred to were selected from the face of the whole country.

The three healthiest registration districts in the kingdom, it will be observed, are the South-Eastern, the South Midland, and the South-Western, the several death-rates of which are the same, *i.e.* 20 per 1000, and this rate, it will be remembered, agrees with the mean mortality of the country districts when taken by themselves, viz., 20·10 per 1000. Within these three healthiest registration districts there are 28 towns * of consider-

* Besides the suburbs of London—extra-metropolitan—there are the following 28 important town sub-districts included in the South-Eastern, South-Midland, and South-Western registration districts.

Names of Town Districts.	Population, 1861.	Annual Death-rate per 1000 persons, 1851-60.
South-Eastern Counties.		
Kent:		
Gravesend	18,782	23
Medway (including Rochester and Chatham, and the Military Hospitals)..	51,805	23
Maidstone (incl. County Lunatic Asylum)..	38,670	23
Canterbury	16,643	23
Thanet (incl. Ramsgate and Margate)	31,862	

Sussex :

able size, the death-rate of which varies from 21 to 27 per 1000, and if these were withdrawn, the average mortality of the remaining rural sub-districts would, of course, be correspondingly reduced. And it would be naturally supposed that the effect of such withdrawal would be to reduce the death-rate of *every* rural sub-district much below the mean of 20 per 1000 persons;

South Eastern Counties.—*Continued.*

Name of Town Districts.	Population, 1861.	Annual Death-rate per 1000 persons, 1851-60.
South-Eastern Counties.		
Sussex:		
Brighton	77,693	22
Chichester (incl. Bognor)	14,775	21
Hampshire:		
Portsea Island (incl. Portsmouth and Military Hospitals)	94,828	23
Alverstoke (incl. Gosport and Haslar Hospital)	22,653	26
Southampton	43,414	24
Berkshire:		
Abingdon (incl. Lunatic Asylum for Oxford and Berks)	20,861	23
Reading	25,876	22
South Midland Counties.		
Middlesex:		
Uxbridge (incl. Hanwell Lunatic Asylum)	23,155	22
Barnet (incl. Colney Hatch Lunatic Asylum)	19,128	25
Buckinghamshire:		
Aylesbury (incl. County Lunatic Asylum)	23,600	22
Buckingham	13,756	22
Oxfordshire:		
Oxford	20,037	22
Northamptonshire:		
Northampton (incl. County Lunatic Asylum)	41,152	25
Cambridgeshire:		
Cambridge	26,361	20
Whittlesey	6,966	23
Wisbeach	33,323	22
South-Western Counties.		
Wiltshire:		
Salisbury	9,039	24
Dorsetshire:		
Dorchester (incl. County Lunatic Asylum)	24,810	21
Bridport	16,828	21
Devonshire:		
Exeter	33,742	24
Plymouth	62,599	24
East Stonehouse (incl. part of Devonport and the Naval Hospital)	14,343	27
Somersetshire:		
Bath	68,336	22

but upon examination of the tabular statement comparing the more healthy sub-districts with the less healthy, it will be seen that such is far from being the case. (See pages 214, 215.)

By a careful comparison of the two descriptions of tabulated sub-districts, it will be seen that while the death-rate of all the less healthy sub-districts equals or exceeds 20 per 1000, several of them show a death-rate exceeding the adopted standard of 17½ per 1000 persons as much as 4½ and 3½ per 1000; and that in the case of the more healthy sub-districts of which the death-rate is less than 20 per 1000, there are some in the enjoyable position of having a death-rate below the healthy standard.

It should be observed, too, that several districts strictly rural suffer under a mortality higher than that of populous towns in the same counties. For instance, the sub-district of Hoo, in Kent, is 2 per 1000 higher than Gravesend and Chatham; Hemel Hempstead and Berkhampstead, in Herts, are 2 per 1000 higher than St. Alban's, and 4 per 1000 higher than Hertford; Towcester, in Northamptonshire, is 3 per 1000 higher than Peterborough; Woburn, in Beds, is 3 per 1000 higher than Bedford; and the pretty country town of Frome, in Somerset, has a mortality as high as Bath. It is unnecessary to specify by name the particular villages which have gained notoriety for the frequency of endemic and epidemic diseases;* it is quite sufficient to point out that the difference between the mortality which signalizes them and the adopted standard of natural healthfulness—17½ per 1000—represents the loss of life arising from causes which may be partially, if not entirely, prevented by sanitary treatment.

It is more than probable that in some instances there

* The writer cannot resist extracting from two newspapers of recent date, which are accidentally before him, the following statements as to two villages within the most healthy registration districts:—

"*The Sanitary State of Stoke Gabriel, Devon.*—At the meeting of the Totnes Board of Guardians on Saturday, the inspector, Mr. R. H. Watson, reported the existence of several nuisances at Stoke Gabriel, caused by night-soil lying about in different parts of the village. A man had lately died there of typhoid fever, leaving a widow and five children, who were also suffering from fever. The Guardians expressed some concern at this state of affairs at Stoke, and regretted that something was not done in the matter, especially after the ravages made by the cholera a few years since. The Chairman said they had that morning refused a young woman permission to go to Stoke Gabriel to visit her friends, on account of a man having died there from virulent fever. He really thought that the owners of property there should adopt some means to prevent a repetition of what had already occurred there."

"*The Water at Pirton, Herts.*—There are seven wells almost in a line, within the distance of a hundred and forty yards, all of which may, with equal propriety or impropriety, be said to be on the Great Green; but as the ground for the whole distance is more or less saturated with sewage, I should be sorry to avouch for the purity of the water of any one of them. I could point out other wells which I am afraid are equally defiled; but, with many small cottage-owners, the remedy can only be provided by means of public pumps."

LESS HEALTHY SUB-DISTRICTS,
the Rate of Mortality of which equals or exceeds the mean of 20 per 1000.

Sub-Districts.	Acreage.	Population, 1861.	Density. — Acres per person, 1851-60.	Annual Death-rate per 1000 persons, 1851-60.	Excess of Death-rate above the standard of 17½ per 1000.
Kent:					
Hoo	33,281	2,861	11·67	25	7½
West Ashford	41,901	15,137	2·95	20	2½
Milton	35,409	14,775	2·64	21	3½
Sussex:					
Rye (including Winchilsea) ..	39,369	11,927	3·24	20	2½
Chichester and Bognor	21,054	14,775	1·44	21	3½
Hampshire:					
Fordingbridge	31,167	6,377	4·72	20	2½
Whitchurch	29,513	5,522	5·30	22	4½
Berkshire:					
Newbury	42,956	19,999	2·10	21	3½
Faringdon	64,207	15,688	4·09	21	3½
Hertfordshire:					
Hemel Hempstead	25,457	13,922	1·88	21	3½
Berkhampstead	24,583	13,204	1·91	21	3½
Buckinghamshire:					
Amersham	49,840	18,240	2·70	22	4½
Winslow	35,395	9,265	3·80	22	4½
Oxfordshire:					
Thame	54,997	15,305	3·55	21	3½
Bicester	64,127	15,555	4·12	21	3½
Northamptonshire:					
Towcester	42,216	13,004	3·27	23	5½
Wellingborough	55,505	24,224	2·43	22	4½
Bedfordshire:					
Woburn	29,603	11,684	2·49	22	4½
Leighton Buzzard	38,015	17,648	2·19	22	4½
Wiltshire:					
Bradford	18,800	10,475	1·70	22	4½
Westbury	30,944	11,751	2·55	22	4½
Dorsetshire:					
Beaminster	53,764	13,587	3·86	20	2½
Bridport	33,187	16,828	1·97	21	3½
Devonshire:					
Axminster (incl. Lyme Regis).	61,738	19,758	3·08	20	2½
Tiverton	103,212	30,875	3·29	21	3½
Cornwall:					
St. Germans	47,148	17,631	2·76	21	3½
Penzance (incl. St. Ives) ..	65,092	54,554	1·20	21	3½
Somersetshire:					
Yeovil	52,151	28,189	1·84	21	3½
Frome	51,239	23,704	2·09	22	4½

In both Huntingdonshire and Cambridgeshire the gradual decrease of mortality is doubt owing to improved drainage in the

MORE HEALTHY SUB-DISTRICTS,
the Rate of Mortality of which is below the mean of 20 per 1000.

Sub-Districts.	Acreage.	Population, 1861.	Density. — Acres per person, 1851-60.	Annual Death-rate per 1000 persons, 1851-60.	Decrease of Death-rate below the standard of 17½ per 1000.
Kent:					
Bromley	39,927	20,368	2·10	16	1½
Dartford	53,109	32,316	1·78	18	—
Bridge	41,394	11,316	3·68	18	—
Sussex:					
Hailsham	54,365	12,668	4·19	17	½
Steyning (including Shoreham)	44,344	24,053	2·17	16	1½
Hampshire:					
South Stoneham	30,715	25,542	1·48	17	½
Alresford	39,761	7,182	5·45	16	1½
Berkshire:					
Cookham (incl. Maidenhead)..	29,588	13,031	2·39	18	—
Easthampstead	25,176	7,436	3·65	16	1½
Hertfordshire:					
Hertford	34,410	15,301	2·26	17	½
St. Alban's	34,615	18,926	1·87	19	—
Buckinghamshire:					
Eton (incl. Slough)	41,589	22,353	1·90	18	—
Oxfordshire:					
Henley	61,662	18,200	3·42	19	—
Chipping Norton	76,418	17,306	4·40	19	—
Northamptonshire:					
Oundle	69,822	15,463	4·49	19	—
Bedfordshire:					
Bedford	97,320	38,072	2·55	19	—
Wiltshire:					
Pewsey	65,650	12,466	5·26	19	—
Tisbury	40,494	9,862	4·04	19	—
Dorsetshire:					
Blandford	57,271	14,821	3·89	17	½
Wareham	96,309	17,072	5·58	19	—
Devonshire:					
Torrington	81,472	16,876	4·74	17	½
Holsworthy	82,519	9,876	7·94	18	—
Cornwall:					
St. Columb	78,693	16,754	4·61	18	—
Scilly Islands	3,560	2,431	1·41	18	—
Somersetshire:					
Wellington	60,454	20,480	2·84	18	—
Axbridge (incl. Weston-super-Mare)	105,679	36,106	3·06	17	½

to be traced very distinctly in the Registrar-General's Annual Reports, and it is, no
fens, and, in a less degree, in the clay-land districts.

exist physical drawbacks exercising special influences on health not to be removed by human action, and that in others the excess of mortality is greatly attributable to the unfavourable condition of the soil and subsoil in the neighbourhood of the village, owing to wetness, over which the residents have no control, and which is only to be removed by under-drainage which the owners of the land have the sole power to effect. The Reports of Dr. Buchanan, which are appended to the 9th and 10th Reports of the Medical Officer of the Privy Council, show clearly that the existence of undrained wet lands in the immediate vicinity of dwellings, and of saturated subsoils beneath them, provoke and maintain several fatal diseases—particularly pulmonary phthisis or consumption. Natural drawbacks, such as the existence of seaboard and riverside marshes and inland morasses, which offer no prospect of profit to induce reclamation, can only be partially met by those outside improvements which may reduce their injurious effects to the narrowest limits. In the case of neglected drainage of wet land adjacent to villages it is to be hoped that when the owners become thoroughly impressed with the truth that its existence has an injurious influence on the health of the people living near at hand, they will set to work to drain the land, with the twofold satisfaction that they are effecting a sanitary improvement at the same time that they are securing a benefit to their tenants by increased produce and greater facilities of cultivation, although it may occur that the occupying tenants may prefer leaving matters as they are. However, after making all allowances for the drawbacks referred to, there can be no question that the owners of property in villages have the power in themselves to effect improvements which will reduce the mortality.

The greatest obstacle, and doubtless the real stumbling block, to village sanitary improvements, is the undeniable fact that, where small and scattered communities are called upon to effect them, the cost involves a comparatively heavy taxation, however cheaply the works themselves may be executed—almost invariably increasing in proportion as the number of inhabitants decreases. There does not appear to exist any published data for arriving at the average number of dwellings and persons congregated in villages, but a certain number of each may be taken for the purpose of illustration. A village, for instance, with 60 dwellings, of which 50 may be cottage tenements, will probably contain 400 persons of all ages, of which three-fourths will be farm labourers and their families, who can badly bear taxation. It is true that some of the difficulty arising from the poverty of village cottagers may be met by the obligation imposed on the owners of cottage property to pay local rates levied for sanitary purposes, which they, in their turn, may recover wholly or partially from their tenants; but this provision really acts very slightly in favour of village improvements, which, to be acceptable to the general body of rate-payers, must not only be palpably necessary, but must render the property rated more valuable commercially. The little chance there is, in fact, of recovering payment from labouring tenants renders the small owners of cottage property opponents rather than friends to sanitary reform.

But sanitary economy does not deserve the name unless it brings to the whole community interested advantages at least equal in value to the instalments by which the money expended will be repaid. To realise them, however, it is necessary to have special regard to the character of the persons benefited, and to look to indirect results as a means of helping to make up the required return. To do this a value must be put on the increased health and vigour gained by the labouring class forming that large proportion upon which the more wealthy of our village population depend for the productions of the land and the maintenance of their own position and comforts. It is a great point gained by the employers of labour if they render the physical powers of their workpeople more effective, but it is of equal consequence that those services should be improved in character, and thereby made more valuable, by the home influences of cleanliness and comfort, which really serve to elevate character and promote education.

If these results are the consequence of Village Improvements, as they assuredly will be, then the answer to the question, "What is village sanitary economy," should be enlarged beyond that already given in the opening passage of this paper, by adding that the return will consist: physically, in health and increased duration of life; socially, in the comfort and cleanliness of home and body; and morally, in mental advancement and influences, which, when added to the more tangible return due from the improvement of house property, cannot fail to repay any fair outlay in structural works:—

The objects to be aimed at to ensure these results in small towns and villages are as follows:—

First. The provision of sufficient space and means of ventilation within the dwellings of the labouring class to secure *pure air*, and that proper accommodation which will secure *cleanliness and decency* at the same time.

Second. A copious supply of *pure water*.

Third. Sewerage for the *removal of the refuse of dwellings*.

Fourth. Drainage of subsoil for the *improvement of the climate immediately surrounding dwellings.*

Fifth. The *removal of common nuisances.*

And Sixth.* The *disposal or utilisation of collected sewage* in an *unobjectionable manner.*

Existing Sanitary Laws for the Local Government of Small Towns and Villages.

At the present moment powers exist under the Nuisance Removal Acts, the Sewage Utilisation Acts, the Sanitary Acts, and the Sanitary Loans Act (18 & 19 Vict. cap. 121; 23 & 24 Vict. cap. 77; 28 & 29 Vict. cap. 75; 30 & 31 Vict. cap. 113; 29 & 30 Vict. cap. 90; 31 & 32 Vict. cap. 115; and 32 & 33 Vict. cap. 100), for the removal of nuisances and preventible causes of disease, the purification and ventilation of dwellings, the provision of water, the construction of sewers, and the utilisation of sewage. By these Acts a local authority—now termed a "sewer authority"—exists in some form or other in all places to put them in force, and in all rural parishes where there do not already exist local boards or improvement commissioners, ordinary vestries, or other bodies acting by virtue of any Act of Parliament, prescription, custom, or otherwise, constitute, *ex officio*, the "sewer authority." Where local circumstances render it expedient to sub-divide parishes, the Sanitary Act, 1866, and the Sewage Utilisation Acts, 1865 and 1867, provide the means of doing so. Any undefined inhabited place may, by petition of one-tenth of the rate-payers, apply to the Secretary of State to fix a boundary, and thus form a special drainage-district; and, when so formed, it is deemed a parish for the purposes of the Sewage Utilisation Acts. Under the Nuisance Removal Acts any premises in a state to be a nuisance, or injurious to health, may be ordered, by two justices in petty sessions, to be made safe and habitable; while any house or building unfit for habitation may be prohibited until the causes rendering it so are removed. Open ditches, watercourses, privies, cesspools, drains, or ash-pits, which are so foul as to be a nuisance or injurious to health, may be ordered to be amended, removed, or a proper substitute provided. Animals, too, so kept as to be a nuisance or injurious to health, may be ordered to be kept differently, and if that be impossible, the animals may be removed; and any accumulation

* This paper being necessarily limited in length, will treat on those objects only which may *prevent* human maladies rather than those which may effect their cure. Many objects not referred to might be usefully included as branches of sanitary economy, such as village hospitals, and the establishment of depôts for the sale of *wholesome* food, both of which deserve the attention of the wealthy and the influential.

or deposit of an injurious character may be ordered to be carried away. The parish authorities may appoint an inspector of nuisances, and the guardians of unions may at any time employ one of their medical officers to make inquiry and report upon the sanitary state of their union or parish, or any part thereof, and upon any nuisance being ascertained, the owner or occupier of the premises may be summoned before two justices, and an order made—which order may extend to structural works, in which case there is a power of appeal to the justices. Moreover, any inhabitant of any place may complain of the existence of a nuisance, and justices in petty sessions may make an order in relation thereto in the same way as they may on the complaint of a recognised local authority. Any sewer authority once constituted has the same powers under the Public Health Act and the Local Government Acts, in conjunction with the Sanitary Act, in relation to the supply of water that any local board has within its district, and the costs of any works are made payable by the owners of property, and are recoverable in the same way before two justices. Sewer authorities have power to construct such sewers as they may think necessary for keeping their district properly cleansed and drained; and as respects all sewers constructed by them, they have all the powers that local boards have in respect of sewers constructed under the Public Health Act, 1848, the 30th section of the Local Government Act, 1858, and the 4th section of the Local Government (Amendment) Act, 1861, subject, however, to certain provisions of the Local Government Act, 1858. Sewer authorities under the Sewage Utilisation Acts may provide any works and do any acts for the purpose of receiving, storing, disinfecting, or distributing sewage; they may also, in furtherance of the utilisation of their sewage without, as well as within, their district, purchase or lease lands, contract with any company or person for the sale of the sewage of their district, or the distribution over any land; and further, they may contract for the purchase, or take on lease any lands or buildings, or apparatus, for the purpose of receiving, storing, disinfecting, or distributing sewage. All these powers, however, must be exerted in a manner by which no nuisance can be created, and with the proviso that no sewage or filthy matter shall be conveyed by the sewers into any watercourse or stream until such sewage is freed from all excrementitious or obnoxious matter, such as would affect or deteriorate the purity and quality of the water. Many other provisions for control and entry on premises are contained in these various Acts. Means are given for the payment of expenses incurred by sewer authorities in the performance of their duties, and for borrowing any money required for the purpose, which, in ordinary cases, must be repaid in thirty years, although, under special circumstances, the period may, with the sanction of the Secretary of State, be extended to fifty years. Sewer authorities are enabled to take upon themselves the duty of scavengering; they can compel the provision of a privy, water-closet, or earth-closet, to every house, and conditions are set forth by the observance of which earth-closets may be constructed instead of water-closets, where privies and cesspools are discontinued. Besides these public provisions a private act has been obtained, intituled the "Towns Drainage and Sewage Utilization Companies Act" (30 and 31 Vic. cap. 173), enabling a private company to execute sanitary works for towns and districts unable, or unwilling, to carry them out by their local officers.

Still, in spite of all these apparent facilities of action, such is the complication of the laws, that very little has been done beyond the sewerage of cities and large towns. It is this fact, and the belief that laws which are permissive only must remain, for the most part, inoperative in small towns and villages, that have led to the appointment of the existing "Royal Sanitary Commission," "to inquire into and report upon the operation of sanitary laws of towns, villages, and rural districts, as far as those laws apply to sewerage, drainage, water-supply, the removal of refuse, the prevention of overcrowding, and other conditions conducive to public health." The attention of the Commission appears to have been devoted up to this time to an investigation of the operation and administration of existing sanitary laws, and the best mode of consolidating, improving, and enforcing them, by the establishment of some control over local authorities other than, or in addition to, that of the Secretary of State for the Home Department acting by the officials—medical and engineering—attached to the Privy Council and the Local Government Acts Office.

First: Condition of the Dwellings of the Labouring Class.

It is unnecessary here to speak of any other description of dwellings in a village than those of the labouring poor, as it may be fairly assumed that in the houses of the more wealthy proper sanitary arrangements exist, or, if not existing, can be readily enforced, if, by their omission, the rest of the community suffer. It is certain that no subject connected with the agricultural interest has been more discussed than the proper provision of cottages for farm labourers. This is testified by the number of essays and papers which have already appeared on the subject in previous numbers of this 'Journal.' It is equally manifest that, although so much attention has been given to all the details of the question, we are at this moment without any positive information or recognised regulations as to the breathing space and ventilation necessary to secure health within the cottage. There seems to be no doubt in the minds of all persons that the owners of large estates should provide a certain number of cottages in villages, as well as a proper proportion on farms, as the former are especially suitable for labourers with large families of young children, who are then within immediate reach of school and the church; that the larger share of these, both in villages and on farms, should contain five rooms, of which three should be bed-rooms, to secure decency among the children of large families, while the rest should have four rooms, of which two should be bed-rooms, to suit smaller families; and that the space within each room should be sufficient to maintain health, though the exact space has not been authoritatively defined. The scientific principles upon which to determine the cubical space necessary for wholesome breathing within living and sleeping rooms have not been generally acknowledged, and perhaps this is the cause why the Inclosure Commissioners, who control the amount of money to be charged upon entailed properties for cottage building, have not thought it right to prescribe rules on the point. It is, nevertheless, much to be regretted that this omission exists, as the materials now within the office of the Inclosure Commissioners might be made the basis of positive regulations, by which those doubts and difficulties, which have led to all manner of estimates of, and misconceptions as to, the cost of cottages, might be avoided. According to Dr. Arnott, the quantity of air respired by an adult human being amounts to 300 cubic inches per minute—not quite one-sixth of a foot—and the total quantity of air directly or indirectly vitiated in a day to 2880 cubic feet. According to another authority—Tredgold—the amount of air respired is as much as 800 cubic inches per minute, or nearly half a foot, and the total quantity of air vitiated during the day to 4320 cubic feet. In our best-constructed hospitals no less a quantity than 1000 cubic feet is given to each person; in prisons 800 cubic feet, in the model lodging-houses 550 cubic feet, and in the barrack dormitories of the army 500 cubic feet. In the absence of any regulations from the Inclosure Commissioners it may be stated that the least floor and breathing spaces recognised by those who desire to act upon some sanitary data as sufficient provision in rural labourers' cottages are:—

	Superficial space.	Cubical contents.
Parents' bedroom	120 feet.	900 feet.
Children's bedrooms .. .. each	80 „	600 „
Living-room	150 „	1200 „
Scullery	100 „	800 „

To obtain these contents it is uniformly conceded that the height of the lower rooms should be eight feet, and that between the floor and ceiling of the upper rooms seven feet six inches; and to secure a perfect change of air in the rooms, which should be effected once each hour, such description of ventilation as will allow of the least interference on the part of the cottager should be adopted. All minute refinements seem to fail; the fire-place, door, and window, are the only certain means by which the requisite ventilation can be maintained with any certainty, for if any special means be adopted in construction by the owner to let out vitiated air, equally careful pains will be taken by the occupier to keep it in, by stopping up any openings that may be made with an old stocking or a wisp of straw; and even in the case of fire-places the writer has often seen an old gown stuffed up the chimney to prevent the passage of air through the room from the door or window.

Next in importance to the circulation of free air in the rooms is a provision against the dampness of the ground rising up from the soil beneath—perhaps saturated with liquid sewage—through the floors, or by attraction within the walls, to be given off as vapour to be respired by the inmates. Though often adopted, sometimes for the sake of economy, and sometimes for that of appearance, tile and stone floors are prejudicial to health. In fact, ventilation below the floor to keep it dry is almost as essential to health as ventilation in the rooms themselves, and a damp-course of cement and slate, or asphalte, in the walls to prevent the uprising of moisture in the materials of which they are composed is a point of equal importance.

Besides the provision of sufficient room and ventilation, it is necessary for the health of cottagers that the accommodation provided by the owner should extend to a well where the water can be kept pure, or an underground-tank, together with a perfect arrangement whereby the privy or closet may be supplied with water or earth. In all cases where the cottager is dependent upon well-water for domestic use, either publicly or privately supplied, cesspools should be unreservedly condemned and discontinued, for the simple reason that in very few instances are they made water-tight, and where perchance they are so constructed they overflow, when the contents are as likely to pollute the neighbouring wells as those from a leaky cesspool itself.

It is unnecessary here to dwell upon the evils arising from the cottager throwing the liquid refuse of the dwelling upon the surrounding ground. Something will be said upon this point when treating of sewerage; but it may be desirable at once to point out in earnest terms the glaring truth that much of the insalubrity of villages is attributable to the "excrement-sodden" condition of the ground at the back-doors and surrounding the cottage. Upon this ground is thrown the urine from the chamber, the foul water in which the clothes are washed, and the refuse of the scullery, which either sinks through the soil to the well, if there be one, to be *drunk* by the cottager and his family, or rises by evaporation in the air to be *breathed* by them. To avoid this, it is probable that no money could be better spent than in properly paving and draining the backyard and garden of the cottage.

Second: Water Supply.

If by the space furnished, and the mode of ventilation adopted, within the cottage a constant supply of pure air is obtained for its inmates, the next object to be secured is a copious supply of pure water, for without it cleanliness is impossible and continued good health very doubtful. At present the majority of villages suffer from either scarcity or impurity of water, or from both. Too long has the country been deluded by the fallacy that good water, and plenty of it, is the special quality of country districts. It is true that we do not find in our towns the running stream or rippling brook which form a striking element in country scenery, and which the writer was once reminded by the late Lord Palmerston is a feature as important in the landscape as the eye in the human countenance (which his Lordship characteristically observed "should be moving and sparkling"); but it is nevertheless equally the fact that many villages with small and poor communities suffer even more than cities and large populations from the want of pure water, though they have not the same power to make their wants known. Seeing as we do from the windows of railway carriages the many streams crossed in an hour's journey, we are apt to believe that every cottager in the country has only to step outside his door to obtain the best of water, when the real truth is, that while the wealthy residents of our towns are paying after the rate of between 1*s.* and 2*s.* per 1000 gallons for water delivered to every floor in their mansions, it is not an uncommon circumstance for the poor of a village to pay as much as a penny for a single pailful of two gallons, or after the rate of 2*l.* 1*s.* 8*d.* per 1000 gallons when carted or carried to their door! Though this price is doubtless exceptional, the fact stated will be confirmed by many occupiers of land who have employed horses and labourers for several months in successive years to cart water to their own houses and those of their village neighbours, as well as to their stock.

Of all classes of the community, agricultural labourers are the least given to personal ablution and house-cleansing; the quantity of water, therefore, used in cottages is less than that required in the lowest class of urban dwellings. This has been attributed to several influences; but it is probably owing, first to the difficulty of getting water in sufficient quantity, and next to the existence of pure air surrounding villages, which naturally maintains a cleanliness superior to that attainable amidst the smoke and gas which pervades the atmosphere of towns. The quantity of water used in towns, where there exists the advantage of a public supply, varies very considerably, according to the special trade of the town and the extent to which water is used for public purposes, such as road-watering, street-fountains, and as a reserve in case of fire, &c. The maximum quantity will probably somewhat exceed 50 gallons per person per diem (example, Lynn, in Norfolk), while the minimum will hardly reach 10 gallons (example, Stroud, in Gloucestershire). In the east of London the charge is 20*s.* a year for a house containing six rooms and a wash-house, and the East London Waterworks Company endeavours to supply to every house of this description, containing on an average seven persons, one pint per minute throughout the day, or 180 gallons per diem.

Of course there are many exceptions to the scarcity stated to exist in villages; but where there exists no lack of quantity, it frequently happens that the quality of water is very inferior, which is a worse evil. Where private and public pumps exist to raise water from a comparatively shallow subterranean supply beneath the village, the water, though possibly clear to the eye, is frequently more or less tainted with the escape of excrementitious matter from the cesspools, privies, or house sewers, or by the soakage of refuse liquid from the surface; and when, in default of well-water, the required supply is obtained during summer and autumn from ponds or water-courses in the neighbourhood, the quality of the water is disgusting both to taste and sight, as the ponds and ditches resorted to receive the surface-water discharged from manured fields, the washings of roads upon which all kinds of filth are thrown, and the escaped sewage from farmyards whenever heavy rains fall.

Taking into consideration all the circumstances—personal and physical—attending village communities, it has been considered that a daily supply of 10 gallons per head is the least quantity that should be provided for them wherever a public supply is established, and that every cottage with three bedrooms should have the command of 50 gallons a day, or 350 gallons a week. For this quantity, without labour on the part of the recipient of fetching and drawing, but which would be obtainable by simply turning a tap or raising a pump-handle, it is considered that the labouring cottager can, under any circumstances, afford to pay 2*d.* a week, or 8*s.* 8*d.* a year, and that other residents in villages should pay in proportion to the rateable value of their dwellings. Under any circumstances, all authorities concur in the opinion that whatever may be the quantity supplied, or the charge for supplying it, the quality should be unexceptionable. To secure this very important point it appears desirable that standards of quality should be established under the authority of Government, which may be applied to the various sources of supply, and which should serve as a test for all water used for domestic purposes, even though it be obtained by private means.

Water Supply from Private Sources.

Doubtless the provision which would be most acceptable to all rate-paying communities is that obtainable from private sources within the limits of each occupation, assuming the quality to be the same and the cost of obtaining it—putting a money-value upon the labour involved—no more than would be payable for a public supply. It is only necessary to say a few words on this part of the subject.

The sources of a private character which would be comparable with a public supply are:—

I. Wells sunk down to a shallow depth, affording a constant supply of water to be raised by a common lift-pump.

II. A running stream of unpolluted water passing the doors of the inhabitants, from which they can dip out all they require.

III. The storage of roof-water.

I. *From Wells.*—As a positive condition upon the use of water from shallow wells in villages, no privies or cesspools nor leaky sewers should exist within such a distance of the wells as will allow of the infiltration of excrementitious matter. A proper system of impermeable sewerage for house-refuse and of permeable drainage for subsoil-water will be found indispensable where this mode of supply is used.

II. *By Dip from a Public Watercourse.*—Where dependence is placed on a supply to be obtained by dipping from a stream running through a village, the strictest care is necessary to prevent surface-defilement, and to see that steps are taken to lower the water standing in the soil, so as to prevent that complete saturation which is incident to the constant flow of water on the surface,—too frequently resulting in evils as great as those arising from the want of sewerage itself.

III. *The Storage of Roof-water.*—It is, perhaps, only by one or other of the two private sources already referred to that the *whole* of the water required for domestic use by villagers can be obtained with sufficient certainty. Much, however, can be done by house and cottage owners by the provision of tanks, in which to collect and store roof-water. The quantity and quality of the water to be obtained from the roofs of buildings, when the covering is slate, has not been generally appreciated. In the cases of thatch and tiles, the same remark does not apply, as much of the rain is absorbed by the roof itself, and that which is thrown off is not so pure as that discharged from slate roofs. Taking an ordinary middle-class house in a village, with stabling and outbuildings, the space of ground covered by the roofs will frequently reach 10 poles; while the space covered by a farm labourer's cottage and outbuilding will be $2\frac{1}{2}$ poles. Assuming that the roof is slate, and the water dripping from it is properly caught by eave-troughing and conducted by down-pipes and impervious drain-pipes into a watertight tank, sufficiently capacious to prevent overflow under any circumstances, and that by this method 20 inches of water from rain and dew is collected in the course of the year, the private house will have the command of 28,280 gallons, and the cottage 7,070 gallons in a year. To make it clear that this quantity of water can generally be obtained, it should be stated that the proportion lost by evaporation, &c., from a slate covering will not exceed one-sixth of the total quantity of rainfall with the deposition of dew added, which, together, may be taken at an average of 24 inches. The quantity of water due to an inch of rain falling upon every pole of surface is $141\frac{4}{10}$ gallons, which, if multiplied by 10, the number of poles covered by the roofing in the one case, and by $2\frac{1}{2}$ in the other, and again multiplied by 20, the number of inches of rainfall and dew collected, we arrive at the quantities stated. From such a supply an average daily quantity of $77\frac{4}{10}$ gallons for the house,* and $19\frac{3}{10}$ gallons for the cottage, will result. These respective quantities would not be sufficient for all purposes, but they would form a very good resource in the absence of a more copious supply. To secure them, however, it would be necessary to have tanks to hold half the year's amount, so as to provide against those extraordinary seasons of drought which occasionally take place, and which in the year 1868 extended over three months without any interruption. But a tank to hold even half the quantity obtainable from roofs would be considered so large and costly as only to be within the reach of the wealthy. A tank to hold 14,140 gallons would have to be 15 feet square and about 10 feet deep, while a tank for the cottage quantity of 3535 gallons would have to be 8 feet square and 9 feet deep. The cost would vary with locality; but the recent adoption of concrete for the walls of tanks, and the greater

* The writer uses in his house roof-water only, and the daily gauged quantity averages 90 gallons. The drinking-water is filtered. Well-water is used in the stables, outbuildings, and garden.

knowledge we now possess of the mode of mixing it for the purpose, cannot fail to bring concrete tanks of all sizes into frequent use, whereby the expense will be somewhat reduced.

But, in considering the relative advantage of private and public supplies, it should not be overlooked that where water is derived from private sources no provision can be made for meeting those public requirements which are as desirable in villages as in towns, such as watering roads, a reserve for extinguishing fires, providing wash-houses and baths for the poor, and public urinals, and also for the periodical flushing of sewers and waterclosets.

Water-Supply by Public Co-operation.

Failing sufficiency or proper quality from either of the three private sources enumerated, there remains to be considered how a village may be economically supplied by public co-operation. It is not improbable that, even where private sources now exist, a public supply may, under a combination of advantageous circumstances, be the cheaper means of service.

The various means at command may be classified under the following heads:—

I. The use of a constant or an intermittent supply existing *above* the village, and conducted to it by gravitation.

II. The raising of subterranean water lying *beneath* or near the village.

III. The use of a stream near at hand, but at a *lower* level than the village, both as a supply and as motive power to raise the required quantity; and

IV. The use of steam-power in the place of other motors.

I. *The Use of a Constant or an Intermittent Supply, existing above the Village, and conducted to it by Gravitation.*—This description of supply will include that to be obtained from a running stream or from under-drainage, either where the discharge is constant or intermittent. Upon the capability of abstracting a sufficient supply for a village from an existing stream running at a higher level, and in sufficient volume to allow of the abstraction without interfering with its use to existing water-right owners, it is unnecessary to dwell, as the instances are rare where the capability exists, and where the owners of such rights are willing that an abstraction of the sort should be made without compensation. There are some instances, however, where the exceptional circumstances exist, and they are to be found where properties are large, and where the same owner has the command of the lands above, as well as a preponderating influence in the village to be supplied; and in such cases the operation would be so simple, requiring only a pipe to connect the stream with the village street, that no explanation of the mode of effecting it can be required. And even where compensation may have to be paid to the owners of riparian rights for the abstraction of water, it is not impossible that a village may be economically supplied by such means.

But the extension of under-drainage has opened up a source of supply of a kindred character which is not open to the doubts and objections attending any interference with ancient water-rights, and the quality of the water may be even better than that obtained from a running stream. Such is the case where, in the operation of draining saturated free soils above villages, a constant flow of water has been or may be gained, and for the conduct of which to the head of the village physical facilities exist. The writer has been enabled, in carrying out works of under-drainage on several estates, to originate a constant run of water from land which had been previously saturated, and had given off its excess of wetness by evaporation. In some few cases the advantage has been turned to account, and an immeasurable benefit conferred on the village poor, who have since continued to take their daily supply of water from the outlets. The discharge from waterlogged free soils is frequently constant, when the wet lands form part of large beds in which the rain-water from adjacent surfaces is conserved; and as this is the result of under-drainage, which interferes only with undefined sources of supply, there cannot possibly arise objections of the same character as those which attend any interference with the ancient rights of defined streams. The villages that could be thus supplied with the best water are not few, and it is remarkable that, with such an advantage within reach, efforts are not more frequently made to obtain it. Without discussing here any question connected with under-drainage and its benefits to the occupiers of land, it may be admitted that all that is necessary in dealing with free soils is to give motion to water which would otherwise rest stagnant within them; and that the fewer drains that will set this stagnant water in motion and reduce evaporation the better it is for the water-supply of the country, inasmuch as the fewest number of drains that will effect the desired object will secure the longest-continued discharge. If this be a correct view, drainage affords a means of supply to villages and farm homesteads in the simplest form; and instances exist in which not only has a supply so originated been furnished for domestic uses, but it has been used as motive-power for pumping or raising water by ram or turbine, and doing sundry other duties besides; and there is no doubt that much is to be done, by the combination of owners and occupiers of adjacent wet lands, to convert water into a benefit which while resting in the land is an evil.

But for one instance in which under-drainage furnishes a constant discharge, hundreds of cases occur in which the outlets cease to run after the month of May; and in these cases, if we are to turn to account such an intermittent flow, the surplus of the winter must be collected in a reservoir, from which the supply of the village may be taken when the outlets cease to flow. The difference between a constant run of water and the supply to be gained from an intermittent discharge by the aid of storage is very great, both with respect to cost and quality; for, as the supply to a village is comparatively small, and the opportunities of collecting it in any deep natural receptacle rare, recourse must be had to comparatively shallow reservoirs, which are open to the objection that vegetable and animal life thrive in them, and when they decompose render the water less pure. This objection is, however, met by constructing the reservoir in such a manner as will allow of its being emptied every year and properly cleansed. The proportion of the rainfall discharged by under-drainage during the winter from clay lands will not be less than $3\frac{1}{2}$ inches,* where the annual rainfall does not exceed 24 inches, and the proportion due to the winter is not less than 9 out of the 24 inches. This amounts to 79,183 gallons per acre. To supply a village of 400 inhabitants with 10 gallons each per diem, a total quantity of 1,460,000 gallons will be required for the year's supply, half of which (730,000 gallons) must be stored during the discharging period for use during the remainder of the year, with an addition of 50 per cent. for evaporation, waste, &c. By this means a village may be amply supplied with water all the year round, the quantity used during the winter being supplied direct from the outlets, and that of the summer from the reservoir. A reservoir capable of holding the quantity required would occupy about 4-10ths of an acre, assuming the depth of water not to exceed 10 feet. The whole expense of constructing such a reservoir, with supply-pipes, &c., would probably not exceed 400*l.* (putting a fair value on the land required), which, if repaid with interest in thirty years, would involve an average annual charge upon each dwelling of about 8*s.* if 60 dwellings composed the village. This is rather lower than the minimum rate which it has been already stated the labouring cottager can fairly afford to pay.

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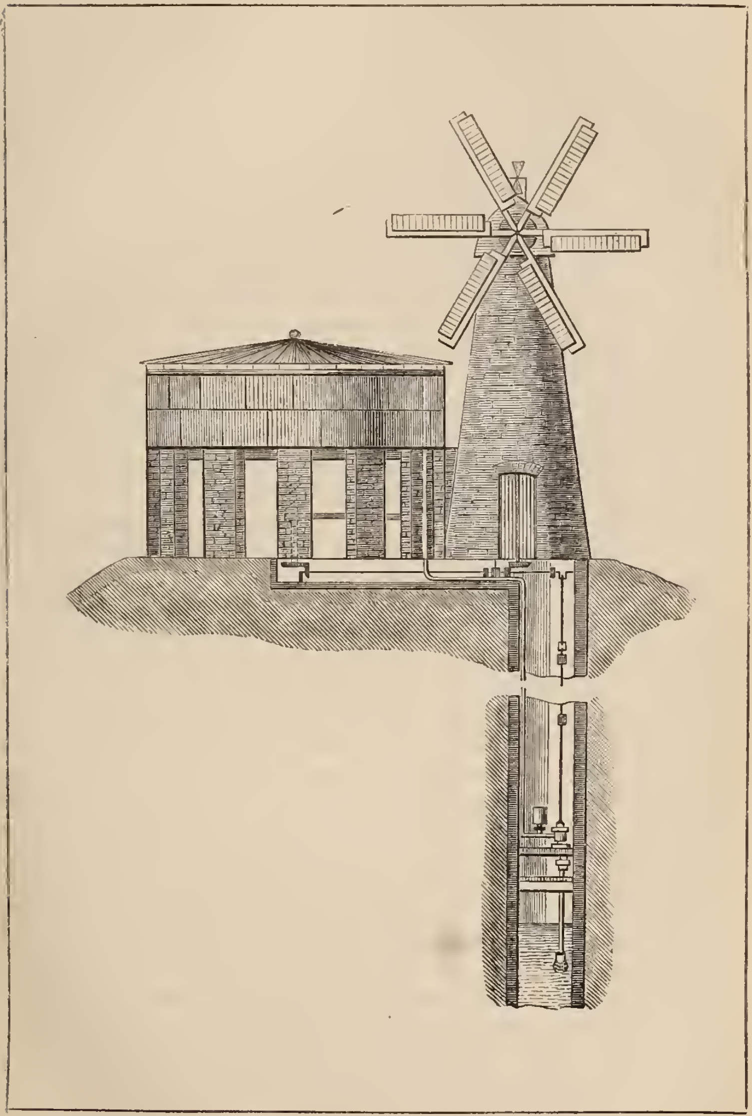
* *See* 'Journal of the Royal Agricultural Society of England,' vol. xx. p. 273 *et seq.*

II. *The Raising of Spring or Subterranean Water lying beneath or near a Village.*—Having already spoken of procuring spring or subterranean water by means of private wells, within the limits of each occupation in the village, it will be anticipated that the supply now proposed, though of a public character, will be derived from the same source, the only difference being that while the number of private wells will be numerous, the number of public wells will in most cases be limited to one, and that the pumping will be effected by a power sufficient to secure a constant supply to all the residents in the village at a height reaching, if possible, to the upper floor of every dwelling. The capability of thus publicly supplying a village from a spring or subterranean water level extends over a large part of the country. A great number of villages on the new and old red sandstone formations, on the greensand and lower outcrops of the chalk, as well as those on considerable beds of the post-tertiary drifts, may so obtain an inexhaustible supply. The depth from which the water will have to be raised may vary very considerably in different formations, but there is no limit to the height to which it may be raised if the motive power is appropriately selected. Three kinds of power present themselves for application, viz., horse, wind, and steam-power. Of these it is only intended to dwell upon wind as the most appropriate, if it be supplemented by horse-power when the force of the wind is not sufficiently great to drive the machinery. Horse or steam power are each too expensive for general application, except in special instances in the north-western districts, where coal is cheap, when the latter may perhaps be advantageously resorted to. The recent improvement in wind engines for general agricultural purposes, as well as for drainage and irrigation, has gone far to bring back general attention to wind as a source of power, and considerable ingenuity is now being applied to its adaptation.

There is much to be said in favour of the primitive system of lifting water by a chain of buckets or pots known as the noria, or sakia, which, it will be remembered, was applied to Joseph's well at Cairo. Though, perhaps, the very earliest method invented by man for lifting water from deep wells, it has still much to recommend it, if iron buckets and chains be used instead of earthenware pots and rope. Its advantages are simplicity of construction, and the readiness with which repairs can be made in the apparatus by any village blacksmith; there are no troublesome valves, and it is capable of working at irregular intervals. On the other hand, the quantity of water it raises is not great, and the level of the upper wheel, over which the chain hangs, is the limit or top of the lift. This wheel, however, can be so

Fig. 1.—*Illustrating Village Water-supply by means of a Pump worked by a Wind-engine and Auxiliary Horse-power.*



placed that the water shall be discharged from the buckets or pots into any reservoir or receptacle at a height from which it can flow direct to the dwellings of the recipients. The chain of buckets would occupy the same place in the well, and in the body of the wind engine, as the pump shown in the preceding drawing; and the reader has only to suppose that the upper driving wheel, with the pendant chain, occupies a sufficiently high position to discharge the water raised from the well into the tank, to comprehend the simplicity of the arrangement. The height, however, to which the noria can be applied in a village should not exceed 50 to 60 feet, as there would be a severe strain upon the chains, and their liability to break would be increased if the height were greater. These machines will raise to the greater height (60 feet) as much as 5 gallons of water per minute, or 7200 a day, when the force of the wind equals ¼-horse-power, to acquire which the velocity must be from 6 to 7 miles an hour. The cost of the wind engine, with chain of pots and tank to hold 16,000 gallons, with horse-power appliances under the tank, as shown in the drawing, would probably reach 750*l.*, including a supply-main down the village street for a distance of half-a-mile, but excluding connections with the dwellings, and this sum, if repaid with interest in 30 years, will result in an annual charge of 15*s.* on all dwellings, supposing 60 to compose the village. This would probably result in rather a higher rate upon cottages than it has been before stated it would be desirable to charge; but in many cases the tank would not necessarily be raised above the ground, when the cost would be reduced very considerably. The number of days on which the wind would not have sufficient power to perform the required duty may possibly reach 100 in the whole year, but this depends so much on locality that no general rule can be stated. The cessation would seldom last more than a fortnight at the same time, and seeing that the service tank would hold 4 days' supply, and that the wind when at work would do duty during the night as well as the day, it may fairly be supposed that recourse would seldom be had to the supplemental power. When this should occur, a good strong horse working half a day would suffice to furnish the village with the supply of 4000 gallons, and thus 2 whole days' work would suffice to fill the tank of 16,000 gallons, or 4 days' supply. The current expenses beyond the payment of the instalment by which the original outlay would be repaid, would therefore be small, and there would be no difficulty in obtaining the use of a horse or two when required.

The next lifting machine to which wind engines can be applied is the centrifugal pump,* which was invented not many years ago, and first obtained prominent notice during the Exhibition of 1851. Since that period a large number of these pumps have been brought into use for drainage and other purposes, where large quantities of water have been dealt with. They require considerable velocity, and when once at work any increase in speed greatly augments the quantity raised; for instance, if the velocity of rotation be doubled, the quantity of water raised is quadrupled. The disadvantages of these pumps, when worked by wind engines, are, that there is more complication of wheel work than in others, and there is a positive necessity for a certain minimum speed being attained before any water at all can be raised. This is not the case with the noria or ordinary pumps, which raise a quantity in proportion to their speed, however slow that speed may be.

Although the ancient noria and the modern centrifugal pump may, in certain instances, be found very appropriate, neither one nor the other possesses the universal applicability of such pumps as are now commonly used and known under the two heads of lift pumps and force pumps, which are most frequently combined in such operations as those now under consideration. The lift pump owes its action to the pressure of the atmosphere alone, the movement of the bucket creating a partial vacuum, which is filled by water forced upwards by the pressure of the air on the surface of the water in the well. Although the maximum elevation to which atmospheric pressure can raise a column of water is 33 feet, it is found practically that a vertical height of 25 feet, should not be exceeded. In all cases it is desirable to avoid suction, as far as possible, by placing the pumps near to the level of the water in the well, and using the power at command for forcing the water upwards rather than lifting it by suction. The force pump, in the correct application of the term, does not make use of atmospheric pressure at all, but the water flows into its barrel, and is forced up an ascending pipe by direct pressure. It is true that great objection is entertained to pumps of any description when applied to deep wells, but this is due in great part to inferior and disproportionate workmanship. For all moderate elevations the common plumber's pump may be appropriate enough, but for deep wells it has often been found to fail from the want of that strength and correct construction which are more frequently attained in what may be called the "engineer's pump." With a lift of 60 feet from the surface of

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* Messrs. Easton, Amos, and Anderson, of Southwark, are the makers of the centrifugal pump known as "Appold's;" and Messrs. Gwynne and Co., of Essex-street, Strand, are the makers of the pump which is known by their name, and which they recommend for wind-engines.

the water in the well to the mouth of the delivering pipe, the pressure on the pump when at rest amounts to 26 lbs. per square inch, and when working this pressure is much increased by the friction due to tortuous and narrow passages, and the necessity of overcoming inertia. Under full force all deficiencies of strength are shown, and the superiority of the engineer's over the plumber's pump made manifest. There are three kinds of pumps which will be found serviceable for the supply of villages with water, viz., the bucket pump, the plunger pump, and the combined plunger and bucket pump. The two former, when worked in sets of three, will give a continuous stream, but the last pump acting both in the up-stroke and the down-stroke will give a stream sufficiently continuous for all practical purposes by itself when combined with an air vessel, which prevents those sudden shocks to the machinery which would otherwise occur. The cost of all the machinery in the case of either the centrifugal pump or the lift and force pumps, when worked by wind power, and supplemented by horse-power, would be about the same as that of the noria.

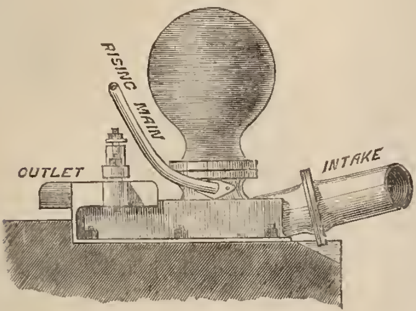
III. *The Use of a Stream near at hand, but at a Lower Level than the Village, both as a Supply and as Motive Power to raise the required Quantity.* — Three descriptions of machinery present themselves for consideration, each being preferable under certain conditions. The machines are the hydraulic ram, the turbine and pump, and the undershot wheel and pump.* Where the quality of the water is suitable, the power small, and the elevation to which the supply has to be raised is not more than 10 times the fall, there is nothing equal in simplicity, efficiency, and cheapness to the hydraulic ram. With a fall, for instance, of 8 feet, a ram will raise 4000 gallons daily to a village half a mile off, 40 feet higher than the supply if the quantity of water at command is 38 gallons a minute. The ram acts upon a principle different from that of any other hydraulic machine, inasmuch as by concentrating into a small quantity of water the force accumulated by motion of a larger body, the small quantity is raised to the required height. The greatest amount of water a ram will raise does not exceed half of what a horse would accomplish if its power could be brought to bear in the most favourable way; but as the ram is self-acting, and never-ceasing if the water acting through it remains the same, the advantages of the ram over the horse, though it apparently does only half the work, are very superior.

The fall to the ram should in no case exceed 20 feet, as the

* The writer is indebted for much of the information respecting the use of the ram, the turbine, and the wheel, as well as that respecting pumping machinery generally, to Mr. Arthur Rigg, engineer of the George-street Works, Chester.

stress on the valves then becomes too great for their long endurance. One of the special features of the ram is, that a portion of the same water that works it is raised as the supply; so that, unless the water of the stream is suitable for domestic purposes, the ram is inapplicable. One of the best forms of ram is shown in the annexed drawing. As the hydraulic ram differs in principle from all other means of raising water, so its useful effect varies according to a different law. For example, when the elevation to which water has to be raised amounts to about eight times the fall which works it, the useful effect is 66 per cent.; but when the elevation is ten times the fall, the useful effect is reduced to 50 per cent., while at twenty times the fall, the useful effect is only 18 per cent.

Fig. 2.—*Sketch of an Hydraulic Ram.*



To give an example reduced to gallons raised per minute, so as to judge of effects under different circumstances, let it be assumed that 40 gallons of water per minute are at command, having an available fall of 10 feet—then the following calculations apply to different heights:—

$$\text{If lifted 80 feet} \quad \frac{66}{100} \times \frac{40 \times 10}{80} = 3\tfrac{1}{3} \text{ gallons per minute.}$$

$$\text{,, } \quad 100 \text{ ,, } \quad \frac{50}{100} \times \frac{40 \times 10}{100} = 2 \text{ gallons per minute.}$$

$$\text{,, } \quad 200 \text{ ,, } \quad \frac{18}{100} \times \frac{40 \times 10}{200} = \tfrac{1}{3}\text{rd of a gallon per minute.}$$

These figures will suffice to show that the hydraulic ram should not have to lift more than ten times the height of the fall, where economy is the object aimed at.

In cases where the water which furnishes the power is not of a quality suitable for domestic use, and where there is other and better water at hand, or where the quantity required is greater than the ram can lift, or where the elevation is higher than the ram can economically raise the required quantity, pumps worked by either water-wheels or turbines can be more appropriately used than the ram. The water-wheel is slow in movement, and therefore ought to be adapted to comparatively slow-moving pumps of large capacity and regular resisting power.

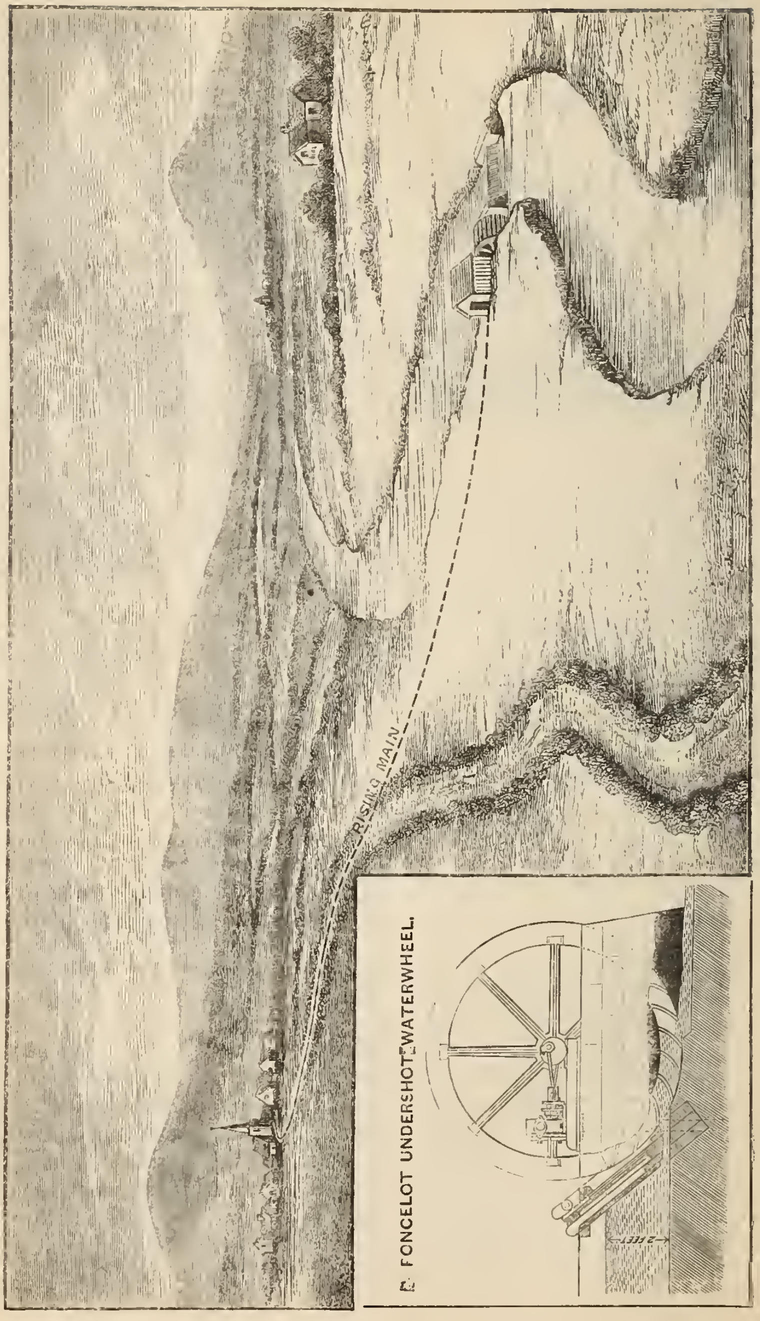


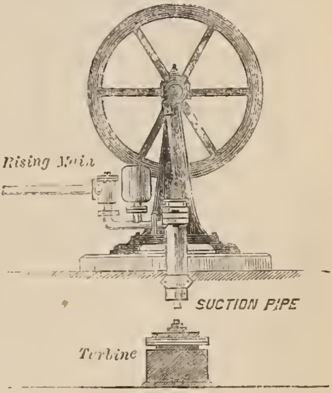
Fig. 3.—*Illustrating Village Water-supply from a Stream at a Lower Level by means of an Undershot Water-wheel.*

The turbine, on the contrary, moves rapidly, and a double-acting lift and force-pump can be associated with it with advantage. Where the stream has a fall of less than 3 or 4 feet, and particularly if great variations take place in the quantity of water constituting the motive-power, it will be found that the Poncelet undershot, or the breast-wheel will give the best result, which, having regard to the loss due to pumps and gearing, practically amounts to 35 per cent., or about one-third of the whole theoretical power due to the fall driving the wheel: thus,

$$\frac{1}{3} \times \frac{\text{galls. falling per minute} \times \text{height of fall}}{\text{elevation required}} = \text{gallons raised per minute.}$$

For instance, an undershot wheel working with a fall of 3 feet will raise 10,000 gallons daily to a height of 100 feet, and a distance of one mile, with a flow of 945 gallons per minute. When the fall exceeds 4 feet the overshot wheel or the turbine may be used, but the latter is generally the cheaper of the two; and, as it occupies the least space and will work below water, it has advantages superior to the water-wheel. The turbine was brought very closely to its present perfection by M. Fourneyron, whose machines have not been superseded, although many attempts have been made to do so. There is, however, no machine which requires more absolute perfection in its proportions to give a good result than the turbine, and many that are sold are very far from being fully effective, from imperfect design or construction. On a large scale, very high results have been obtained; but for small applications, such as those of water-supply to villages, 70 per cent. of the power expended may be considered the limit of perfection, and from this must be deducted the further loss due to the pump and gearing, which will reduce the product to 50 per cent. To ascertain the quantity of water raised per minute, by a given fall and quantity, the following rule may be used for turbines:—

Fig. 4.—*Sketch of Turbine and Double-acting Pump.*



$$\frac{\text{gallons falling per minute} \times \text{height of fall}}{2 \times \text{elevation required.}} = \text{galls. raised per minute.}$$

$$\frac{2 \times \text{gallons to be raised} \times \text{height to be raised}}{\text{height of fall.}} = \text{gallons falling per minute.}$$

For instance, with a fall of 20 feet a turbine will raise 10,000 gallons daily to a height of 100 feet and a distance of one mile with a flow of 90 gallons per minute. As all the foregoing rules assume the machinery to be perfect, an allowance ought to be made in small machines and longer rises for the inevitable loss by leakage, &c. Indeed, in smaller works it is desirable to have the machinery from $1\frac{1}{2}$ to 2 times as powerful as that which seems to be requisite.

The cost of the several machines, appropriately applied, with rising-main and supply-pipe, may be approximately estimated as under:—

Hydraulic-ram, working with a fall of 8 feet, and capable of raising daily to a height of 40 feet, and a distance of half a mile, 4000 gallons of the same water by which it is moved, with supply-pipe down village street, half-a-mile long, exclusive of connections with the dwellings, &c.	£360	0	0
Turbine, working with a fall of 20 feet, and capable of raising daily 10,000 gallons of water (taken from the stream and filtered in its passage from thence to the pump-well) to a height of 100 feet, with pumps and rising-main for forcing the supply a distance of a mile, including supply-pipe down village street half a mile long, but excluding the connections with dwellings	£650	0	0
Water-wheel, capable of doing the same work as turbine, but working with a fall of 3 feet only instead of 20, with pumps, rising-main, &c., exclusive of house connections	£750	0	0

IV. *The Use of Steam-power in the Place of other Motors.*—Where none of the foregoing plans are available, the steam-engine forms the last and a never-failing resource. The kind of pump most suitable would be the double-acting lift and force-pump, or possibly three ram-pumps forcing water into one ascending main. To form a comparison between this description of power and that of wind or water, it will suffice to state that the first cost of a steam-engine to raise the same quantity, height, and distance as was assumed in the case of the turbine and wheel, would be 725*l.*; but with steam-engines the annual cost of fuel, stores, wear and tear of the machinery, and attendance, would amount to a considerable sum; while with rams, turbines, and water-wheels, worked by a constant flow of water, the annual outgoings are only nominal.

In the foregoing observations on village water-supply all reference to methods of a doubtful character has been avoided. Norton's Abyssinian pumps, for raising water out of shallow water-bearing beds, have been found extremely valuable in certain localities where geological conditions have favoured their use; and no doubt there are instances where they would be available in villages. The happy contrivance, too, of fog-ponds,*

* The reader is referred to the second volume of the Society's 'Journal' (Second Series), p. 273, and to White's 'Selborne,' Letter 71, p. 256, for very interesting

for collecting water from the atmosphere on the tops of the chalk downs, has been found useful for the supply of live stock; and when the scientific principle upon which they are founded is better understood, it is not impossible it may be found more generally applicable. Any treatise, therefore, which professed to deal with village sanitary arrangements, would be incomplete if some reference, cursory though it be, were not made to both these valuable expedients. Neither, however, possess properties sufficiently certain for general adoption.

Third: Village Sewerage.*

The necessity of effecting the sewerage of villages, in order that the refuse may be removed in an inoffensive manner, is no longer a debateable question. Considerations of the public health absolutely demand the removal of all sewage from human habitations; and the legal obligation to abstain from polluting the rivers and watercourses of the country will compel village communities, as well as those of cities and towns, to desist from the present practice of discharging their noxious matter without regard to its ultimate destination. Considerations of national economy would also demand, with almost equal force, that human excreta, as well as the excretions of animals, should be returned to the land from which their constituents have been extracted by vegetation which has served for food for man and animals. The point to be determined at the present moment is not whether a perfect removal of house-refuse is to be accomplished, but how it is to be done without injury to others, at a reasonable cost, and with the greatest probability that the sewage will be returned to the land, from which the excrementitious matter was originally derived, with the best—*i. e.* the most profitable—result to agriculture. It is often asked why the sanitary condition of the country is so much more pressing now than it was in the last generation, and why so much more value should be attached to organic refuse as a reproductive material. The answer is a very simple one. The population of England and Wales, and all the demands arising from that population, have doubled themselves in the last fifty years. In the year 1811, the number of people was a little over 10 millions; in 1861 it exceeded 20 millions. The use of water has grown at even a greater rate than the population—in many instances to the prejudice of both health and economy indirectly; and though

descriptions of "fog-ponds;" also to the last number of the Society's Journal for some observations on the wold ponds of Yorkshire.

* The British Association at its meeting at Norwich, in 1868, appointed a Committee to inquire into the treatment and utilization of sewage, which is still engaged in the investigation.

the larger communities of cities and towns have taken the lead in obtaining a supply, those of small towns and villages have not been dead to the advantages of an increased use of water. Under the influence of wealth and combination the former have, for the most part, secured not only a copious supply for domestic and public uses, but water-closets have been very commonly brought into use, with a system of underground sewers to carry away the sewage. To the extended use of water, consequent upon the introduction of the water-closet, is to be attributed the difficulties now attending the treatment and disposal of the refuse of towns and villages; for the defilement of wells, the excrement-sodden condition of the soil surrounding dwellings, and the pollution of our rivers are greatly to be attributed to it. Water-closets exist in all the better class of houses in the southern counties; they are numerous in the northern counties, and are well-known and appreciated in the manufacturing districts, where privies and cesspools almost generally prevail. Few villages, indeed, exist in which water-closets are not to be found in the better description of houses, and the comfort they afford is so generally acknowledged that it would doubtless operate against any other vehicle than water for the removal of refuse. At the same time, so much is to be said in favour of dry earth as a deodoriser and absorbent—the introduction of which valuable discovery is due to the Rev. Henry Moule, Vicar of Fordington, in Dorsetshire—and of the facility with which suitable earth can be obtained for use, and removed after use in rural villages, where scavenging can be organised and enforced, and where the expense of procuring a copious supply of water would, in a majority of cases, be disproportionately great, that personal preference and prejudice must, in such cases, give way to economy.

It is not impossible, however, that although up to this time all chemical processes have practically failed in purifying sewage, so that the effluent fluid may be discharged without injury into rivers, some process may yet be discovered whereby a portable manure may be prepared out of the bulky and unwieldy matter called "sewage," which may extract from it every particle of matter deleterious to human and productive of vegetable life, and which would be more profitable in an agricultural sense than the sewage itself. This object, however, appears very distant at present. It is indeed more than possible that even at this moment those substances of organic matter which are extracted from sewage by the partial processes in practice constitute an article more valuable, as a saleable manure, than the whole sewage from which it was taken—if we adopt as the test of value the return per head of the population contributing the sewage. But this is hardly a proper criterion: for as long as any portion of deleterious or fertilising matter is retained in the effluent liquid discharged into our rivers we fail of complete success, short of which we ought not to stop.

Abstaining from all comment upon the imperfect methods already before the public for filtration, precipitation, and other modes of separation, and confining our present view to the comparative value and suitability of earth and water as a vehicle for the removal of village refuse, it will be well to state briefly the advantages and disadvantages of each, and the conditions under which the one may be preferred to the other. To put the matter in a clear light, the proportion which the excretal bears to the whole refuse of dwellings should be stated. With the moderate daily supply of 10 gallons of water per head —assuming village communities to obtain such an advantage— the average quantity of refuse passing down the sewers, exclusive of surface and subsoil water, will amount to about 100 lbs. per head daily. In this assumption it has been considered that water-closets would, in such case, generally take the place of privies, and that the supply would be divided between the service of the dwellings, for drinking, washing, cooking, and house cleaning—all of which, in various degrees, defile the water used —and that due to the water-closets and sewers. Of the 10 gallons a-head, about one-half will probably satisfy the increasing demand for water for household purposes — though at present 2 gallons a-head, or about 12 gallons a family, is as much as is used daily by the rural labouring class—while the remaining half will be applied partly in the ordinary way to the water-closet and partly to the public flushing of sewers and water-closets. The weight of excretal refuse from each person,* solid and liquid together, averages 3 lbs. daily; so that the proportion of human excreta to the whole sewage per head would be as 1 to 33. With rural communities, consisting of a large proportion of farm-labourers who are engaged out of doors during the day, it is more than probable that much less than the ordinary quantity of excretal refuse would go into the closet. Moreover, a considerable part of the fluid excretions of families does not now, and never will, reach either the privy or the closet: they are mixed up with the other liquid refuse of the dwelling, and disposed of in the same way. But, assuming that it be practically possible to add the human secretions of the bedrooms to the excreta of the closet, and to dispose of them by the earth system, there

* See 'Journal of the Royal Agricultural Society of England,' vol. xv. p. 140, *et seq.* Many improvements in the details of the earth-closet must be adopted before they become generally useful, which will doubtless be carried when the present patent lapses.

would still be that part of the refuse resulting from the use of 5 gallons of water per head in washing, cooking, &c., which must be dealt with. At the present moment, the slops are thrown from the cottage-door, or they are run from the scullery sink upon the ground surrounding the dwelling; and considering that the quantity discharged from each cottage, whenever a public supply may be adopted, would amount to 25 gallons, weighing 250 lbs., a day, the importance of the question assumes its proper magnitude. It may be easy enough to absorb and deodorise the smaller proportion represented by human excreta; but, inasmuch as it requires 2 lbs. of dry earth to absorb 1 lb. of fluid, so as to render it capable of ready removal, it would require between 4 and 5 cwts. of earth to absorb and deodorise the 250 lbs. weight of refuse which does not find its way to the closet.

It is the disposal of this large share of refuse and the prejudicial influence of patent rights that form the great difficulty standing in the way of the earth system of sewerage. Several modes of dealing with house-slops have been suggested; sub-irrigation is one; filtration through a prepared soil heap, allowing the effluent liquid to sink into the ground after it is filtered, is another; and filtration through prepared earth in tanks, allowing the effluent liquid to pass away by a sewer or drain into the river or outfall of the watershed, a third. The first two methods contemplate the absorption of the liquid refuse by the soil, and with the knowledge that the saturation of the soil and sub-soil surrounding the dwelling, even with pure water, is detrimental to health, it is manifest that we must be very cautious as to the adoption of, if we do not altogether reject, any method having this object in view. A study of the views of Pettenkofer, the German physiologist, will help to decide this question. He is represented to have laid it down as a maxim that water impregnated with contagium conveys it through the earth to the level of the water in the sub-soil, where it collects and stagnates, and that when the water level sinks, and air takes the place of water in the soil, the morbific germ or poison retained in the soil is raised by evaporation, and so communicated to man.* Deferring all remarks on this point, it is enough to state here that the existence of excrementitious or putrid organic matter in the soil under foot, either with or without sufficient water to completely saturate the soil, has been shown to be highly pernicious, and this alone should induce all sewer authorities to *prevent the absorption of sewage by the soil* rather than sub-irrigate that surrounding the dwelling *with*

* See the very able address of Dr. Rumsey to the Health Department of the Association for the Promotion of Social Science, delivered at the Congress held at Birmingham, 1868.

sewage, which would rise by evaporation and load the air with that organic dust which Professor Tyndall has shown to exist in a quantity quite unappreciated even by those most advanced in science. Moreover, the system of sub-irrigation is opposed to the practice of the best cultivators, who water the roots of all growing vegetation from *above* and not from *below;* in proof of this good gardeners have long ceased to water plants in pots by means of saucers. Should, however, notwithstanding the above objections, circumstances favour the adoption of sub-irrigation in particular cases, one of the most promising methods of carrying it out, of which the writer is aware, is that now being tried at some cottages in Essex by Mr. Rogers Field, C.E. Each cottage is provided with a small water-tight deposit tank which receives the water from the sink; to this tank is attached a self-acting syphon, so arranged that it empties the liquid whenever the tank becomes full, but not before, leaving the solid that has been deposited behind to be cleared out by hand when a sufficient quantity has accumulated. The syphon discharges into the sub-irrigation drains, and the flow, being intermittent, is considerable when it does occur and is under favourable conditions for forcing the sewage along the pipes and for feeding vegetation. The last method of dealing with the refuse of the house which has been suggested by the advocates of the dry-earth system, viz. by conducting it into tanks in which earth is placed for the means of deodorising and filtering it, is really only another plan of separating a part of the sewage from the whole, and this, for the reasons already assigned when referring to the processes of precipitation, &c., must be passed over as incomplete and unsatisfactory.

The general conclusion is, that to effect the sewerage of villages one of the following modes of treatment must be adopted.

1. By a system of underground sewers of sufficient capacity to remove the whole of the refuse by the agency of water, or—

2. By the substitution of dry earth for water as a vehicle for the removal of the whole refuse, or—

3. By confining the use of dry earth to the deodorising and removal of excretal matter only, and either discharging the remaining refuse by a system of underground sewers, or dealing with it by sub-irrigation or surface-absorption.

As the sewerage of every village must depend upon the specialities of the place it would be useless to venture upon any estimate of cost. Villages are frequently much scattered, but the cost of sewers would not necessarily be great, inasmuch as glazed earthenware pipes would be suitable, and the quantity of sewage would at most be inconsiderable. When earth is used instead of water a system of scavenging must be adopted too, or

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the worst consequences would follow from inattention, which would inevitably attend the system when applied to the dwellings of the poor, and the annual cost of scavenging must be capitalised in order to compare the total expense of the earth system with that of water.

Fourth : Village Drainage in contradistinction to Sewerage.

The objection raised to both sub-irrigation and surface-absorption of liquid sewage near dwellings will be deemed consistent with the stress previously laid upon the importance of a drained sub-soil. Having pointed out the necessity of abstaining from throwing sink water and collecting other refuse in the yards and gardens of village dwellings, it is hardly necessary to dwell upon the advantage of having a system of underground drains, laid at sufficient depth below the surface throughout the village, to effectually draw out of the land any water which would otherwise remain in it, and which would help to support evaporation from the surface. The superior healthfulness shown by the returns of the Registrar-General to exist in districts where natural drainage exists proves at once, and in the most apposite way, the benefit to be derived from this simple and inexpensive operation ; inexpensive in itself, and collaterally profitable in its effects. The sanitary advantages of under-drainage, moreover, are confirmed by the improvement which has taken place in rural districts where the operation has been extensively carried out by landowners ostensibly as an agricultural improvement. The fogs and mists which surrounded villages in wet districts no longer characterise them after drainage ; ague has entirely disappeared, and the visitations of fever have become much less frequent.

Wherever water is used for the removal of village refuse it will be desirable to avoid the escape of sewage out of the sewers into the surrounding sub-soil. To secure this object the sewers must be made water-tight, and if the soil is wet, and therefore requires draining, this condition involves a separate system of permeable drains (common agricultural drain pipes) to keep the water in the sub-soil down to the level of the sewers, by which arrangement, and by the use of self-acting flaps at the junctions, the water from the drains may be discharged into the sewers without allowing the sewage to pass into the drains. This will help to keep the sewers flushed.

In those instances where dry earth is used to remove all excretal refuse, with sewers to discharge the house refuse only, it is very possible that the latter may be made to serve the purpose of drains as well as sewers, and if made partially water-tight—

i. e., for the lower half of their circumference—the arrangement may be made to answer the purpose without drawback.

Some very interesting information on the value of draining the sub-soil of towns, irrespective of the removal of sewage, is to be found in the able and careful reports of Dr. Buchanan, appended to the 9th and 10th Reports of the Medical Officer of the Privy Council.

Fifth: The Removal of Common Nuisances.

But a very few words are necessary on this point. As already intimated, the Royal Sanitary Commission is devoting its attention to the consolidation and improvement of existing laws, and the establishment of local sanitary authorities throughout the country—in every village or parish, as well as every town and city. It is hoped that one of the duties of such an authority will be to enforce the immediate removal of nuisances injurious to health, whether they be the collection of objectionable matter on private premises, the existence of putrefying refuse in common and private ditches or drains, the obnoxious productions of trade, or any other object of an unhealthy character. At the present moment, in spite of the existence of legal facilities and the ample powers already explained, there is an absence of precaution to prevent, and of timely action to remove, nuisances. Boards of Guardians have their nuisance committee, which is sometimes supported by subordinate parochial committees, and nearly everywhere there exists, in some form or other, an officer to inspect nuisances; but so long as permissive enactments take the place of compulsory laws, personal considerations, disinclination to interfere with others, and delay, will prevail, and frustrate any effective sanitary improvement in small towns and villages. The country is anxiously awaiting the results of the deliberations of the Commission.

Sixth: The Disposal or Utilisation of Collected Sewage in an unobjectionable Manner.

If we act upon the duty implied in the alliterative dogma of "rain to river and sewage to soil," and confine our attention to the removal of the refuse of villages by the use of either water or earth, it remains to be shown how, under either system, the sewage may be disposed of inoffensively and productively.

If the system adopted be water sewerage, then the only mode of disposal open for adoption is irrigation; and before describing how it can be carried out for the benefit of a village community, it is desirable to point out the possibility that exists of the irrigated land becoming an evil rather than a benefit by the concentration of deleterious matter on the surface and in the soil, from whence miasmatic exhalations may arise and find their way back as malaria to the village. Too little is known of the combined effect of evaporation from a wet surface when associated with exhalations from organic matter; but judging from the experiences of foreign countries, where malaria abounds, it would appear to be an undoubted fact that wherever organic matter is evolved at the same time and from the same surface that water is evaporated, malaria of a deadly character becomes localised. The Reports of the Registrar-General distinctly show that the health of towns in this country has been immediately improved wherever the effect of the sewers has been to lower the water in the subsoil, and evaporation has been reduced. Hence it follows that to avoid all chance of malaria arising from land to which sewage is applied, the soil should be either of a free and open description, allowing the liquid sewage to descend for a considerable depth before it reaches the level of the springs, or where such a description of soil cannot be obtained, and a soil of tenacious character must be resorted to, then that under-drainage, laid out with regard to the system of surface irrigation, should be adopted to enable the sewage to pass through sufficient earth to become purified before it reaches the outlets. Up to this time the opinion has prevailed that the passage of sewage over a surface of growing vegetation is sufficient to purify it. This opinion, however, is entertained only by a few recognised authorities. After feeding vegetation, it is desirable that the effluent sewage should pass *through a considerable quantity of soil* before it is discharged into the rivers; the drains, therefore, where clay lands are used, should be as deep as possible, in order to increase the downward filtration, and should be as distant from each other as is consistent with effective percolation. By thus increasing, horizontally as well as vertically, the amount of soil through which the sewage will travel, it will become oxygenised in the same way as is the case with sewage passing several miles down a river. Under any circumstances, the condition of the effluent water when it leaves the subsoil will approach much nearer purity than can be the case where the sewage passes over the surface only, or where the drains are laid out without strict regard to the system of irrigation adopted on the surface. Instances exist where the under-drains have passed directly under the surface carriers, and having received the sewage direct from them, have discharged it into the rivers in a state very little different from what it was when it left the sewers; but this is wholly caused by injudicious construction of works, though the circumstance has been quoted, without explanation, as a reason for not draining sewage irrigated lands.

It is stated by the Rivers Commissioners, in their first Report, that the extent of land in proportion to population to which sewage should be applied by irrigation should not be less than one acre to every 150 inhabitants contributing the sewage, care being taken so to appropriate the land as to leave to each day a sufficient available area, and that the irrigated land should not be less than a mile distant from the place discharging the sewage. It is needless to say, however, that the quantity of land required for irrigation must necessarily depend upon the nature of the soil. Experience has gone some way to prove that with land of a free description the proportion mentioned by the Commissioners may apply, but where the land is of a retentive character one acre to 100 people is the better provision. Beyond the land irrigated, it is necessary to have at command some additional land, so as to allow of a change or rest, as occasion may require.

Any digression upon sewage farming, and the return to be obtained from it, would be out of place here. It is sufficient to state, without quoting the extraordinary returns obtained at Edinburgh and other places, that, by good management, from 15*l.* to 20*l.* an acre may be gained from sewage irrigated land. It is, therefore, not unlikely, when the practice of sewage farming is better understood, that there will be a competition for the sewage itself where it can be applied to land in the occupation of several parishioners within the reach of gravitation. This would relieve the parish of some difficulty in leasing or purchasing land, but it would also deprive the ratepayers of any profit that might attend the application. To make the utmost from the sewage of small village communities, and to secure the greatest approval amongst those most interested, it will probably be found desirable to devote it to allotment gardens for the labouring poor, in which case, should the soil be of a free and open character, the sewage would have a value for watering as well as manuring. But whatever be the character of the land used as garden allotments, it would be necessary to have at command an equal quantity not so treated, in order that the garden ground may be periodically changed for it. In a village with a population of 400 persons, the quantity required to receive the sewage would be four acres, and if doubled, eight acres. One moiety would be under irrigation, and the other not; the former would be applied to the growth of grasses and roots, under the management of the local authorities, and the other would form the garden allotments, which, being cultivated by the spade and used for vegetables for three or four years together before the land would be changed, would ensure the perfect dissipation of any deleterious matter.

In cases where dry earth is adopted as a means of removing the sewage, wholly or partially, it will be necessary, as already intimated, to establish a system of scavenging. The duty of the scavenger would be to prepare, or see prepared, a sufficient quantity of earth for those who have none at command, or who having it, are not disposed to use it. His duties would extend to the periodical removal of the earth when used; indeed, the success of this system of sewerage altogether depends upon the supply of a proper quantity of earth in a proper condition, and its removal at the proper time. By the substitution of earth for water, the sewage of each dwelling might remain the private property of the villagers, if they value its fertilizing properties at their worth, and take care to remove and use the sullage in their gardens. If any inhabitants have no garden ground on which to apply it,—and this is not unfrequently the case,—the scavenger supplying the earth at the cost of the parish would remove and dispose of the sullage on the best terms he could for the general benefit.

How far village authorities, in obedience to improved sanitary legislation, may be able to eradicate cesspools, create water-supply, and effectually discharge or innocuously apply sewage, remains to be seen; the whole subject is so new in its economical and social bearings, that the future can only be conjectured. The scattered condition of villages,—the inferior value of house property in villages,—the contradictory results from sewerage works in towns,—the doubtful return to be obtained from small quantities of sewage,—and, above all, the want of intelligence characterising the village populations, impose immense difficulties, though, adopting the words of Liebig, "even the most ignorant peasant is quite aware that the rain falling upon his dung-heap washes away a great many silver dollars, and that it would be much more profitable to him to have on his fields what now poisons the air of his house and the streets of the village; but he looks on unconcerned and leaves matters to take their course, because they have always gone on in the same way." *

APPENDIX.

Any general code of sanitary bye-laws, applicable to small towns and villages, should set forth where the combined action of a community for sanitary works shall commence and the individual action of private owners cease.

Combined action should extend to districts comprising several towns and villages, where the cost would be reduced by such combination; and it should be left to the determination of a central authority whether such united districts should exist or not.

The code should include regulations as to the minimum accommodation to be afforded in the dwellings of the labouring classes in both "towns" and

* 'The Natural Laws of Husbandry,' p. 275, 1863.

"villages," and should specify the size (breathing-spaces) of living and sleeping rooms. On the ground-floors of all new buildings there should be one room at least with a boarded floor, and all walls should be built with a damp-course above the ground-line to prevent the rising of moisture within the walls above ground.

All local executive authorities should be compelled to provide a public water-supply at constant service, where it can be secured at a cost not exceeding 2*d.* per dwelling per week; and in case of inability to do this, pumps for general use, or a stored supply, should be provided to meet seasons of drought.

A chemical standard of purity of drinking-water should be established by Government, by which test it could at all times be determined whether the quality of supply is properly maintained by the executive.

In the absence of a public water-supply, the owners of all dwellings occupied by the labouring classes should be obliged to sink a well where spring-water can be readily obtained; or to collect the rain-water from the roofs into underground tanks, where such may not be the case.

Where a constant supply of water, or a certain provision during times of drought, is secured at public expense, the owners of labourers' dwellings should be compelled to lay on water from the public main at their private cost, instead of, or in addition to, sinking a private well or collecting the roof-water in a private tank.

Every local executive authority in villages, as well as in towns, should be compelled to construct and maintain an under-ground water-tight sewer (of a size to meet the requirements of the place) to discharge all liquid refuse; and no open sewer should be permitted to exist between the point where dwellings commence and end.

The owners of existing as well as future dwellings of the labouring classes should be compelled to construct privies or closets for the application of earth or water, and to discontinue the use of cesspits altogether where from their proximity of position or the porosity of the soil neighbouring wells may become tainted by the percolation of sewage into them.

The owners of all dwellings occupied by the labouring classes should be obliged to connect the sewerage of each dwelling with the common sewer, so that the liquid refuse may go directly into it.

All public sewers should be perfectly ventilated by means distinct from street gullyholes, and should be periodically flushed.

A standard of quality (on Government authority) should be adopted as a test of all refuse liquid discharged into streams or ditches, and no effluent water from irrigated lands should pass into streams below the standard of quality.

All lands to be irrigated with sewage should be first underdrained with reference to the system of irrigation, if not naturally drained; and in the case of small village populations, the sewage should be applied to gardens for the labouring poor, by some arrangement admitting of the land being irrigated for two, three, or four years together, and growing rye-grass and other sewage crops alternately, with its use for the same period as garden-land, to be cultivated by spade husbandry. Sewage-irrigated lands and burial-grounds should not be permitted to exist within a distance which will admit of the percolation of effluent water through the soil into wells.

All lands and grounds within the inhabited districts, which are wet in the subsoil, should be perfectly underdrained, as a part of the sewerage system essential to health.

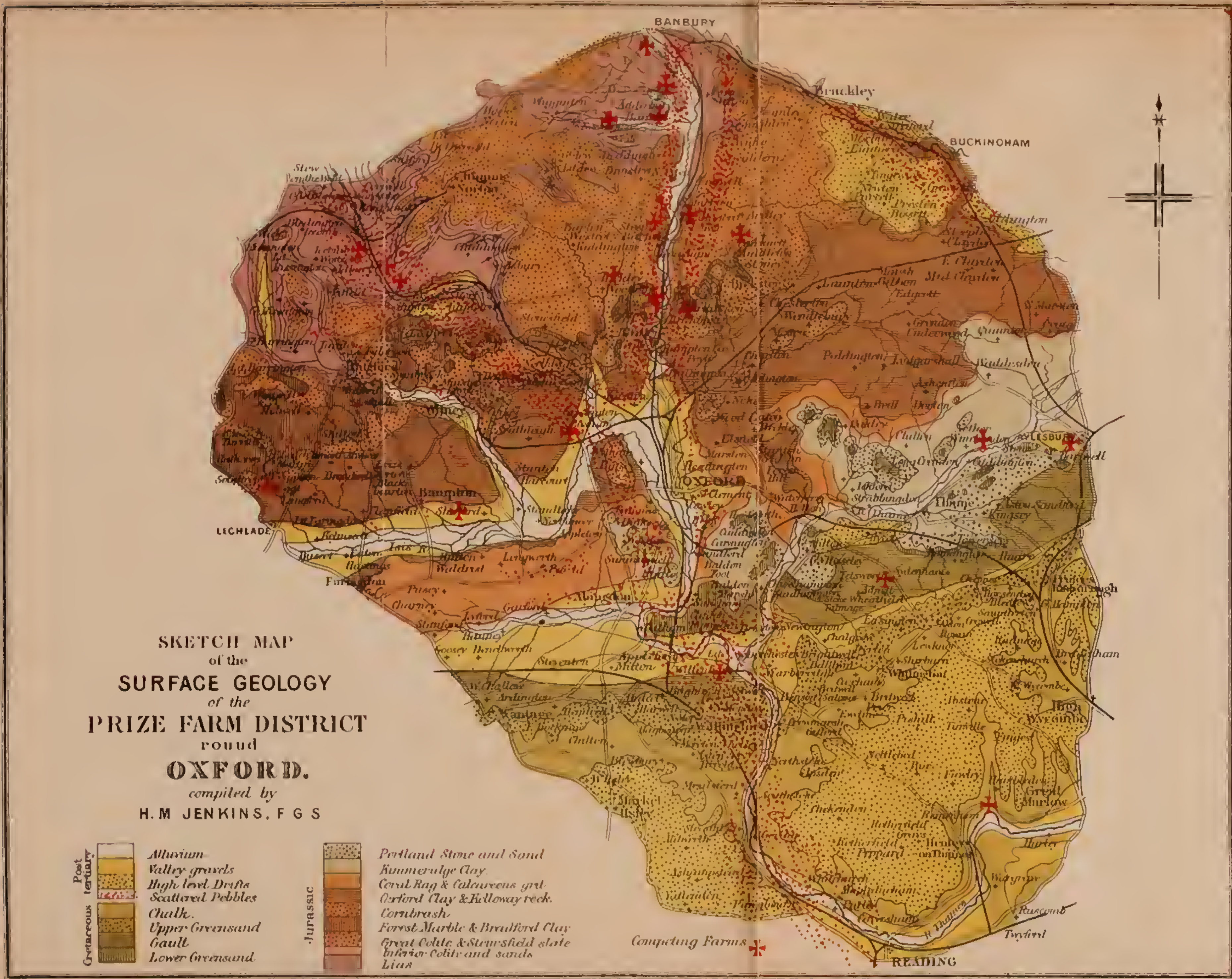
All turnpike-roads and public roads in towns and villages, under which sewers may be laid, should be placed under the control of the executive authority; and any difference between that authority and the surveyor of highways should be decided by the central authority.

Special powers should be given to central authorities to deal with canals and railways which interfere with the drainage of towns and districts and with water supply.

Individual ratepayers should be enabled to lodge a formal complaint of nuisance with the inspector or acknowledged representative of the executive authority, who should be obliged to represent it at once to such authority; and if no notice be taken of the complaint within a fortnight of the time of making it, the complainant should be authorised to make direct application to the central authority, who should then depute their own officer to investigate it.

The code should render the executive authorities liable to penalties for neglect of duty as severe as those against private individuals who fail to remove a nuisance after notice to do so. It should also make the inspectors themselves liable to a small fine for neglect of complaint, if convicted before justices of such neglect; and all parties who are reported by the central authority to have made an unjustifiable complaint should be made liable to a small fine, to be collected by the rate-collector, and recoverable in the same way as parochial rates.

22, *Whitehall-place.*



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ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

XIII.—*Report on the Farm-prize Competition*, 1870.*

By H. W. Keary.

Introduction.

Before entering upon a description of the several farms which will form the subject of this Report, it may be well to give a short account of the origin of the competition.

Mr. Mason of Eynsham Hall, near Witney, late High Sheriff of Oxfordshire, with a most laudable desire to promote the improvement of agriculture, and also, if possible, to obtain from Judges appointed by the Royal Agricultural Society a definition of that which constitutes good farming, offered a most handsome prize, of a hundred-guinea cup, for the best-managed farm comprised within a district, the boundary line of which runs through

* The map illustrating this Report is a reduction from the maps of the Geological Survey of Great Britain, with the addition thereto of certain surface-deposits, which unfortunately have hitherto been more or less ignored by the Survey, though happily not so much so by the surveyors. I have been enabled to map the approximate distribution of these deposits by the kindness of several geological friends, especially Professor J. Phillips, M.A., F.R.S.; Rev. J. C. Clutterbuck, M.A.; W. Whitaker, Esq., B.A., F.G.S.; and J. Codrington, Esq., F.G.S. The alluvial soil of the river-valleys is left uncoloured. The valley-gravels (coloured plain yellow) generally constitute light land; an analysis and a description of the land are given subsequently in Mr. Druce's paper. The high-level drifts (yellow with black dots) form the strong land which so frequently covers the summits of the chalk and oolite hills; they are known to geologists under various names, corresponding either with their relative age or lithological characters, but in the Prize-farm district they consist generally of "clay with flints," on the chalk, passing on their margin into a more distinct "flint-gravel," which latter is the character they assume on the other formations in this district. Near Brackley this drift is associated with boulders. The "scattered pebbles," shown by red dots, are much too scattered to be mapped into distinct beds; but as they influence the agricultural character of the surface, they cannot be omitted from a map of the "surface-geology." I fear that the public-spirited donor of the silver cup, which gave rise to the farm-prize competition, possesses experimental knowledge of the poor hungry nature of the land over which they spread.—H. M. J.

the towns of Reading, Wantage, Lechlade, Stow-on-the-Wold, Banbury, Buckingham, Aylesbury, Great Marlow, and back to Reading. Having communicated his wishes and intentions to the Council of the Royal Agricultural Society, they at once undertook to nominate the Judges and to settle the conditions of competition, and also agreed to offer a second prize of 50*l.* for the second best-managed farm among those which should compete.

These preliminaries having been arranged, my colleagues (Mr. W. Torr, of Aylesby Manor, near Great Grimsby, Lincolnshire, and Mr. T. Gibbons, of Burnfoot-on-Esk, Longtown, Cumberland) and myself were requested by the Council to undertake the inspection of the 21 competing farms, and to award the prizes under the following conditions:—

1. "General management with a 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."

We commenced our first inspection on the 9th of May, and concluded our second survey on the 14th of July.

The spring of 1870 has been a peculiarly trying one—cold, dry, and ungenial throughout April and May—followed by extreme drought and heat in June and July; and this has had much influence upon many of the farms in the interval between our two visits. The reports from the North of England, and from some parts of the Eastern counties, speak of abundant rain during the month of June, and, although this occurred too late in many cases to produce a good hay-crop, it has immensely improved all the late sown barley, and all but secured a full plant of swedes and turnips.

Within the district, however, in which the competing farms are situated, little or no rain fell for many weeks, and it was quite lamentable to see on many of the farms how crops, which promised well in May, were completely burnt up and almost ruined for want of moisture in July. I feel it necessary to lay some stress upon this peculiarity of the season, inasmuch as it will be seen from the description of some of the farms noticed below, that high farming and high condition have told this year in a remarkable degree.

I have observed in almost every instance in which high farming has prevailed for a series of years, and thus good condition of the land been obtained, that the effect of adverse seasons has been to a great extent counteracted.

First Prize Farm.

I will now proceed to describe the farm occupied by Mrs. Mary Elizabeth Millington, to which the Judges awarded Mr. Mason's prize. It is known as the Ash Grove Farm, and is situated at Ardley, about five miles south-east of Bicester, and about 14 miles north of Oxford. Its extent is 890 acres, of which there are about 820 acres of arable land and 70 acres of pasture. The farm is held under a 21 years' lease from the Duke of Marlborough, six years of which are unexpired. The arable land is chiefly a light thin brown loam resting on the stone or corn brash; and the depth of the surface soil, all of which is of poor quality, sometimes does not exceed 6 inches. The pasture land consists of a narrow strip of meadow nearly in the centre of the farm, on a peaty soil of the worst description. A glance at the Map which accompanies this Report will show the surface-geology of the district, it is therefore unnecessary to trouble our readers with a geological description.

The high road from Oxford to Brackley runs through the farm, but does not divide it quite equally. The house and premises are situated near the road, and on the north-west side of it. The arable land is well laid out in good square fields, and is farmed strictly upon the 4-course rotation, although the only covenant in the lease as to cropping provides that the land shall be farmed under a 4-course shift during the last four years, leaving it entirely to the discretion of the tenant how to farm it during the first seventeen.

Buildings.—The house and buildings are of stone and slate, very substantially built, and in good repair. The buildings, however, are somewhat old-fashioned, and do not contain such good arrangements for the accommodation of cattle as they should do. The yards are insufficiently provided with shelter-sheds, and altogether behind the age; but these defects are clearly not the fault of the tenant.

Roots.—The 200 acres of wheat and barley stubble-land, intended for roots, are ploughed up as deeply as the thin stony land will allow early in the autumn, and steam-cultivated in the following spring. The land is afterwards worked with Coleman's cultivator, and the roots are all drilled on the flat 24 inches apart. About 20 acres of mangold-wurzel are usually sown, and are manured with 5 cwts. of superphosphate, applied by the water-drill.

The plants are horse-hoed three or four times as occasion may require, and hand-hoed, picked, and finished off for 7*s.* per acre. The roots are taken up when ripe towards the end of October, and stored in the usual way.

Swedes are sown between the middle of May and the 10th of June, and then the 80 acres of green and white turnips usually grown, the whole of turnip-sowing being generally completed by the longest day. Swedes are drilled on the flat, 24 inches apart, 4 cwts. of superphosphate being applied by the water-drill. The turnips are also sown at the same distance, with, however, only 3 cwts. of superphosphate. These are all horse-hoed as often as necessary (never less than three times), and then hand-hoed, picked, and finished,—the swedes for 6*s.* 6*d.*, and the green and white turnips for 6*s.* per acre. Nearly all the white turnips and generally about three-fourths of the swedes are fed off.

In addition to the above large quantity of roots, 50 acres of the seeds are broken up about Midsummer, and sown with white mustard, which is fed off by the ewes when they are put to the ram, from the middle of September to the end of October. About 2 cwt. of superphosphate is applied by the water-drill for the mustard. When the land is clear it is sown with wheat in the usual course.

Barley.—Barley follows the whole of the root-crop; and as only about 120 acres of wheat are sown annually, 80 acres of the seeds are also sown with barley, the rule being only to sow wheat on so much of the seed-shift as has been manured with well-made farmyard-dung, at the rate of 10 or 12 loads per acre. Chevalier is the sort usually grown, and sowing commences early in March; about 10 pecks of seed are drilled per acre; early sowing is held to be of great importance, and nearly all the barley is sown by the end of March. Barley is cut by reapers, and is all sheafed and shocked at 4*s.* per acre.

Seeds.—Small seeds are sown in the barley in the usual way, being rolled down by a Cambridge roll immediately after sowing. Red clover is sown only once in eight years, trefoil and white Dutch, with a little Italian ryegrass for early sheep-feed, being sown in the alternate four-course.

About one-half of the seeds are usually mown for hay, and the remainder are fed off by the ewes and lambs, which are liberally supplied with cake or corn. As soon as the lambs are weaned they are divided into lots, and placed upon the clover eddishes, and after harvest upon young seeds and stubbles until they go to turnips.

When the lambs have left the grazed seeds, the dung-cart is immediately set to work, and the whole of the farmyard-manure is spread over the fields intended for wheat. This operation goes on at intervals (regulated by the amount of time during which the horses can be spared from their other work) until all the manure is spread on the land.

Wheat.—The treatment of the seed-shift, already described, is the first preparation for the wheat-crop. The clover-ley is ploughed up as soon as the weather permits, then rolled with the Cambridge roll; and about 10 pecks of seed are drilled in during the month of October. The usual varieties sown are the Scotch White Chaff-red and the Improved Lincolnshire White. In the spring the wheat is hoed where it is thought necessary, but not otherwise. Somewhat later, thistles, docks, and weeds of all sorts are carefully taken out.

No kind of top-dressing is applied to the wheat-crop, but I venture to give an opinion that small dressings of nitrate of soda mixed with salt, judiciously applied several times in the spring, would yield a good return for the outlay. The effect would be to bring up all the small ears, and to produce a more even, and therefore a more productive crop.

Wheat is cut with a reaper, and is tied and shocked by men and women at 4*s.* 6*d.* per acre. Two reapers are employed, and two pairs of horses are allotted to each, with frequent changes; by this means 36 acres are usually cut in the day. The pitching and unloading are done by the acre, usually at a price of from 1*s.* 10*d.* to 2*s.* The stacking is performed by the foreman-labourer, assisted by carters and boys. Thatching costs 4*d.* per square of 100 feet. No beer is given, and the whole cost of the wheat and barley harvest amounts to about 11*s.* per acre.

Cattle.—No cattle are bred, and only a few young steers are kept in the summer; about 70 head of cattle are wintered in the strawyards. They have a very small allowance of roots, but a liberal allowance of linseed cake. They are sold in the spring, and are never fatted out. If they pay the cost of the cake consumed, it is all that is expected of them. Paradoxical as this may appear to the uninitiated, the practical farmer will understand that, on light poor land, the more turnips that can be fed on the land by sheep, the better; and therefore to attempt to fatten oxen to any extent would necessitate more turnip carting—increased expense with little or no extra profit; the only object of keeping cattle on a light-land arable farm being the conversion of the straw into good manure.

Sheep.—A flock of 400 Lincoln ewes is kept, and the produce does not generally exceed a lamb to an ewe. After weaning, the ewes are kept on seeds and stubbles until the white mustard is ready, towards the middle of September, when they are put to Lincoln rams, which remain with them five or six weeks. During the remainder of the autumn and winter they are moved about the farm, and, for a month or two before lambing, are allowed ½ lb. of cotton cake per day. This allowance is increased, some linseed cake is added as soon as the lambs begin to drop, and continued until weaning takes place; 150 theaves are annually introduced into the flock, and the draft ewes are all made off as fat sheep.

The lambs are weaned upon clover eddishes, run lightly over the young seeds and stubbles, and then go to white turnips early in the autumn. They become accustomed to the cake-troughs before weaning, and are supplied with the best linseed cake afterwards, the quantity being carefully and gradually increased during the autumn and winter. The hoggets are all clipped and sent fat to market when 12 or 13 months old.

In good turnip seasons about 200 sheep are bought, and are added to those bred on the farm; thus 1000 sheep are wintered annually upon turnips and cake.

The ewes are good of their kind, but it is questionable whether the Oxford Down sheep is not better suited to the district.

Pigs.—From 80 to 100 pigs of different ages are generally kept, all being bred on the farm. A small number are fattened annually on the refuse corn, &c., but they do not receive much attention, and do not form any great feature in the management of the farm.

Horses.—Eighteen horses are kept, and are always worked in pairs. They are fed highly on corn all the year round, having vetches in the yards in summer, and clover-hay in the stable during winter. They are strong useful animals, but do not deserve any special notice.

Fences.—The fences are for the most part of thriving hawthorn, weeds are not allowed to grow upon the banks or in the hedge-rows, and there is not the least waste of land, for the fences are closely trimmed, so that the corn grows almost on to the banks.

Grass Land.—The pastures are very inferior; they have been drained but not otherwise improved; and they ought certainly in future to share in the same liberal treatment which has been so judiciously practised in regard to the arable land.

Labourers.—The labourers at Ardley are well looked after, and well paid; at the time of our last visit the able bodied men were earning nearly 18*s.* per week at task work. All the work that can be done by the piece is put out at Ardley, and the men are made to work as much as possible by themselves, and not in gangs. No beer is given, and everything is reduced to a money value.

General Remarks.—The foregoing description of Mrs. Millington's system of farming may, perhaps, disappoint those who expected to hear of something new, or of some departure from the old four-course routine, the propriety of which has of late years been much questioned, not only in West Norfolk, where it first originated, or at all events is very generally adopted, but also in many other parts of the kingdom. I by no means think it desirable that the system of farming, or the exact rotation of crops, should be set forth in the lease or agreement; and I am decidedly of opinion that every farmer who has capital and brains, should be allowed to make use of both in any way that will give him the highest return for his money, provided that he fulfils the one important condition, which must never be disregarded, of good crops and perfectly clean cultivation.

The advocates of the four-course rotation will find at Ardley that system carried out strictly, and in the best manner. The results speak for themselves. In a peculiar season, which has tried to the utmost the thin dry and arid soils upon the stonebrash formation, this farm shows us, on the whole, better crops of corn and roots, according to the land, than any of the competing farms. It is worthy of note that, although the lease of the Ardley Farm allows the utmost license as regards cropping during the first seventeen years of the term, no departure has been hitherto made from the four-course rotation, the tenant believing it to be the best adapted for the soil and district.

Mrs. Millington's crops clearly prove the fact to which I have previously alluded, viz. that land in high condition is more capable of resisting the effect of bad seasons than when it is impoverished by overcropping, or out of condition for want of that fertilising system which can alone restore the elements of productiveness. This state, however, cannot be attained by sudden or spasmodic efforts; and nothing but a series of years of high farming can produce such crops as those which Mrs. Millington's farm this year exhibits. Mr. Mason's prize has not been obtained by hasty preparation, but the well deserved honour which has been awarded to the tenant of the Ash Grove Farm, has been won by years of clean cultivation and high feeding. The annual amount of Mrs. Millington's cake bill, 1200*l.*, is the great secret of her success. I believe that high feeding of the stock to be the best and safest expenditure that a farmer can make at all times, and in all seasons. The animals are benefited, the land is enriched, and good crops are secured.

The Judges were asked to point out a farm which most nearly fulfils the condition of one that is managed in the best possible manner—in short, to define good farming. This they can do, and they point to Mrs. Millington's as an extremely good example of a well managed farm under the four-course system: but they cannot say more. It may be, and probably is, the best system which could be adopted for the land to which it is applied, but to say that the four-course system is the one that ought to be generally adopted would be the height of folly. First say *where* you are to farm before you can say *how* you are to farm; for although the four-course rotation succeeds remarkably well at Ardley, different soils and different circumstances may require an essentially different system.

Second Prize Farm.

I will next describe the farm of Mr. Treadwell, of Upper Winchenden, near Aylesbury, Bucks, to which the Judges awarded the second prize of 50*l.*, given by the Royal Agricultural Society.

This farm contains 420 acres, 180 of which are arable land and 240 pasture. The map which accompanies this report shows that Kimmeridge clay, with a thin band of alluvium running through it, extends from Aylesbury to Thame, and thus embraces the whole district in which Upper Winchenden is situated.

The road from Thame to Aylesbury runs in a north-easterly direction through the farm, leaving the greater portion with the homestead on the east side of it. The farm is undulating, almost hilly, and the whole of the arable land is on the high ground, intersected by the road, or on the slopes which run down to the meadows and pastures of the valley. The soil of the arable portion may be described as rather a strong clay loam of good quality, but varying very much in depth, being very thin on some of the brows of the hills. The pasture land is of that kind known as good dairy land, but not strong enough to fatten cattle.

The farm is held under a yearly agreement from the Duke of Marlborough, and there are compensating clauses for manures on leaving.

Mr. Treadwell has only occupied it for five years from Michaelmas last. The house and buildings are nearly new, and are substantially built of brick and slate. Besides the home buildings there are some detached old premises, which are very useful for young cattle and sheep.

The arable land is farmed upon a six-course rotation as follows:—

1st. *Roots.*—	12	acres.	Mangold wurzel heavily manured.
	4	,,	Rye, eaten off, manured, and sown with mangolds.
	8	,,	Winter tares, eaten off, manured, and sown with swedes.
	6	,,	Spring tares, fed off, manured, and sown with turnips.
	—		
	30		

2nd. *Barley* or *Oats*, half sown with Italian ryegrass or Dutch clover, the other half, with the exception of 4 acres, sown with broad clover.

3rd. *Seeds.*—The Italian ryegrass is fed off by sheep, and is mown over once in the summer to sweeten it.

The broad clover is mown or fed as it is wanted. Four acres are heavily manured and planted with cabbages.

4th. *Oats* or *Barley* after the Italian ryegrass. *Wheat* after clover or cabbages.

5th. *Winter beans*, *spring beans*, *peas*, and about 5 acres of *mangold-wurzel* and *swedes* to draw off for the beasts. Yellow tankard *turnips* are drilled between the rows of beans and peas.

6. *Wheat*, where turnips are eaten off soon enough, otherwise *barley*.

The above six-course system may be almost described as a four-course rotation extended. Although the roots and seeds are diminished and pulse substituted, still the land only produces white corn every other year, and as turnips are sown between the rows of beans and peas after the last horse-hoeing, which in favourable seasons produce a large amount of sheep feed, the system appears to be very profitable without being exhausting. The amount of sheep feed raised is considerable, and as the green crops as well as the roots are all fed off by cake-eating sheep, high condition of the soil cannot fail to be produced.

Mr. Treadwell does not adopt steam cultivation, but he ploughs all the land intended for roots very deeply, and frequently subsoils it also.

The mangold-wurzel appeared to be drilled rather close in the rows, 18 inches apart, on the flat; but Mr. Treadwell always uses Gibbs's Selected Golden Globe, which grows a very small top, and which he thinks admits of being grown in closer drills than other varieties. The crop we saw was very perfect in plant, and in spite of the extreme drought of the season, looked healthy and vigorous.

The crops of wheat, barley, and oats; except a very few patches upon the thinnest soil, were remarkably clean, heavy, and good; plenty of straw, and large, well-filled ears.

The wheats usually grown are Red Browick and Rivett; none is sown till the beginning of November, when 2 bushels and 1 gallon per acre are drilled, and the quantity of seed is increased as the season advances to 2 bushels and 3 gallons.

It is all hand-hoed twice in the spring, at a cost of 3*s.* 6*d.* per acre each time. It is cut with a fagging-hook, at an average cost of 11*s.* 6*d.* to 12*s.* per acre, which includes tying and shocking.

Chevalier Barley is always grown, and 3 bushels of seed per acre are sown as early in spring as the land will work well.

Cattle.—A dairy of 50 cows is generally kept. The milk is made into butter, which is sent to the Metropolitan Market.

In summer the cows are kept on the pastures, in winter they are tied up in stalls and fed well with roots, hay- and straw-chaff, and cake.

Twenty calves are reared annually, and 12 heifers are annually added to the dairy. The draft cows are fatted off, as also are all steer-calves and heifers (not required for the dairy) at 3 years old. This gives an average stock of 110 cattle both in summer and winter. All the young stock are supplied with cake and chaff in the winter, as well as with roots.

The cows are all shorthorns, of a very useful description, and appeared to be in excellent condition.

The young stock, according to their different ages, were grazing in the pasture fields, and were in that healthy and satisfactory state in which young animals ought to be kept, that is, neither too lean nor too fat.

Sheep.—A flock of 220 Oxford Down Ewes is kept, and they generally produce about 270 lambs.

About 50 theaves are put into the flock every year, and 50 or 60 yearling rams are sold annually in the month of August. All the draft ewes are fatted before they are sold, as are also all the hoggets not kept as rams, or put into the flock.

About 80 sheep are bought in the autumn in addition to those bred, so that there is generally a winter stock of nearly 600 sheep.

In summer, as well as in winter, all the green crops are hurdled off. No sheep run at large except on the pastures. In early spring the ewes and lambs take the rye, having mangolds thrown to them with chaff and cake. The lambs run forward and take the fresh feed, and soon learn to share the cake with their dams.

Vetches succeed rye, which are hurdled and fed off in exactly the same way. As Mr. Treadwell's sheep arrangements are carried out in a very superior way, I think I cannot do better than give a detailed description of it in his own words:—

"On the 1st of September, or a little earlier, according to circumstances, I draft my ewes into small lots in different pastures, using about 5 rams; of course the ewes are drawn to suit the different rams; about the middle of October the ewes are put all together again with two rams (probably different sheep, to catch those that turn again), and brought on to the seeds, and to clear up any food we can spare on the arable land, such as mangold-tops, &c. The rams are taken away in the middle of November, and the ewes drafted out all over the pastures, where they are kept until we can spare some turnips, or rye, or vetches, or seeds for them in the spring. The ewes, after lambing, get on the pastures about $1\frac{1}{2}$ pint of oats each, and later on a few mangolds. When on the rye or vetches the lambs run forward and learn to eat a little cake and corn, the ewes getting 1 lb. of cotton cake. The lambs are weaned soon after shear-day, about the middle of June, and are put on the pastures and seeds. The tup-lambs get $\frac{1}{4}$ pint of corn and cake, and some cabbage as soon as we can spare them any, until the rams are sold—the first Wednesday in August. The ewes, as soon as the lambs are weaned, have rather a hard time of it until September, they are run thick in a pasture, or they clean up seeds after the other sheep, or run anywhere where we can keep them cheapest. The rams, as you are aware, during the summer, are kept on vetches, and have cabbages taken to them, always having a plentiful supply of water by them, and moveable shades to protect them from the sun, getting about a pint of split peas, and a little linseed and cotton cake."

Pigs.—Seven breeding sows of the Berkshire sort are kept, and all the produce is fatted off at about ten score weight. The sows are remarkably good specimens of the Berkshire breed, and the feeding pigs combine great aptitude to fatten with sufficient size.

Horses.—Mr. Treadwell keeps nine working horses, which are strong useful animals, but not specially deserving of notice. They are yoked at length, three in a plough, for deep winter ploughing, and they work abreast for the lighter operations of spring cultivation.

Grass-land.—The pastures are a very important feature in Mr. Treadwell's farm. A very small proportion of them are mown for hay, and none are mown two years in succession without an application of good well-made farmyard manure, at the rate of nine or ten loads per acre.

The fields are divided into convenient enclosures, and are nearly all well watered. Although depastured almost entirely by dairy cattle and young animals, they do not show any symptoms of deterioration; and although breeding animals must eventually, under ordinary management, impoverish the pastures they graze upon, Mr. Treadwell's high farming and liberal use of linseed cake and corn no doubt correct as much as possible a system of stock-farming, which, in too many instances, has impoverished much of the grass-land in the kingdom.

Mr. Treadwell buys annually 600*l.* worth of linseed and cotton cake, 200*l.* worth of corn, and besides this generally consumes beans and peas grown upon the farm to the value of 600*l.*

Fences.—The fences are, generally speaking, not good, and are evidently suffering from many years' neglect of former tenants. In many cases they are past repair, and can only be improved by grubbing up the old ones and planting new ones, where practicable, on a fresh site. A work of this sort can only be managed by the joint efforts of landlord and tenant, and in this case it is very desirable that some equitable arrangement should be made for the improvement of the fences.

General Remarks.—Mr. Treadwell's system, although differing very much in detail from that pursued at Ardley, nevertheless fulfils the same essential conditions of high farming; and it has produced at Upper Winchendon, in this trying season, magnificent crops of roots and corn, and has moreover maintained in the best possible condition a large herd of cattle and a large flock of sheep.

The catch-crops, as they may be called, of vetches before roots, and of turnips with the beans and peas, tend extremely to promote this great fertility. It is scarcely necessary to point out the large amount of sheep-feed contained in a really good crop of vetches, and when these are all fed off by sheep eating cake, the amount of manure of the best description returned to the soil is very large indeed. The same remarks apply to the turnips after pulse, which are also all fed off by cake-eating sheep.

The amount annually expended by Mr. Treadwell in cake and corn, as has already been shown, is very large; and we thus, in the second Prize Farm, obtain a further confirmation of the value of high stock-feeding, combined in this case, however, with a most excellent system of green cropping. I think that Mr. Treadwell's system of management is highly instructive; great ingenuity is exhibited in the adaptation of his root and green crops, and the whole concern is managed in a thoroughly systematic and business-like manner.

It is right that I should notice the difficulty the Judges had in comparing two such very different farms as those to which the first and second prizes have been awarded.

The first is a large poor light-land arable farm, and the second contains a large proportion of very useful pasture land. It is obvious, therefore, that different systems of farming should be adopted upon lands so entirely opposite in character and quality. At Ardley, very inferior land has been made to produce remarkably good crops, and we therefore think it deserving of the greatest credit; but we nevertheless consider that Mr. Treadwell pursues a system well adapted for the land he occupies, and carries it out in the most effective manner.

Third Prize Farm.

Mr. Craddock's farm at Lyneham, Chipping-Norton, although not altogether fulfilling the conditions necessary to entitle it to the first or second prize, is nevertheless, in the opinion of the Judges, so meritorious in many respects, that they deemed it to be worthy of high commendation and of recommendation to the Royal Agricultural Society for a third prize of 25*l.*, to which request I am happy to say the Council has acceded.

It consists of 503 acres of land, 150 of which are pasture and 353 arable. It is held on an annual tenancy under the Earl of Ducie, with an ordinary farm agreement. Mr. Craddock has occupied it some eleven or twelve years. At the time when he entered upon it a re-arrangement of the farms had just taken place at Lyneham, and two farms were then thrown into one, forming the one which he now occupies. The house and premises are situated in the village, and are built of stone and slate; the latter are remarkably commodious, and provide ample accommodation for any amount of stock which can ever be kept upon the farm. There is also a fixed steam-engine, and some excellent machinery for cutting hay and straw, grinding cake, &c. These excellent farm buildings are by no means thrown away upon Mr. Craddock, for we have seldom seen upon any occupation so much order and neatness, and where the epithet of "a place for everything, and everything in its place," could so rightly and properly be applied.

The farm is bounded on the south-east by the high road from Barford, and is intersected almost in the middle by the road from Chipping-Norton to Shipton. The West Midland Railway runs along its western boundary, and at one point separates a large meadow from the rest of the farm. The surface-geology of the district is cornbrash and lias; but the farm contains several varieties of soil. There is light and thin stonebrash, strong and poor clay loam, and about one-third perhaps of good mixed loam land.

Some of the grass land is also very inferior, but there are some useful pastures near the village and homestead.

This variety of soil necessitates a mixed rotation of crops, which is effected in the following manner:—

The thin poor stonebrash is farmed upon the four-course shift; the good mixed loam upon a five-course rotation, taking three-fifths of corn and pulse; and the poor weak clay on a six-course shift, as follows:—

1st. Roots, all drawn off.
2nd. Wheat.
3rd. Beans.
4th. Barley and oats with seeds.
5th. Seeds.
6th. Wheat.

The roots are grown with half-inch bones and superphosphate, and all the farmyard manure is, as a rule, put on the young seeds.

Under the above system of cropping and manuring we found a remarkably clean farm and extremely good crops, even on the poorest land, with the exception of the roots, which this year have to some extent failed, and in other cases were so backward that it is doubtful whether they can now make a crop.

Great pains are taken on the poor pastures to eradicate, by constant spudding, the innumerable thistles which they produce, and on all the grass land there is a very neat system of management.

A small dairy of 15 remarkably good shorthorns is kept, and the produce is all reared. The females go into the dairy, and the steers are fed off at 3-years old. Calves are also bought, reared, and made off fat at 3-years old. About 90 head of cattle, of all ages, are wintered, and all have cake or corn.

Two hundred Cotswold ewes are put to the ram, and they usually produce about 250 lambs. About 60 ewe hoggets are reserved to renew the flock, and the remainder, together with the draft ewes, are all made fat during the winter on turnips, with corn or cake, and are generally shorn and sent to market early in the spring.

Mr. Craddock does not keep many pigs, and has only three breeding sows, whose produce is all fatted off.

The districts through which the Judges travelled and the generality of the farms which they inspected have not given them a very favourable impression of the cart-horses of the neighbourhood. They are generally undersized, ill-bred, and slow animals—badly groomed, and badly fed. The natural consequence is, that in too many instances three horses are put to do the work of two. This, however, is by no means the case at Lyneham, for I have seldom seen a better lot of horses, many of them being of considerable value, and all in the best possible condition. The admirable cultivation of the farm is a sufficient proof that the horses are kept for work and not for show; and Mr. Craddock's example with respect to the management of horses, as in many other respects, might be followed with advantage by many farmers in Oxfordshire.

Altogether Mr. Craddock's farm exhibits several points of management which are full of instruction, notably, a sensible adaptation of different systems of cropping to each variety of soil; the growth of clean and good crops under such system of management; and the attention paid to his pasture land, which, whether good or bad, has had labour employed upon it, and has been improved.

Moreover, good animals of every kind, and good ones only, are seen upon the farm—the cattle, sheep, horses, and pigs, being all of a thriving and paying description.

The order, neatness, and careful management which strike one at every turn are in pleasing contrast to the slovenly state of things which too often prevails on many farms.

Commended Farms.

The farms of Messrs. Nathaniel and Zachariah Stilgoe, at Adderbury, near Banbury, and of Mr. Denchfield, at Easington, close to Banbury, deserve notice in this report.

As will be seen from reference to the map, these farms are on the lias formation, and the soil of which they are composed may be described as light, mixed, and strong red loam. Such soil is naturally extremely fertile, but, from some cause or other, not producing this year such heavy crops, both of corn, grass, and roots, as the quality of the soil might lead one to expect.

Mr. Denchfield's Farm.—This farm, as before mentioned, is close to the thriving little town of Banbury. It possesses the best and deepest soil, and contains 252 acres, 168 of which are arable and the rest pasture. It is farmed on a six-course rotation, in the following order:—

1st. Roots.
2nd. Barley with seeds.
3rd. Seeds.
4th. Wheat.
5th. Beans.
6th. Wheat or barley.

Farmyard manure is applied for roots and beans. Fine crops of wheat, barley, and beans are growing this year; but the roots are backward and are not thriving, and do not promise a good crop. The cultivation is superior, and there is an air of neatness and good management everywhere visible.

The pastures are on lighter soil than the arable land, and are much burnt up by the dry weather. They were stocked with some nice young shorthorns, and with the ewes and lambs. The former had not grass enough, and would have done better with an allowance of linseed cake, for which they would undoubtedly pay well.

There are 140 Cotswold ewes on this farm, which breed about 160 lambs. These are all fattened and sold off, and 150 are bought in addition to those bred; about 40 head of cattle and 300 sheep are thus annually sold from the farm.

I have not hesitated to notice Mr. Denchfield's weak points, but his heavy crops of corn and extremely clean cultivation are deserving of the highest praise.

Mr. N. Stilgoe's Farm.—Mr. Nathaniel Stilgoe's Farm is situated at Adderbury, and contains 507 acres, of which 271 are arable, and 236 pasture. The soil of the former is a good mixed red loam, and the latter chiefly strong clay on the slopes, with deep alluvial soil in the meadows, which form the northern boundary of the farm.

It is farmed on a six-course rotation as under:—

1st. Roots.
2nd. Barley and oats.
3rd. Seeds.
4th. Wheat.
5th. Beans.
6th. Barley.

Four acres of mangold wurzel are sown on 27 inch ridges, about the middle of April, and have 12 loads of farmyard manure, and 3 cwt. of superphosphate of lime per acre; 40 acres of swedes and turnips are drilled on the flat, 21 inches apart; the swedes are manured with 10 loads of farmyard manure, and 3 cwt. of superphosphate of lime; and the turnips with 5 cwt. of superphosphate alone. The sowing of swedes is commenced in the middle of May, and the turnips in the middle of June. These are all horse-hoed as often as necessary; and hoed, picked, and finished for about 7*s*. per acre. The mangolds are taken up and stored in the usual way; half the swedes are taken off for cattle, and the remainder fed on the land by sheep eating cake.

Barley is sown after swedes and turnips, but wheat sometimes succeeds the mangold wurzel. Chevalier barley only is grown, and the heavy seeding of 3½ bushels per acre is sown. The first sowing takes place very early, viz.: in the second week in February, and all the turnip land is sown in succession as soon as it is ready. The barley is cut by a reaper, is left on the swath and is carried loose.

Seeds are sown in the barley with a hand seedbarrow in the usual manner, at the rate of 12 lbs. of mixed seed per acre. Part of the seeds are mown and part grazed with sheep. No manure of any sort is applied, and wheat is sown upon them rather late in the autumn.

Wheat follows seeds; the land is ploughed in October, and pressed with a Cambridge roll. Sowing commences about the last week in October, three bushels of seed are drilled per acre. Burrell's red, and certain white varieties are the kinds most usually sown.

In early spring the wheat is all hand-hoed, and later on thistles and weeds are carefully taken out. The wheat is cut by scythe, and is tied and shocked by the day, and the whole cost of wheat and barley harvest ranges from 12*s*. to 14*s*. per acre.

Beans follow wheat, farmyard dung being applied on the wheat stubbles. Both spring and winter beans are grown, and rape or white turnips are generally sown between the rows, when the hoeing is finished. In favourable seasons a great deal of sheep feed is produced in this way.

Barley or oats are sown after beans without any manure.

A dairy of 40 shorthorn cows is kept, and the produce is made into butter. There are now also on the farm 10 in-calf heifers to calve about Michaelmas, 10 two-year old heifers, 12 yearlings, 10 calves, and 10 feeding cows, making a total of 92 head of cattle, which is the usual summer and winter stock. These are summered on the pastures, and in winter have roots, hay, and chaff, and a small allowance of linseed cake.

Two hundred Oxford Down ewes are kept; they generally produce about 250 lambs; about 70 theaves are put into the flock every year, and the remainder are all made off fat at twelve months.

Six breeding sows are kept, and all the produce fed off on milk and flour.

Ten horses and two colts are worked, two are sold every year and two foals are bought. The pastures are useful dairy land, but with the exception of the low meadows not first class. They have rather an impoverished look, and it appears as if the large herd of dairy cows, and the young cattle, and the flock of ewes and lambs were gradually impoverishing them. I think that Mr. Stilgoe will soon find it necessary to alter his system of farming in this respect, and he should do so either by using a larger quantity of artificial food for his stock, or by resorting to bone manure upon the grass land.

The arable land is extremely well cultivated, and the whole of Mr. Stilgoe's farming operations are carried on in a most methodical and business-like manner, but he has somewhat lost sight of the fact that pastures pay as well as, or even better than, ploughed land for high farming.

Mr. Zachariah Stilgoe's Farm.—Mr. Zachariah Stilgoe's farm is also situated at Adderbury, near Banbury, The soil may be described as a kind light red loam resting generally on a rubbly stone subsoil, free working, and easy to farm; in short, an excellent turnip and barley soil. The extent is 340 acres, of which 125 are pasture, leaving 215 acres of arable.

It is farmed upon a six-course rotation, as follows:—

1st. Roots; 2nd. Barley; 3rd. Seeds; 4th. Wheat; 5th. Beans or Peas; 6th. Barley or oats.

The mangolds and a part of the swedes receive 12 loads of farmyard dung and 3 cwt. of superphosphate. The remainder of the swedes and the white turnips are grown with 5 cwt. of superphosphate alone. The mangolds are grown on 27 inch ridges ; the swedes and turnips on the flat, from 18 to 22 inches apart, according to circumstances.

Half the swedes are drawn off for consumption by cattle in the yards, and the remainder are fed on the land by sheep eating corn and cake.

Barley is sown very early, commencing, when the season admits, early in February. The land is ploughed once, and then scarified, $3\frac{1}{2}$ bushels of Chevalier seed being sown. It is mown by a reaper, and tied and shocked for the convenience of harvesting. In favourable seasons good crops are produced of the best malting quality.

Seeds succeed barley, and are sown by a handbarrow in the usual way; about 12 lbs. of mixed heavy seed and a little Italian ryegrass are generally sown.

Wheat follows the seeds ; no manure is applied in the autumn, sowing does not commence until the last week in October, when 3 bushels per acre of Burrell's red and some white varieties are drilled on a stale furrow. It is the opinion at Adderbury that wheat is subject to blight and mildew if sown earlier ; but it is probable that little more than half the seed sown a month earlier would produce a better crop, and be less subject to disease. No top-dressings are applied in the spring.

Beans follow wheat, farmyard dung being applied on the wheat stubble. Winter beans are generally sown, but they are a failure this season here, as in many other places ; rape or turnips are sown between the rows of beans, and in most seasons produce an excellent crop of sheep feed.

Barley or oats follow the beans and complete the course.

The cultivation is of a very superior character ; the greatest cleanliness prevails, and nothing could look better than did the generality of Mr. Stilgoe's crops in the month of May, In July, however, the drought had told severely, and we were certainly disappointed not to find heavier crops of corn.

About 50 Hereford or shorthorn oxen are grazed on the pastures in summer, about 20 more are bought in the autumn, and the 70 are all fattened in the stalls and yards during the winter.

A flock of two hundred very good Oxford Downs is kept ; the produce generally being about 250 lambs. 70 she hoggs are annually put into the flock ; and all the rest, including the draft ewes, are made off fat in the spring of the year, and in addition 150 hoggs are bought and fattened during the winter.

Four breeding sows are kept, and all the pigs are fattened on the produce of the farm.

Eight working horses are kept; they are worked generally in pairs, are stabled during winter, and kept in the yards on green food during the summer. They are never turned out into the pastures at any season of the year.

A small proportion only of the 125 acres of pasture land is mown, and never two years in succession without having sheep folded on it, eating cake or corn. Until weaning-time the ewes and lambs are always in hurdles, the lambs running forward and eating a moderate quantity of cake. In this dry season both cattle and sheep had cake-troughs in almost every field, and although rather short of grass were doing well.

The fences are remarkably good, and are carefully and well managed. There is not a gap to be seen, and scarcely a weed on the banks; there is as little waste ground as possible, and in the arable fields the corn grows quite close to the fence.

There is very much to admire in the system of farming pursued at Adderbury. The cultivation is very superior, the crops are clean, the pastures and fences well managed, and the stock good, and carefully attended to. There is not, however, the same bulk of corn, or the same promise for roots, as we have described on the two Prize Farms, although the district is considered one of the most fertile in the county.

Mr. Latham's Farm.—On Mr. Latham's farm at Little Wittenham, the summer management of sheep is specially worthy of notice, and I propose therefore to give a short description of this farm.

It contains 500 acres, of which 140 are pasture and 360 arable land. The geological formations upon which it rests are valley gravels and gault, and the soil may be described as a strong clay loam on a dry subsoil, mixed loam or gravel, and a rather strong loam on a rubbly stone subsoil. The system of farming is therefore varied, in accordance with the nature of the soil. The object most kept in view, and most cleverly and successfully carried out, is the production of as large an amount of sheep feed as possible, and the consequent keeping of a large number of sheep upon the farm. Trifolium and ryegrass, rye, and winter vetches are sown immediately after harvest upon all the stubbles, and these are carefully hurdled off in early spring, and serve as summer food for the ewes and lambs, the lambs always running forward and eating corn and cake. Rape is sown between the rows of winter beans, and makes excellent sheep food after the vetches, the last of which were being fed off when we visited the farm about the middle of July. Mr. Latham keeps a flock of 400 Oxford Down ewes, which generally produce about 450 lambs; about half of these are sold as fat lambs to the London market before the middle of May, the remainder are kept to renew the flock, or to be sold as breeding ewes. The Judges were much struck, on their last visit, with a remarkably good lot of ewe lambs which were feeding on vetches, in which there were a small sprinkling of winter beans. Finer lambs could not be seen, and they were eating only a small quantity of malt-dust in addition to their green food. A large number of lambs are bought in addition to those bred, and the summer sheep stock of the farm frequently numbers 800.

Mangolds and swedes had been sown as far as the sheep had fed off the green crops, but to a certain extent the roots are a failure this season.

Mr. Latham keeps and fattens a great quantity of Berkshire pigs. They are of an excellent sort, and are a substitute to some extent for cattle in the making of manure.

Mr. Latham's farm has some fine crops of wheat and beans upon it, but his roots are indifferent, and his straw is not made into very good manure for want of more cattle being kept in the winter season.

Captain Dashwood's Farm.

A Report upon the Farm-prize competition in the Oxford district would not be complete without some notice of Captain Dashwood's farms at Kirtlington.

These are two farms which are held and worked together, and contain 1072 acres, of which 145 acres are meadow and pasture, leaving 927 acres of arable land.

Kirtlington is about 10 miles north of Oxford, situated on rather high and exposed table-land. The soil is a thin loam of poor quality, resting on the stone or corn brash.

There are two sets of buildings, one on each farm, most substantially built of stone and slate, containing ample barn and stable accommodation, with both open and covered yards, and loose boxes for cattle, and, in short, everything which can be required in a modern homestead.

The course of cropping is a somewhat peculiar one; this year the following crops were growing on the farm:—

588	acres	White Corn: Wheat, Barley, and Oats.
73	,,	Pulse.
75	,,	Seeds.
147	,,	Roots.
883		
44	acres of Sainfoin.	
927		

Making nearly $\frac{4}{6}$ of white corn, $\frac{1}{6}$ pulse and seeds, and $\frac{1}{6}$ roots, exclusive of the 44 acres of sainfoin. The roots this year consisted of—

40	acres of	Mangold-wurzel.
70	,,	Swedes.
20	,,	Turnips, after vetches or seeds.
17	,,	Rape, after ditto.
147		

The land intended for roots is broken up as deeply as possible by steam-cultivation or a four-horse plough. Mangolds are sown on the ridge 27 inches apart, about the middle of April, and receive 12 or 14 loads of farmyard dung, $2\frac{1}{4}$ cwt. of best Peruvian guano, and two cwts. of superphosphate.

Swedes are also sown on the ridges about the tenth of May, and are manured with farmyard dung, $1\frac{1}{4}$ cwt. of guano, and 2 cwt. of superphosphate. The turnips after vetches are sown on the flat, and have about 4 cwt. of superphosphate only.

The mangolds are all carted off and stored in the usual way; one-third of the swedes are carted off, and the remainder fed on the ground, by sheep eating corn and cake. Wheat is generally grown after mangolds, and barley after swedes and turnips. Barley and oats are also grown after wheat sown as early as possible, 7 to 10 pecks of seed being drilled 8 inches apart; the plants are horse-hoed, and a top-dressing of nitrate of soda is applied in the spring.

Seeds are drilled after the crop has been horse-hoed; red clover is generally sown, and but little or no ryegrass.

The seeds are ploughed up early for wheat; no manure of any kind is applied in the autumn, but heavy top-dressings of nitrate of soda (as much as $1\frac{1}{2}$ cwt. per acre) are applied in the spring. Talavera and Browick red, and a mixture of white and red wheats, are usually sown. From 4 to 8 pecks of seed are drilled 10 inches apart early in September; all the wheat is horse-hoed, with Garrett's hoe, early in spring; it is generally cut by the fagging-hook, at a cost of 10*s.* per acre.

No cattle are kept in the summer, but good shorthorn steers are bought in the autumn, and are made fat upon roots and cake in the foldyards and boxes.

A flock of 500 Oxford Down ewes is kept, which breed on an average about 25 lambs to the score ewes. All the produce are kept highly and made fat, and sold at about 12 months old; the draft ewes are also all fattened off.

About 100 pigs are kept. They are called the Oxfordshire breed, and are a coarse sort with a good deal of flesh These are fed very much on roots, supplemented by meal, but no cooking, only cold mixing.

There are 27 cart horses, a large and good sort; they are always worked abreast, and are fed on crushed corn and chaff, and no long hay. In summer they have green food in the yards.

The fences at Kirtlington are good, and on the whole well managed. Many of the old fences have been taken down, and those which remain divide the farms into large enclosures.

The labourers are well cared for at Kirtlington, living in new and excellent cottages, which are placed in different situations on the farm. Captain Dashwood is very particular as to the management of the men, and his intelligent bailiff, Mr. Hibgin, takes great care that there is little or no working in gangs, and indeed two men rarely work together. There is a great deal of piece-work, and each man takes his own part, which is all measured up and paid for separately. In hoeing turnips, and other work of the sort, the advantage of this plan is obvious. If men work in gangs the good labourer has no inducement to perform his work well, as he is mixed up with the careless man and the sloven. No beer is ever given, even in harvest-time; but every thing is paid for in money. When Captain Dashwood first commenced this system it was much disliked, but now that the men are used to it they prefer having more money to take home to their wives and families.

The foregoing description of the course of cropping adopted at Kirtlington shows a very different system of farming from that pursued on the two Prize Farms, and I trust that Captain Dashwood will pardon me for making a comparison which may be instructive.

At Ash Grove and at Upper Winchendon one-half only of the arable land is annually under white grain crops. The manure is all applied under ground, and much reliance is placed upon the fertilizing power of cake- and corn-eating sheep; but at Kirtlington four-sixths of the arable land is given up to cereal crops, nitrate of soda being the great stimulant employed to force these extra crops from a somewhat exhausted soil. In very favourable seasons the system is said to answer, but this year it is certainly a failure. When we made our first inspection in May, we were much struck with the general appearance of the farm, its large square fields, its clean cultivation, its straight drilling, and the business-like system of management which pervaded the whole concern. The young crops then looked green and flourishing, and we were not prepared to see so many acres of very light and inferior corn in the month of July. The whole blame is laid upon the season, but we think that want of condition is the real reason why light land at Kirtlington has suffered so much more by drought than similar light land at Ardley. The fact is that the system of growing corn by means of stimulating manure has been pushed too far, and the elements of fertility have not been restored to the soil in the same ratio as they have been abstracted. A trying season has come, and the crops have failed.

I know that Mr. Lawes contends that corn may be grown year after year by the use of artificial manures. I doubt, however, whether upon light thin soils the alternation of green and white crops can profitably be departed from. The inspection of the 21 competing farms has impressed me strongly with the opinion that it cannot. For not at Kirtlington alone, but on several other occupations where the history of light and inferior corn-crops could be traced, it was invariably found that an exhausting system had previously been pursued. On more than one farm which we examined, deep and excellent steam-cultivation had been relied upon to grow repeated crops without manure, and, although on strong good soils this may answer for a time, I believe that in the long run the true system is to endeavour to keep as much stock as possible, and not to grow corn upon too many acres. Stock must and will pay in this meat-consuming country, and the more stock a farmer keeps, the more he will have of that fertilising matter wherewith to produce his cereal crops in the greatest perfection.

Concluding Remarks.

Having now described the prize and commended farms, it may be well briefly to notice generally the farming of the district through which the Judges travelled during their survey.

Mr. Read, in his report upon the farming of Oxfordshire, published in 1854, writes as follows :—

"The improvements still required are both numerous and important. The principal are of such magnitude that they can only be originated by the landlords. Throughout the county there is a great need of better situated, more extensive, and more convenient farm buildings ; also the formation of good farm roads, the extension of an improved system of drainage, the speedy adoption of some effectual means of obviating summer inundation, and giving the occupier of land increased security of tenure.

"The tenantry should continue to give increased attention to the growth of green and root crops, and, when necessary, apply liberal doses of artificial manure. They should keep a heavier stock of cattle, and devote more care to the formation and preservation of farmyard-manure. They should also dispense with all superfluous horse-labour, use better implements, and more machinery, and cultivate most of the soils more deeply. The pasture-land ought to receive more generous treatment, and the ditches and watercourses should receive constant attention. Many of these improvements are already carried out on some good farms, and most of the suggestions apply with especial force to the corn-land of the country."

The above remarks were written sixteen years ago, let us now inquire what has been done in the interval. On many large estates the farm buildings have been much improved, but in none to the same extent as in that of Mr. Langstone (now Earl Ducie), where the most substantial and excellent farmhouses and buildings have been erected on almost every part of the property. In many instances on this estate, also, excellent fixed steam-engines and barn machinery have been put up under the able superintendence of Mr. Savidge, the late manager of all Mr. Langstone's farming operations. Much, however, remains to be done upon some estates in the way of improvement to farm buildings. In too many cases there is a great want of cattle-accommodation, and the consequence is that straw is, as a rule, not made into good manure. The straw stacks are too frequently left standing about the farm and when brought home the straw is thrown into open yards and rotted by rain, instead of being trodden into real good manure by cake-eating animals. The defect in the horses, noticed by Mr. Read, still exists to a great extent throughout the prize-farm district. With a few exceptions, a really good yard of horses was not to be seen, and in too many instances the horses may be described as being very inferior, undersized, and weak animals, badly fed and badly managed. Three horses are generally employed where two would suffice, and the system is therefore in the end really an expensive one.

I turn with pleasure to a more agreeable topic, the improvement in the growth of green and root crops, and in the management of sheep. In no part of England have greater improvements been made in these respects than in Oxfordshire and the adjoining counties.

The Oxfordshire Downs are rapidly growing into importance as one of our national breeds. They have been well described as rent-paying sheep. I believe them to be so, and that their general management is probably in many respects superior to what it is in other districts of the kingdom.

The labour question in Oxfordshire and in other counties is now obtaining more attention than heretofore. Better cottages have been erected, and in many respects the condition of the agricultural labourer has been much improved during the last twenty years. Some further improvement, however, might be made in the system of employment. As a rule, there is not much piecework in Oxfordshire; the labourers are too often seen working together by the day in large parties at low money-wages, a certain quantity of beer being given almost all the year round. I believe this to be a bad and also an expensive system.

Money payment, piecework, and the allotment, as much as possible, of work to each man, is the true secret of getting work well and cheaply done, and of producing a thrifty and contented set of labourers.

In conclusion, on behalf of my colleagues and myself, I must express our sense of the great kindness and hospitality which we experienced on both occasions of our visits of inspection, and I shall long remember the pleasant days we spent, and some of the instructive lessons which I learnt, in the Oxford Prize-Farm district in the year 1870.

H. W. KEARY.

Bridgnorth, August 1st., 1870.

We subscribe to the foregoing descriptions of competing farms.

T. GIBBONS.
W. TORR.

XIV.—*The Farming of Monmouthshire.* By W. FOTHERGILL.

MONMOUTHSHIRE, though now an English county, partakes so much of both England and Wales, that it may justly be considered the link between them, as it unites their language, their manners, and their customs. Even as far as the principal town of Monmouth, which is situated in the interior of the county, houses and lands are still known by their ancient Celtic names; and the traveller will find many persons who, although dwelling by the fruitful banks of the Monnow, still delight to converse in the vernacular, whilst the all-conquering English tongue has penetrated to the very heart of the mountain region; and even on the Bedwas and the Bedwellty heights it is now difficult to find one who can truthfully say "Dim Saesonog"—no English—when addressed by an Englishman.

PHYSICAL FEATURES.

The county is about 28 miles at its greatest length, which is from the Black Mountains on the north to the river Rhymney on the south; and its greatest breadth, from the Rhymney Iron Works on the west to Hadnock Wood on the east, is about 34 miles. The circumference may be taken at 130 miles, containing an area of about 496 square miles, or something more than 317,440 acres, divided into 125 parishes.

With the exception of about 70,000 acres on the coast line, 20 miles in length from the Wye to the Rhymney, and in the valleys of the rivers, the county is generally hilly and rugged; indeed, a full fourth of its extent may be taken as mountain, with an elevation of nearly 2000 feet above the level of the sea; and this

Sketch-Map of the Geology of Monmouthshire.

portion, spoken of in ancient writings as the "Wilds of Monmouthshire," may be truly described as all hill and dale, well watered and wooded, and comparatively productive.

A long chain of hills from Bedwellty Mountains runs in an almost unbroken line to the Curtain Mountain of Machen. On the east of this we have the Mynyddysllwyn Mountain, and a second and third range of hills, 1815 feet high, running east and west of the river Ebbw; whilst Twynffynmonmaison, on the west of Blaenavon, rises to the height of 1980 feet above the level of the sea.

At Abergavenny are the Blorenge, the Skirrid, and the Sugar Loaf Mountains, 1954 feet high. A portion of the Black Mountain range, and the exceedingly wild bold ridges of the elevations of Aberystwith and Llanhilleth, are to the north and west of Pontypool. The Graig forms the principal height of Skenfrith on the north; and Machen, Tynbarllwyn, and the far-famed Wyndcliffe, are the principal eminences in the south.

In contrast to these elevations—the principal of which only are named—are the narrow valleys running between the higher ranges of mountains, and the large broad tracts of the Wentlloog and Caldicot levels, lying even below the flood-level of the sea, and protected from its encroachments by walls and embankments of many miles in extent, which will be more particularly described hereafter.

The total acreage of the county, being 317,440 acres, may be divided geologically as follows:—

	Acres.	Localities.
Upper Silurian:—		
(*k*) Ludlow rocks	12,000	
Shales and sandstone, shales prevailing ..	5,920	.. Centre of the county.
(*h*) Wenlock limestone	3,200	... Usk, Monkswood, Clytha.
(*g*) Devonian Conglomerate and Sandstone	128,000	.. Central, Northern, being two-fifths of the county.
(*f*) Mountain-limestone	26,880	.. Chepstow, Magor, bordering Coal-measures.
(*e*) Millstone-grit, Sandstone, Shale, &c.	6,400	.. Bordering Coal-measures.
(*d*) Coal measures	67,840	.. West side of county.
(*c*) New Red Sandstone; alternate beds of stone, marl, and limestone	3,840	.. Portskewit, Chepstow, and Tintern.
(*b*) Lias clay, clayey loam, and limestone	5,120	.. Liswerry, Maesglass.
Boulders, pebbles, gravel ..	3,200	.. Tredegar Park, and vicinity.
(*a*) Alluvium	55,040	.. Wentlloog and Caldicot levels and valleys.

The Boulders and Alluvium (*a*), are probably under the actual acreage, as the deposits of the valleys in all the districts are not known and noted.

(*g*) *Devonian Soils.*—The rocks, when fragmentary, as on the escarpments of the hills, and when not denuded to a very great extent, crumble down to a deep rich loam, which is generally fertile and favourable to the growth of trees, especially the oak and the apple.

The siliceous gravel, where it abounds, gives the soil a friable character, well suited for roots and barley; whilst on the clay a strong wheat-soil is formed, and is found to be especially productive where a porous and rubbly soil accompanies it.

In the neighbourhood of Chepstow and round the boundaries of the Coal-basin, lime is found in considerable quantities, and great advantages are reaped from its liberal application to the land upon the sandstone soils. When, however, the character of the soil becomes slaty or shaly, as in the neighbourhood of Wentwood and other places in the vicinity, it appears to be best adapted for woodland or depasturing. Here indeed we see, as in so many districts of England, that the application of clays and marls, when easily transferable, produces remarkable and beneficial results.

The red lands in the valley, more especially south-east of Wentwood and New Church, protected as they are by the hills and woods, are generally of a highly ferruginous warm character, of superior fertility, excellent in mineral character, and for the most part of good texture.

(*f*) *Mountain-limestone.*—This formation, when occurring at high elevations, is admirably adapted (producing as it does sweet and good pasture) for carrying the native sheep and cattle. In lower localities it is favourable for roots and barley. Its escarpments, ravines, and ridges, are well adapted for the growth of woods, whilst the easily made lime from the upper beds affords a cheap and excellent manure.

(*e*) *Millstone-grit.*—This formation appears adapted for sheep-walks only.

(*d*) *Coal-measures.*—The various seams of coal and iron in Monmouthshire crop out along the northern boundary of the county, turning round by Pontypool, Risca, Caerphilly, Llantrissant, and on towards Swansea. They repose upon the limestone, under which is the red sandstone; the minerals on the northern part of the basin crop out at a less angle than they do on the south, hence the reason why Iron Works have been established at the head of every valley running north, as the minerals are from this fact worked at a less cost than on the southern edge of the basin, where they crop out at a greater inclination.

At or near Blackwood the lowest seam of coal would probably be found at the *greatest* depth from the surface, as the upper seam, which is known as the Mynyddyslwyn seam, and which has frequently been worked by levels from the mountain sides, is here worked by means of a deep pit, having been displaced or thrown down by a fault.

On this formation, which extends over such a large portion of the county, the sandstones and dark-coloured clays are in an unimproved state most unfavourable for agriculture. Indeed, it has been stated that the worst land in England lies upon the Coal-measures; and certainly at its best it is but hungry soil. However, by draining and liming, it can be rendered in a measure productive, except in the most elevated parts, where shales and sandstones occur at the outcrop. In some parts of the district the elements of a good soil are present, and frequently each may be greatly improved by an admixture of the other.

(*c*) *New Red Sandstone.*—This formation is of marked fertility, producing in rich abundance every kind of crop, and, where lime is at hand, great benefits result from its application. The neighbourhood of Crick, Portskewit, Magor, Chepstow, and Skenfrith, illustrate this.

(*b*) *Lias.*—This is a cold wet tenacious clay, or a clayey loam on the limestone. When porous it is found to be adapted for cultivation, and grows good wheat and tares. At Lliswen and Maesglaes, quarries have been opened, producing hydraulic lime, and yielding, from easily worked surface-beds, an abundance of cheap lime for the surrounding districts.

(*a*) *Alluvium.*—Here we have a very great variety of soil, in appearance as well as in productiveness, arising partly from deficient drainage, partly from the character of the subsoil, and sometimes from the elevation.

The washes on the alluvium are numerous, and some of them of considerable extent. The principal ones are Caldicot, Greenmoor, Devandon, and Chepstow.

The alluvium of the valleys of the Devonian area is wonderfully rich, and cheaply cultivated. Along the banks of the Usk it is of a faint red colour, and is as fertile as a garden. The alluvium of the hills, on the other hand, is of a thin peaty nature, with a sandy loam and clay, becoming marshy in the comparatively low grounds in the neighbourhood.

Distribution of Rocks and Soils.—That portion of Monmouthshire which lies east of a line drawn from Abergavenny to Newport, and prolonged thence to the Channel, is Devonian (*g* on the Table of Acreage) Conglomerates, Sandstones, and Marls, except from Chepstow and Magor, where there is an oblong tract, parallel to the Severn, of Carboniferous Limestone (*f*), partially overlain by a strip of New Red Sandstone (*c*), which borders it on the south and forms the shore of the Channel. Near Lliswen are found patches of Lower Lias (*b*), and the Alluvium of the Caldicot Level (*a*). Near Usk this formation has been denuded, so that the underlying Caradoc Sandstone, Wenlock Limestone, and Ludlow Rocks come to the surface and form an oblong district of about 3200 acres. Of the line described, 67,840 acres consist of Coal-measures, skirted by a narrow band of about 9600 acres of Carboniferous Limestone, and 5400 acres of Millstone-grit, being the eastern end of the great coal-field of South Wales. On the south of this is the remainder of the Devonian formation, making its quantity of 128,000 acres (*g*), and the Alluvium of the Wentlloog Levels (*a*).

Generally, therefore, the features of such a geological map as is here given may be taken for the mountains and uplands; but the 67,200 acres of low and highly valuable land require, and would amply repay, careful surveys of the subsoil, and proper plans of the farms. The labour of such an undertaking is, however, beyond the time or means of any private individual, or the scope of this paper.

Elevation.—The general elevation of the Devonian formation may be taken at about 300 feet above the sea. The mean level of the valleys and the Coal Basin may be taken at about 500 feet, and the cultivated slopes of the vales at an average of about 700 feet.

Temperature.—The mean temperature of the lower portions of the Devonian formation is 56°, and that of the valleys of the Usk and Wye would reach 60°. In the more elevated portions of the county it is considerably lower, whilst in the cultivated portions of the coal-fields it is even as low as 45°.

Climate.—Monmouthshire, being the westernmost county of England north of the Bristol Channel, has, from its vicinity to that channel, the elevation of its hills, and its general uneven character, a very large rainfall and a moderately saline atmosphere.

In the more mountainous portions of the county this is found to be the one great obstacle to any improvement of the native breeds of sheep; for when the short-woolled sheep of the district are crossed, the lengthened fleece retains so much moisture that the animal suffers considerably from the cold, and from the heavy load which it vainly endeavours to shake off. In the vales, where the nature of the subsoil is good, as in the largest portions of its area, the climate is very favourable to agriculture, especially in the valley of the Usk and the uplands bordering on the Channel.

A writer on the present state of the county says: "The climate is considered salubrious in most parts. In the valleys a great portion of the soil is on a gravelly subsoil, and therefore free from the exhalations arising from a retentive and ill-drained swamp; and though the air is keen and piercing on the mountain-ridges, it tends to brace and strengthen the animal system, and diffuses its salutary influence over the level districts."

Woods.—The eastern part of the county, even now well timbered, was in former days celebrated for the extent of its forests. Wentwood still remains, but it is now shorn of the glories it possessed when, as Wentwood Chase (the demesnes and peculiar possession of the several successive kings and princes of Gwent), it was guarded from trespass or invasion, not only by the vigilant "keeper" of the day, but by strong forts and fortresses, which even now in their ruin encircle it. Then "all creatures called '*Feria Natura*,' as all kinds of deer and four-footed beasts, and birds and eagles, hawks and their airy swans, the heron and other wild fowl, bred therein." In later years "*Charta Forresta*" was made for the preservation of these; and "did likewise ordain Swainmoth Courts to be kept thrice in the year, and that gwent-takers, foresters, and verderers, shall there appear to do their services; and that every forty days within the year our foresters and verderers shall meet to see the attachments of the forest, as well as for greenhew as for the hunting of our deer," &c. But "the old order changeth, giving place to new;" and Wentwood Chase, which, when Henry Earl of Worcester hunted the wild deer there, was 7000 acres in area, is now an excellent fox-cover of a very much more limited extent. Doubtless the time is not far distant when this ancient chase, once such a noble and spacious nursery for timber, will entirely disappear; and the wheat-plant will cover those undulating acres of clay, where the oak-tree still grows so well.

There are extensive woods and plantations on the estates of His Grace the Duke of Beaufort, Lord Tredegar, the Herberts of Llanarth, and others, all of which are managed with great care and skill.

On the steep declivities of the mountain sides, larch has, since the days of Bishop Watson, been planted with considerable success; and thus land, which in its natural state will scarcely support a goat, is brought to supply the extensive coal-districts of the neighbourhood with excellent pit-wood.

On all the principal estates, woods, or coppices as they are termed, are held by the landlord amongst the farms let to the tenantry; and consequently, independently of the profit arising from this source, many localities, which would otherwise be bare and leafless as a desert, are, to the gratification of the inhabitants, clothed with forest-trees.

The Levels.—A highly important part of this county lies in the southern district, namely, the Caldicot and Wentlloog Levels, which, many centuries ago, were reclaimed from the sea, it is supposed by the Dutch. Whenever this work was carried out, it must have been a stupendous undertaking, it being exposed in its entire length to the most violent action of the sea. The defences and works to maintain the land against the incursions of the sea are exceedingly costly and onerous, and are maintained under the direction of Commissioners appointed by the Crown and the Duchy of Lancaster. This commission is renewed every ten years.

These levels of Wentlloog and Caldicot extend from the river Wye, which bounds the county of Monmouth on the east, to the river Rhymney, which divides it from Glamorganshire on the west. The river Usk separates these lowlands into two distinct districts: the one on the eastern side is called the Caldicot Level, and contains 15,682 acres of excellent land, and that on the western side is known as the Wentlloog Level, extending over 8723 acres.

The whole of this tract of land is an alluvial deposit, and, when properly and judiciously drained, becomes rich and highly productive. Its protection, however, from the incursions of the sea requires most vigilant and careful attention, and for this purpose there are two surveyors engaged by the Commissioners to watch and carry out the necessary works for its protection as well as for its drainage.

The sea-walls and banks, erected as defences against the rush of the tide, are about 42 miles in length, and are chiefly maintained and kept in repair by the owners of certain lands to which the liability is attached. Other portions, however, are maintained by the Commissioners out of a general rate made upon the level. The drainage is at present carried out by means of sewers or large drains, by which the water is conveyed to the outfalls; and these works are in part public and part private. The public Reens, as the open drains are locally called, within the Caldicot Level, are 113 miles in length, and those within the Wentlloog Level are 46 miles, making in the whole no less than 159 miles. These in their entire length are kept in repair and cleansed by the owners of certain lands, which are subject to these charges by and under the direction of the Commissioners.

Throughout the district, of course, the fertility and productiveness of the soil is very greatly influenced by the way in which these onerous duties are carried out. Notwithstanding the extensive drainage here spoken of, the requirements of the district are really very far short of that which it supplies. The land on that account varies considerably in its quality, and the crops are correspondingly various in their bulk as well as in their feeding properties.

The farming is chiefly confined to grazing and the growth of hay, for which there is a constant demand in the manufacturing districts of the hills.

The drainage at present consists simply of large open cuts or channels, through which the water that falls upon the land, as well as that which flows down from the hills above, is conveyed by a natural descent to the sea; and these channels are also the only divisions or fences between the enclosures. The main drains, or "reens," may be called arteries, as they not only carry the surplus water out to the sea, but also convey the supply of fresh water required for the use of the inhabitants and for the general purposes of the district. The lands are not let out in large holdings, but in small farms varying from 200 down to 20 acres. A large portion, happily, is also let to farmers who live far out of the district, by whom the lands are much sought after, as a change for their young stock from their sterile mountain pastures, and to finish off such of their cows as they may turn out of their dairy for feeding. The best land in point of quality lies within the parishes of Nash, Goldclift, and Redwick. Here, in many allotments in these parishes, bullocks may be fed on grass alone to great perfection: the quantity usually assigned as necessary for the feeding of each bullock is from an acre to an acre and a quarter. The letting value varies from 30*s.* to 60*s.* per acre, and some choice pieces can be let at 70*s.* to 80*s.* per acre. But very small portions are cultivated—none, indeed, except for the growth of corn for the farmer's own use, and for the sake of straw as litter. In no instance is any regular course of husbandry adopted on these arables.

From a return made to Parliament in the year 1866, it appears that the total acreage in Monmouthshire under all kinds of crops, bare fallow, and grass—

	Acres.
At that date was but	208,276
Under corn crops	41,469
Under green crops	15,658
Under clover and artificial grass	16,552
Under permanent pasture, meadow or grass (not broken up in rotation), exclusive of hill pasture	127,071
Percentage of crops: total acreage under all kinds of crops, bare fallow, and grass	19·9

Cattle.

	Cattle.
Total number of estimated ordinary stock of cattle	36,735
Proportionate number to every one hundred acres, under crops, bare fallow, and grass	17·6

Sheep.

	Sheep.
Total number as returned upon 5th March, 1866	131,158
Proportionate number to every one hundred acres of crops, bare fallow, and grass	63·0

Acreage under each description of Corn Crop.

	Acres.
Wheat	19,796
Barley	12,150
Oats	7,904
Rye	68
Beans	408
Peas	1,143
Total under corn crop	41,469

Acreage under each description of Green Crop.

	Acres.
Potatoes	2,443
Turnips and swedes	9,666
Mangold	677
Carrots	74
Cabbage, kohl-rabi, and rape	199
Vetches, lucerne, and any other crop (except clover or grass)	2,599
Total	15,658

Acreage under bare fallow, or uncropped arable land ..	7,526
Clover and artificial grasses, and other under rotation ..	16,552
Permanent meadows, pasture, or grass (not broken up in rotation), exclusive of hill pasture	127,071
Total of acreage under all kinds of crops, bare fallow and grass	208,276

Meadows.

It is observable throughout the whole of South Wales that nearly all soils return to their natural state of grass with surprising rapidity; and this also occurs in a very remarkable degree in the neighbouring county of Monmouth.

Numerous instances may be given of land, even upon the mountain sides, which had been apparently exhausted by the repeated growth of oats, until it refused to double the seed, but which, when left fallow, recovered naturally the green appearance of the surrounding country. It is not couch that covers it, but a small fine grass indigenous to the locality. Some grass-fields, if folded very heavily with sheep, will produce white or Dutch clover in great abundance.

What Mr. Hassell says in his report on Pembrokeshire may be truly quoted of Monmouthshire. "The mildness of the climate, and the perpetual vegetation that is going on, even in the winter months, seem in so peculiar a manner favourable to grass that we cannot but lament to see so much under plough. There does not, however, appear to be very great attention paid to the management of grass lands generally through the county; and irrigation, which has produced such astonishing results when it has been adopted on a small scale, does not meet with the attention which it most certainly merits." Many a rivulet in this land of streams might be brought by judicious and inexpensive application to do its part in clothing with a permanent verdure places quite inaccessible to the plough, and at least doubling the crop of hay in the vale. The levels of Caldicot and Wentlloog in "a rainy season" produce an abundance of grass of good quality, but they are susceptible of very great improvement. In the neighbourhood of Abergavenny, near Monmouth (where the wet lands contiguous to the Trothy are being effectually drained under the direction of Mr. A. O. Wyatt, agent to His Grace the Duke of Beaufort), and at Usk, very great care is taken of the lands intended for hay, and good average crops are produced; but these are favoured localities.

To prove that the county in its least fertile parts is admirably adapted to the growth of grass, it is only necessary to visit the Rhymney or the Tredegar valley, where infinite pains are taken with the land, under the energetic and spirited management of the iron-masters. Larger crops are produced there, although upon the coal-measures, than almost in any other part of the county.

The fields are every season carefully weeded and cleared, and an abundance of stable manure and ashes is applied in the autumn or early spring. The whole of the crop is cut with mowing machines, and the greatest care is paid to the "making" of it. It is invariably put up into heaps overnight, and opened out when the dew is off in the early morning; consequently, even if some rain falls, the "starch" is not all washed out of it, which would certainly be the case if it were left abroad; and it retains the smell of good well-made hay, even when cut out of the stack for consumption.

It is very observable that even if no rain falls, hay made in this way alone retains its peculiar aroma.

Hill Sheep-farming.

Some sixty years ago, before the establishment of the iron-works above alluded to, in the mountainous portions of Monmouthshire, bordering on South Wales, the whole farming of the district might very properly be described under the one word pastoral. The whole country was pretty well divided into small farms ranging from 50 to 150 acres each, and the inhabitants, a careful and thrifty race, possessed one common system (if system it may be called) of managing the land.

They generally reserved a small croft, or portion of land near the dwelling, for the milch cows, and ploughed a few acres of the best upland for oats. This was a successional crop, without dissolution of continuity, with an occasional plant of potatoes by way of variety, till the piece, having become thoroughly exhausted, was left for Dame Nature to carry on the seeding and laying down. In the course of a few years the land would again become green; for, as observed above, in consequence of the humidity of the atmosphere, it is wonderful how quickly the barren places will again become clothed with verdure, even upon the slopes of the highest mountains. Then, after a natural sward was formed, the previous course of husbandry again followed.

The oats, ground down generally into a very fine meal, were converted into a thin kind of cake, which, under the name of "Bara Ceirch," or oatmeal-bread, formed with bacon the principal food of the farmer, who looked ever to his flocks and herds as his mainstay, and who, like the Indian of the far west, appeared to consider the tillage of the soil as something quite beneath his notice. The mountains in those days, before they were broken up by the excavations and underground workings of the miners, and injured by the sulphurous smoke arising from innumerable blast and coke-furnaces, provided a remunerative walk for the native breeds of sheep, cattle, and ponies. These mountain flocks appear, from the records of the past, to have enjoyed about as much "management" as the land they wandered over.

The mountains of Monmouthshire are, as it is generally supposed, "commons without stint," the meaning of which is simply this: that any occupier of land may put any amount of stock upon the mountain at any time, and no man may say him nay. This being the case, it is not at all surprising that we hear the golden maxim of former days was, "never kill a ewe;" breed and breed till your stock becomes so numerous that you can overrun your neighbour; but this rule, however glittering to the ambitious man, had anything but golden results for the poorer class of farmers. They found that unscrupulous men fairly drove them off the mountain altogether; indeed instances are given of those who boasted of having sheep all the way from the Brecon Beacons to Tredegar Park. In fact, so far as the pasturage of the common was concerned, Rob Roy's rule, "let him take who has the power, and let him keep who can," appears to have been the only rule of life. Mountain-sheep in those days were never known to see a turnip, indeed it was religiously believed that they would not eat one if they saw it. Never, except in violent and prolonged snow-storms, was any hay doled out to the starving flock. Consequently, many became so poor and weak during the winter months that they dropped off by scores on tasting the fresh green grass of spring. The lambing season commenced generally in March, and in good seasons a considerable number were reared. They were allowed to follow the ewes till late on in October, and then for the most part were removed into the vales of Glamorganshire or Monmouthshire, where they were pastured on the rough lands for the six months of winter. On being brought home in April they were taken right out to the mountain at once, where they were expected to gain their own livelihood: the ewes, with the exception of a run on the land during winter, for the term of their natural lives, and the wethers till they had attained the mature age of five or six years. At great gatherings, such as for sheep-washing, or shearing, the custom invariably was for the whole neighbourhood to turn out together for the purpose of collecting the sheep. The task of gathering the mountains was no slight one; and there are men now living who can recollect seeing the natives dressed in running costume for the task, and it is asserted there were some so fleet of foot that they could, in fair running, outstrip a four-year-old mountain wether. Now, however, the Highland sheep-dog, introduced from Westmoreland some years ago, has made the task of gathering the mountain-sheep a comparatively easy one. In fact, since the period alluded to, there has been considerable change in the manners, customs, and general farming of the mountaineer; though there is yet, it must be confessed, considerable room for improvement.

Hardly one mountain-farmer in Monmouthshire ever dreams of giving his ewes, or indeed any of his sheep, hay or roots in the winter, except in a prolonged snow-storm, yet the shepherds of Scotland many years ago recognized the necessity of making substantial provision for their mountain-flocks in winter. "Let one instance (says Mr. Stephens in his admirable work, the 'Book of the Farm') out of many suffice to show the comparative immunity from loss in providing food and shelter for sheep in winter.

"In the wet and cold winters of 1816 and 1818, the more than usual loss of sheep and lambs on the farm of Crosscleach, Selkirkshire, was as follows:—

In 1816.

200 lambs at 8*s*. each	£80	
40 old sheep, 20*s*. each	40	
		£120

In 1818.

200 lambs at 8*s*. each	£80	
30 old sheep, 20*s*. each	30	
		£110
Value of total extra loss		£230

"Whereas on the farm of Bowerhope, belonging to the same farmer, and on which one-third more sheep are kept, the *extra* loss in those years was as follows:—

In 1816.

70 lambs at 8*s*. each	£28	
10 old sheep, 20*s*. each	10	
		£38

In 1818.

50 lambs at 8*s*. each	£20	
8 old sheep, 20*s*. each	8	
		£28
Value of total extra loss		£66
Deduct from loss on Crosscleach		230
Value saved in farm of Bowerhope		£164

Few farmers in the neighbourhood of the hills carry out a proper rotation of crops, or indeed attempt to grow swedes, although the district is favourable to the growth of them, provided they are sown sufficiently early. The old system of breast-ploughing a piece of rough land, burning the ash upon it, and then growing cereals *ad infinitum*, is now about played out, as it is found to impoverish the soil beyond all redemption. There is now a feeling, rapidly gaining ground in the locality, that the land, poor as it decidedly is, can be brought by good husbandry to produce more; and the increased demand for every kind of produce, in consequence of the large population brought into the country by the extensive iron and coal works, excites the farmer to make an effort to supply it. There can be no possible doubt that if the lands still farmed as open commons were all enclosed, and the right belonging to each farm walled off for the exclusive use of the farmer, a very great and wonderful change in the agriculture of this part of Monmouthshire would at once become apparent.

Now men's energies are expended in struggles for a right of mountain walk, for which indeed they are charged in valuation of rent by the landlords, and which consequently they do not wish to relinquish without an effort; but in too many cases it is, after all, hardly worth the fighting for.

As every man, according to the custom of the country, has a right to turn stock upon the mountain "without stint," it is obvious that the over-stocking following upon such an absurd rule as this utterly precludes the idea of keeping permanently improved breeds of cattle, ponies, or sheep.

The most hardy class of sheep from North Wales are purchased for the express purpose of "keeping the walk." Horned wethers from Cardiganshire are best adapted for this work. When once settled upon a spot they will keep it as their base of operations, and then fight their way till, like the far-famed Lonks of Cumberland, they get the best grass in the parish, even if it grows in the churchyard. These sheep are bought at Brecon as yearlings, generally at prices varying from ten to eighteen shillings each. They are placed upon the mountain, and carefully kept to one spot by a shepherd, who is a being just as unlike one of the shepherds of classic story, who played his lute and was innocent, as it is possible to conceive. Early and late—late and early—he is there walking and watching, and woe be to any man or dog who disturbs him with his charge. The peaceful dwellers in the vale know little of the desperate struggles carried on, every spring or early summer-time, between unscrupulous men upon these wild wastes for the miserable right of walk. Suffice it to say, that there are those who have gone through the whole process of "settling the yearlings," as it is called, and the management of sheep upon a Monmouthshire walk, and who are thoroughly disgusted with the whole system. Further, they are convinced that it would be an incalculable benefit to the country, and to the teeming population of the iron-works, if every single acre of common and open mountain in the county were enclosed at once by Act of Parliament. It is, as a Scotchman remarked but the other day, "a varra great pity that these lands lie waste, whilst so many of our young men are wandering awa to foreign parts, seeking wilds to reclaim." These lands are capable of sustaining the very best class of Cheviot sheep; indeed, the climate and the grass suit them admirably. The Cheviot, however, being a fine heavy sheep, and of a bold wild disposition, is injured to a great extent by the dogging consequent to the present system. Should the mountains ever be enclosed a regular course of husbandry would speedily follow, for it is only necessary to have seen the piece of swedes, averaging twenty tons per acre, grown by the Tredegar Iron Company's bailiff last year, up at the highest point of enclosed ground, to see what can be produced in the district.

Arable Land.

In the neighbourhood to which the recent remarks immediately apply, tillage, as may be supposed, is of little consideration. The corn grown on the small farms is sown broadcast, threshed with a flail, and winnowed for the most part with the exceedingly simple and primitive appliance of a sieve, a sheet, and a through-draft through two open barn-doors.

Roots are seldom grown, but when they are, there certainly is observable a very great improvement of late years in their cultivation. Formerly common turnips were sown broadcast in a miserably tilled field, and were *harrowed* when about six inches high, which was thought to be, at least, a much more expeditious way of going over them than with the hoe. Rye is seldom grown here, neither is the French furze, which, for store stock, is found to be a valuable crop on land of a similar quality in South Wales.

On the larger farms a regular course is generally adopted:—(1.) Oats. (2.) Swedes, with farmyard manure, and superphosphate or "turnip-manure." (3.) Barley or Oats, with Seeds for three years' lay.

The cereals have, for the most part, some artificial manure as a top-dressing, and the seeds, mown the first year, are afterwards grazed. A great number of steers are reared in the locality and sold at two or three years old to go into the Midland counties. Butter of good quality, and somewhat inferior cheese, are made at most farm-houses. They meet with a very ready sale in the neighbourhood. In some cases the whole of the milk is retailed, especially in the mining districts, and Durham cows have been introduced to create a supply; but they have to fight a hard battle with Nature on such high ground, and do not succeed well till they become thoroughly acclimatized.

In the lower parts of Monmouthshire the agriculture is of a totally different order; and very observable, indeed, is the improvement made year by year in the general management of land, and in the different breeds of all kinds of stock. The farms in this neighbourhood are frequently of from 300 to 400 acres in extent, and the course adopted in an instance where the land is three-fifths arable and the remainder meadow is as follows:—(1.) Roots. (2.) Barley or Wheat, with Clover, pastured with sheep generally in the high ground, but mown on the level. The land is in some places heavy, but for the most part light, and, lying as it does upon the limestone, is consequently thin. The cattle are all fed under cover in stalls, generally on roots and meal, with meadow hay and straw. Sheep are fed on roots and corn. The roots are invariably cut for feeding sheep, but not for stores. The average return per acre for corn in the neighbourhood of Usk is—wheat about 25 bushels; barley very much the same; oats 30 to 35; beans 30. It may be interesting to mention here that 77 years ago an Agricultural Society was formed at Usk, which appears, in its day, to have given a great impetus to farming. On Thursday, the 12th September, 1793, premiums were adjudged by the Monmouthshire Agricultural Society at Usk, viz., for labourers hoeing turnips, three different prizes; for long service in husbandry, six prizes. Since that date it is evident that agriculture has made, and is still making, astonishing progress in the lower parts of Monmouthshire; and any one passing through the neighbourhood of Abergavenny, Monmouth, Usk, Newport, and Chepstow, would be struck with the energetic way in which improvements of all kinds, in a more or less degree, are being carried out.

The rotation of crops does not appear to vary much in these different localities. Barley follows swedes; then clover; and wheat, for the most part, and in some cases winter oats, have been successively grown. Although it is contended that on stiff-clay soils the succeeding crop repays for the loss of the year's fallow, it is not unusual in this county to avoid it by ploughing up immediately after harvest, sowing vetches and feeding them off with sheep in the spring.

There is a very great change apparent on the low farms, of late years, in the breed of sheep, consequent upon the improved system of agriculture adopted. Cotswolds are now pretty well established, to the exclusion of the mountain-sheep, or even a cross from them—the larger sheep being found so much more profitable in every way upon turnip-land. In some places a quick shallow soil is met with, and here peas, drilled in rows from 12 to 14 inches apart, are found to do well. They are, however, frequently attacked, just as they commence flowering, by an insect known as the green fly, when, if the sparrows do not come to the rescue, the crop is lost. Beans, too, and mangolds are increasing crops throughout the whole district.

The breadth of potatoes planted recently is very much less than it was some years ago, in consequence of the disease. The only instances in which the potato-disease has not made its appearance are those in which the plant has been an early one. A successful experiment has been made of setting a rood of ground with potatoes in November. The ground was well manured and dug a full spade-depth all over; whole potatoes were then dibbled in a yard apart every way. They were never "moulded" or "earthed up" at all, but flat-hoed by a boy, and the result in quantity and in quality was most satisfactory.

By the kindness of Mr. R. Stratton, I am enabled to give the following account of his farm-operations carried on at the Duffryn, near Newport:—"My occupation," he says, "consists of 800 acres, half grass, half arable, all the property of Lord Tredegar. The arable portion of the Home farm is a light loamy soil, upon gravel, very suitable for roots and clover, but requiring to be done well to grow good crops of corn. The New Park farm is a sandy shallow soil on the limestone, and very hilly: it grows turnips fairly, but has not sufficient staple to grow heavy crops of corn. I adopt the four-field system, with modifications, and use a large quantity of artificial manure, corn, and cake. From 300 to 400 breeding ewes are generally kept; some of the earliest lambs are sold fat in April, May, and June—the remainder are stored through the summer, and fattened on roots in the winter. The ewes are all sold fat every year, and a fresh lot bought in. Dorsets, Downs, or Radnors are kept, and all crossed with the Cotswold. No roots are hauled off—all are consumed with sheep on the land. All the seeds are mown. Of the grass-land, all is summer-grazed, with the exception of from 40 to 80 acres mown. Eighty cows are milked, and Cheddar cheese is made with the surplus-milk which is not required for Newport. The ordinary Durham cow is kept, pure-bred short-horn bulls are used, and 20 of the best heifer-calves are reared, being brought into the dairy at two years and six months old. The principal proportion of the cows calve in March and are milked till December, when they are dried off and kept on straw, oats, barley, beans or peas, and grains, with 4 lbs. of linseed-cake or 5 lbs. cotton, till they calve, when they have hay till grass-time. If the hay is inferior, a little cake or grains is given with it. The milking-cows for Newport have hay, grains, and cake all the winter. No roots are used with the horned stock, as grains, cake, &c., are considered cheaper, and are required to keep the land in condition to grow fair crops. All the cows are tied during winter. Chaffing is not adopted, or rather, it has been discarded. As the cattle must have some bedding, I prefer to let them eat the best of the straw, and bed them with the refuse. I have less casualties, and find the cattle do better on the uncut food. The calves are kept in during the first summer: they have milk for the first two months, then cake; and green food or hay till they are twelve months' old. Barren cows are generally fattened in winter. Many of the sheep are kept on the grass-land in summer, the ewes generally being fattened on grass. Thirteen farm-horses are kept: they lie out in the pastures during eight months of the year. Owing to the peculiar shape of the fields, steam-cultivation is of no advantage here. Fowler's new ploughs are used, and are very highly approved of."

It will readily be allowed that the vast improvement apparent of late years in the farming of Monmouthshire may be attributed to the very great stimulus and encouragement given to all rural affairs by the Tredegar Agricultural Show. The Tredegar family, the originators of this exhibition of live and dead stock, have for a great number of years directed their generous and powerful influence to its support, and have succeeded in raising it to its present position. The show was formerly held at Bellevue, a farm-house in the close vicinity of Tredegar Park; but it was soon found necessary to remove it to more spacious and commodious buildings at Newport. Year by year it has gradually and steadily risen in importance, until at length it stands almost without a rival as the best local show in England. Last year, although an additional wing had been erected for the accommodation of animals, the premises were crowded in every part by stock of a very superior description. Prizes are given by the Tredegar family, the town and corporation of Newport, the members of the Tredegar Agricultural Society, and by all the leading families in the county. There is also an annually increasing attraction in the Poultry Show, to which pens from the most distant counties of England and Wales are forwarded.

Abergavenny also has its Agricultural Show, established in the year 1854, at which over one hundred prizes are awarded. Perhaps it may be regretted that at these exhibitions (situated as they are in the immediate neighbourhood of the hills) so few prizes are offered for purely mountain stock. By their distribution an encouragement would be given to the improvement of the present degenerate race of cattle, sheep, and ponies; whilst in all probability the West Highland Scot and the Cheviot (the best of all hill sheep) would be represented at the annual gathering at Newport and Abergavenny.

Farm-Labourers.

In consequence of the establishment of extensive iron and coal works in this county, farm-labourers are generally in the receipt of higher wages than men of the same class in the purely agricultural districts of England. In some instances the men are boarded in the farm-houses; this arrangement, however, is rapidly falling into disuse, and would in no case be adopted but for the want of proper cottage-accommodation upon the farm. Some estates are well provided for in this respect, others are not; and here the complaints are loud and deep. "What we want," is the remark so often heard in those localities, "is a really good set of cottages for our workmen. If we had them, the men would invariably live under their own roofs, and this would be far more pleasant and satisfactory to both parties." On an average through the county, a farm-labourer receives from 13*s.* to 14*s.* per week, with cottage and garden (where these are available) rent free. In some districts, the money paid is, perhaps, lower; but the allowance of cider, and other perquisites, bring it up to about the same amount as that paid by farmers who have no other arrangement with the men than that of a strictly cash payment.

Horses.

It would be a boon to this county if, like Cambridgeshire and many neighbourhoods in England, each district was travelled in the season by well-bred, powerful, entire cart-horses. At present this certainly is a desideratum. Few farmers rear more than are necessary to replenish their teams, although the demand for clean-legged, active, powerful horses at the ironworks is constant, and sometimes extraordinary. Throughout the county generally, the custom is to chaff nearly all the provender during the winter months, and to turn the team out to grass in the summer time. At one large farm, steamed potatoes with chaffed food was given to the horses throughout the whole winter, and nothing could be more satisfactory than their appearance in the spring; in this instance no corn was given them. The horses at the iron works—where there are hundreds employed—are fed entirely on steamed food, with the addition of a liberal supply of oats, beans, and sometimes maize. The system of picketing horses to tares in the summer, which is so general in Gloucestershire, is followed in some places in this county. The race-horse "Ely" was bred in Monmouthshire, and others of the same blood; but, as a rule, there are not many thoroughbred horses, or, indeed, many nags, bred here.

By the kindness of Colonel Morgan, of Ruperra Castle, the mountain-pony mares on one of Lord Tredegar's estates have been crossed with an Arab, and the stock is very promising. As may be supposed, however, they are not quite so hardy as the native breeds.

Cattle.

Take the whole county, and Herefords are in the majority; although on many farms there are, besides Devons, very excellent herds of shorthorns. At the Raglan Castle Farm there is a herd of 60 Ayrshire milch cows; and Mr. McMasters, the owner of them, states that he can keep three of them where he could maintain but two of the other breeds. The custom of permitting the cattle to tread the land and stand shivering under the hedges in winter time is rapidly on the wane, and all the principal herds are confined to the homestead from November till May. Steamed chaffed food for cattle has, on more than one farm, been abandoned, under the impression that it produced hoven.

In some instances, the Herefordshire system of rearing calves abroad is adopted, but the more general plan is to bring them up at the pail. The dairy-women in the mountainous regions have an invincible belief in hay-tea as a substitute for milk when calves are three weeks or a month old.

The average supply of cattle at the Abergavenny and Newport weekly market is good. At the last-mentioned place a number of Irish beasts are very frequently met with; they are brought direct from Cork to Newport, and thence find their way through the county. The heifers, although called Irish, are in great proportion pure English shorthorns; for Irishmen come over into Wiltshire and other parts of England, buy up the calves when very young at the larger dairies, rear them at home, and then re-ship them for our ports.

Sheep.

As before stated, the heavier sheep are rapidly supplanting the mountain, or even half-breeds, upon the better farms; and on some occupations (as the last exhibition at Newport testified) flocks of pure Cotswolds and Leicesters are reared with the greatest care. The Shropshire Down is a favourite sheep in some localities, whilst the Down and Radnor cross holds its own in others. Folding upon roots, with corn and cake—including the whole system which it involves—is becoming universal in the low country. The black-faced Highland sheep have been tried upon the mountains, but they suffer considerably by the prolonged rains of winter. It is very remarkable that the coarse wool of the Highland sheep becomes comparatively fine after two years' sojourn in Monmouthshire.

The native hill-sheep are well adapted to the very changeable climate they have to endure; and, doubtless, by a judicious selection and breeding in the direct line, a valuable breed might be established. The ewes will rear their lambs almost in any place and under any circumstances; but, as a class, these sheep are miserably small, and they clip but about 2 lbs. of wool each. The Cheviots stand the hill well, summer and winter; they come to maturity early, and were it not for the perpetual dogging going on upon the "common without stint," they would inevitably supplant the smaller breeds.

Pigs.

The Berkshire is now almost universally the established breed of the county.

Implements.

The double-furrow plough is coming into general use, and, being considered *the* invention of the day, is apparently superseding Howard's two-horse plough, which has hitherto been universal.

Coleman's and Bentall's scufflers have deservedly taken the place of the old larger-sized ones; in fact, the old heavy drag is nearly a thing of the past.

On one farm, the Beverley Waggon Company's two-horse self-delivery reaper has been used, since 1861, to great advantage. With this machine and the same pair of horses 33 acres have been cut in three days.

A double-drill horse-hoe, said to be a Scotch invention, has been introduced, and works well. Drills for corn are in very general use, and farmers are quite alive to the necessity of obtaining the very latest improvements in agricultural machinery. On several farms steam-power is used for threshing, chaffing, grinding, and sowing.

Implements of the highest class are annually exhibited at the local Agricultural Shows.

Conclusion.

It is said, in Mr. Clark's 'Sketches,' that although after the Restoration, in the time of King Charles, agriculture and manufactures progressed even to the marches of Wales, wheat at this period was only known as a luxury in Monmouthshire; that in Queen Anne's reign the cultivation of the soil in the county progressed but little; and that under the reign of George I. the contests with some of the European Powers checked the progress of industry, and land was allowed to fall out of cultivation. Doubtless, therefore, there were but slight improvements upon the old state of affairs till the commencement of the present century.

The Tredegar Agricultural Show was established in 1818, and must at the time have awakened considerable interest among the agricultural classes. Certain it is, that all the observable permanent improvements in the management and cultivation of the land may be placed at a subsequent date to this. Of course, in making this statement, with a view to the consideration of the agricultural improvements made, and still required, in the district, the supposed reclamation of the levels, centuries ago, by the Dutch must not be included. The presence of the Dutch rests upon supposition, and it appears uncertain whether this magnificent tract of land was not given to the country by the retrogression of the sea. Large sums, as may be seen above, have, in our own day, been expended in the management of the land ; but the great work now under the consideration of the Commissioners has yet to be accomplished.

There is a now highly favoured district in Lincolnshire, of which an author of half a century ago could write, "I have, times out of mind, seen cows loosed out of their hovels and swim across a river with nothing but their faces and horns above water, and then take footing at mid-rib deep or less, but not one spark of dry land, and then forage till weary, and return to their hovels in a like swimming position."

Without, therefore, being too sanguine, we may well prophesy that the time is not very far distant when by the aid of steam, as in the Fen districts, the levels of Wentlloog and Caldicot will be most completely and effectually drained, and brought into the highest state of cultivation.

The drainage already done throughout the county has been very considerable. By means of parallel drains, under the direction of the late Mr. Andrew Buchan, a wild district, near Rhymney Iron Works, was thoroughly drained about twenty-five years ago, and still remains in an excellent state. In this instance, the drains were filled entirely with stones. The present manager of the iron-works is, with great spirit, engaged in reclaiming a singularly wild and unpromising mountain-side, by the same means, at the present time. In some localities considerable work has been done by the aid of Government grants, and others by private enterprise. In all places the same remark is repeated, "the system of drainage on his farm does not suit mine;" and it is difficult to find a district in England where the rules laid down by Mr. Bullock Webster apply with greater force than here :—

"1. No general rule can be laid down.

"2. Any one system for all soils is an absurdity.

"3. Depth and distance of drains must depend on the nature of the soil and subsoil.

"9. Grass-land can be over-drained.

"10. The direction the drains should be laid must be governed by the strata to be cut through, the fall, and other local circumstances; the rule of going always with the fall is decidedly wrong.

"11. There are instances (in the New Red Sandstone) where drains will act perfectly at 40 yards apart; and there are strong clay subsoils that require drains every 6 or 8 yards.

"15. On the strong clay subsoils (not surcharged with underwater) drains 30 to 36 inches deep, at moderate intervals, are much more effective than deep drains at wide intervals; and on these soils the clay should not be filled in over the tiles or pipes.

"17. It often happens that drains 4 feet deep and 40 feet apart are placed over a field, when one drain, properly put in, would cure the whole."

There is a manifest improvement in the state of the homesteads generally within the last twenty years. In too many instances, however, the buildings are insufficient in every way; and carts, waggons, and valuable implements are exposed to every weather for want of sheds. The large landed proprietors are, in every direction, improving the farm-houses, and meeting, as far as possible, the legitimate wishes of the tenantry. It is to be regretted that this example is not followed by all landlords; for the tenant who is obliged, for want of gates, to fence up every field right round as he sows it, is not a person to be envied.

The roads are, for the most part, good, except in remote districts leading to places unreclaimed. Even here, however, the spirit of improvement is at work; for an estate of the Duke of Beaufort, which a few years ago was considered the best woodcock ground in the county, now grows the best corn in the parish, and sportsmen have actually complained to the agent that he has destroyed their cover for cocks.

Without doubt, therefore, *progress* is broadly stamped upon the agricultural future of Monmouthshire. Influenced, indeed, by that confidence which in all parts of this beautiful county so happily exists between landlord and tenant, there is, in all human probability, a season of prosperity in store for those whose province it is to till her valleys, equal surely to anything that may be looked for by those who cultivate so highly and so well the richer soils of England.

In closing this report I am anxious to convey my most grateful thanks to those gentlemen in the county who have so readily supplied me with important information necessary to its completion.

XV.—*Report of Experiments upon Wheat, Barley, and Swedes, undertaken by Members of the Cirencester Chamber of Agriculture.* By John Wrightson, F.C.S., Professor of Agriculture in the Royal Agricultural College, Cirencester.

Introduction.

In conducting agricultural experiments the investigator is beset with many difficulties, which tend to render his results indistinct, and to detract from the value of his work. Among these difficulties may be named the following:—(1) Inequalities in the condition or in the natural fertility of the soil; (2) inequalities in the vigour of the plant; (3) peculiarities of season; and (4) attacks of insects. A number of plots may be measured off and treated with care, but, as the crop advances towards maturity, one or other of the above-named sources of error appears, causing differences not attributable to methods of cultivation, or special dressings of manure. Hence the importance of *repetition* and control: for although a single series of experiments may yield results of comparatively small value, several series, designed with a view to confirm or control each other, will probably elicit evidence of almost irresistible strength.

The Cirencester Chamber of Agriculture, in undertaking the work of conducting field experiments, kept this truth steadily in view; and it will be observed that the variety of manures or methods of cultivation used was restricted. The treatment decided upon was repeated sufficiently often to justify some useful conclusions being drawn; but, in spite of the precautions taken, contradictory results were occasionally obtained. Such disagreements are not uninstructive. They teach the importance of each farmer conducting experiments upon his own land in order to find its peculiarities. When a general concurrence of evidence is obtained, an important point is gained; when dissimilar answers are the result, some special reason for the want of conformity must be looked for in the soil and surrounding conditions.

In the autumn of 1868, the Committee of the Cirencester Chamber decided to carry out a series of wheat-experiments. In planning this series it was resolved—(1) that the trials should be of a simple character; (2) that the same series should be simultaneously carried out upon as many farms as possible; (3) that duplicate plots should in every case be used. It was also determined that the experiments should consist of two series—one a comparative trial between manurial substances, and the other between two or more methods of cultivation. Subsequently, experiments upon barley and roots were instituted. The following gentlemen undertook to carry out the suggestions of the Committee:—The Right Hon. Earl Bathurst, the Royal Agricultural College, Mr. E. Ruck, Mr. W. J. Edmonds, Mr. William Smith, Mr. Plumbe, and Mr. T. Little. The College undertook to send out weighed quantities of the required manures, and to provide analyses, the Chamber paying for the manure and other expenses.

Wide Drilling and Tillage Experiments upon Wheat.

The usual width of drilling wheat being about 9 inches, it was resolved—(1) to omit every alternate row, leaving a space of 18 inches between the rows; (2) to omit two drills, and leave two, making a space of 27 inches between double rows 9 inches apart; (3) to omit two drills and leave two, forking the interspaces during the summer; (4) to attempt the cultivation of carrots or potatoes between wheat-rows arranged as just described; (5) to try the effect of firmly pressing land with the foot in winter and spring.

In carrying out these experiments the wheat was in some cases sown with the drill in the usual manner, and the surplus rows were obliterated by the hand-hoe soon after the blades of corn appeared above ground. In other cases the drill was set so as to deposit the seed at the required width.

The objects of these experiments were as follows:—To show (1) how far a free admission of air and light influences the growth of the wheat-plant; (2) how far interculture is beneficial or the reverse; (3) the effect of thin seeding.

Similar experiments upon barley were also undertaken with interesting results. The following is a list of the plots required for carrying out these trials:—

- 2 plots in which 2 rows were alternately omitted and left.
- 2 ,, in which 2 rows were alternately omitted and left, the interspaces being forked twice through the summer.
- 2 ,, the same as the last, but with carrots or potatoes planted in the interspaces.
- 2 ,, firmly pressed with the foot.
- 2 ,, untouched for comparison.

Wide Drilling and Interculture.—"In wide intervals," says Tull, "we can raise a good crop with less labour, less seed, no dung, no fallow; but not without a competent quantity of earth, which is the least expensive of anything given to corn." Tull has had a few ardent followers, among whom the late Mr. Smith, of Lois Weedon, may be mentioned as a faithful disciple. Some encouraging results, obtained by Mr. J. A. Clarke from a field cultivated upon modified Tullian principles, were published in vol. xxv. of the Royal Agricultural Society's Journal, and were the immediate cause of a series of wide-drilled plots upon the College Experimental Farm in 1865. A piece of winter-drilled wheat was selected, and alternate rows were cut out with the hoe, leaving the wheat rows 18 inches apart. In like manner three rows were removed, and three left, forming triple rows with 40-inch interspaces. Of these plots some were forked, and others merely hand-hoed. As the experiment was only commenced on April 18th, the result, as might have been expected, was not favourable to wide intervals. It was, however, worthy of notice that although half the wheat was removed, the produce from the wide-spaced plots was, in spite of the unfavourable conditions of the experiment, equal to 27 bushels per acre, while the ordinary untouched wheat yielded 32 bushels per acre.

These experiments were repeated on a more extended scale in 1868, a season in which wide-drilling and forking could hardly be thought advantageous. Both wheat and barley were subjected to the trial, care being taken that the superfluous rows should be removed before they could interfere with the future prospects of the remaining rows. Some of the wide-spaced plots were twice forked during the summer, while others were kept free from weeds by means of the hand-hoe. The results are embodied in the following table :—

Table I.—Results of Wheat Experiments, 1868.

Plots.		Head Corn per Plot.	Bushels per Acre.	Weight. per Bushel.
		lbs.		lbs.
1	Alternate rows obliterated; spaces forked	46	29·6	65
2	Alternate rows obliterated; remaining rows singled into tufts or bunches	35·5	22·8	62·5
3	Ordinary wheat for comparison ..	48	30·8	64·75
4	Three rows left and three hoed out; spaces forked	39	25·2	64
5	Alternate rows obliterated; spaces not forked	44	28·4	64
6	Alternate rows obliterated; remaining rows "tufted" as in 2	38	24·4	64
7	Three rows left and three obliterated; not forked	42	26·8	64·75
8	Alternate rows obliterated; spaces not forked	44	28·4	64·75
9	Three rows left and three hoed out; spaces forked	32	20·4	65
10	Ordinary wheat	45·5	29·2	65·5
11	Three rows left and three hoed out; spaces forked	36	23·2	65
12	Alternate rows obliterated; spaces forked	40·5	26	65

Inspection of this table shows :—

1st. That in no case was the crop so good as in the case of the wheat cultivated in the usual way.

2nd. Plots in which the alternate wheat rows were obliterated were so nearly equal to those of ordinary wheat that, since half the seed might have been saved by sowing at once with a wide drill, the advantage is pretty equal in both methods.

3rd. The forked wheat was generally worse than the corresponding unforked, a result borne out by the experiments of 1865.

4th. Since 25 and 26 bushels per acre were obtained from *half the land* under crop in the cases of Plots 4 and 7, the question whether the interspaces would have borne as large a crop of wheat the succeeding year, as at Lois Weedon, is worthy of attention.

The experiments made upon barley during the same droughty season point to a clear advantage from wide-drilling and interculture, as will be seen upon inspecting Table II.

TABLE II.—BARLEY EXPERIMENTS ON THE ROYAL AGRICULTURAL COLLEGE EXPERIMENTAL FARM, 1868.

PLOTS ($\frac{1}{40}$ Acres).	Weight of Grain per Plot.	Weight of Grain per Acre.	Increase per Acre over Average of Unmanured Plots. Ordinary.	Measure calculated at 58 lbs. per Bushel.	Increase in Bushels per Acre over Average Unmanured. Ordinary.
	lbs.	lbs.	lbs.	Bushels.	Bushels.
Ordinary	43·75	1750	..	30·2	..
Alternate rows obliterated, May 3rd	55·00	2200	390	38·0	6·4
Ordinary	51·75	2060	..	35·5	..
Alternate rows obliterated, May 3rd	63·00	2520	690	43·4	11·8
Alternate rows obliterated, spaces forked, May 3rd	59·00	2360	530	40·7	9·1
Ordinary	42·00	1680	..	29·0	..
Alternate rows obliterated, spaces forked, May 3rd	64·75	2590	660	44·6	..
Average of 3 ordinary plots	44·04	1830	..	31·6	13·6
Average results of 2 plots, alternate rows obliterated	59·00	2360	530	40·7	9·7
Average result of 2 plots, alternate rows obliterated spaces forked ..	62·00	2480	650	42·7	11·1

TABLE III.—WHEAT EXPERIMENTS, 1869—EARL BATHURST'S RESULTS FROM APPLICATIONS OF MANURE, WIDE DRILLING, AND INTERCULTURE.

TILLAGE EXPERIMENTS.

PLOTS ($\frac{1}{20}$ Acre).	Date of Application.	Amount of Dressing per Acre.	Per Plot. Grain. Head.	Per Plot. Grain. Tail.	Per Plot. Grain. Total.	Per Acre. Total Grain.	Per Acre. Increase or Decrease.	Per Acre. Straw.	Per Acre. Cavings.	Per Acre. Chaff.	Increase of Grain per 100 lbs. of Nitrate of Soda used.	Per Cent. of Grain to Straw.
		lbs.										
2 rows obliterated and 2 left, carrots sown between, forked	..	..	139	31	170	1700	− 210	2560	240	360	..	66·4
2 rows obliterated and 2 left, forked April 9 and June 7	..	..	157	25	182	1820	− 90	2720	230	320	..	66·9
2 rows obliterated and 2 left	..	..	..	..	177	1770	− 140	2810	230	300	..	63·0
Nothing	..	..	160	31	191	1910	..	2645	180	300	..	72·2

MANURE EXPERIMENTS.

PLOTS ($\frac{1}{20}$ Acre).	Date of Application.	Amount of Dressing per Acre.	Per Plot. Grain. Head.	Per Plot. Grain. Tail.	Per Plot. Grain. Total.	Per Acre. Total Grain.	Per Acre. Increase or Decrease.	Per Acre. Straw.	Per Acre. Cavings.	Per Acre. Chaff.	Increase of Grain per 100 lbs. of Nitrate of Soda used.	Per Cent. of Grain to Straw.
Nitrate of soda	Mar. 23	168	184	44	228	2280	+ 370	3410	240	480	220·2	66·8
,, ...	,,	84	170	36	206	2060	+ 150	2912	220	420	178·3	71·1
Lawes' superphosphate .. Nitrate of soda	Jan. 13 ,,	336 168	177	31	208	2080	+ 170	2870	190	330	101·0	72·4
Lawes' superphosphate .. Nitrate of soda	Mar. 23 ,,	336 168	178	38	216	2160	+ 250	3290	190	440	148·0	65·6
Lawes' superphosphate .. Nitrate of soda	Jan. 13 Mar. 23	336 168	197	43	240	2400	+ 490	3570	230	470	290·0	67·2
No manure	..	..	160	31	191	1910	..	2645	180	300	..	72·2

In considering the results of experiments upon the effect of wide intervals and forking undertaken by the Cirencester Chamber of Agriculture, the best method will be first to briefly relate the separate experiences of each experimenter, and afterwards to comment upon the general tendency of the results.

Lord Bathurst's experiments (see Table III.) were made under the direction of his agent, Mr. Anderson. They were conducted upon a free-working soil, previously under clover and rye-grass, the land being in good condition. The wheat was sown in October, and the surplus drills removed early in the season. The forking was done on April 9th and June 7th, and the remaining plots were kept clear from weeds by hand-hoeing. The growing crop looked well through the summer, a marked difference being perceptible between the various plots. The wide-drilled portions assumed a dark-green colour and vigorous appearance, and the heads were larger than those of the surrounding wheat. They were considered up to harvest to be carrying a heavier crop than the ordinary untouched plots. The straw, however, was not so clean and bright, and the result showed that, although more straw had been grown per acre, there was slightly less grain. Evidence was given by these plots against forking between the rows. Thus while four forked and wide-spaced examples gave a decrease of 150 lbs. (2·4 bushels), two *un*forked and wide-spaced plots gave a decrease of 140 lbs. when compared with untouched and unmanured portions. In looking generally at these results, it is interesting to observe that with half the quantity of seed, or 1 bushel to the acre, the bulk of straw was actually greater than where 2 bushels were sown. But it is also significant that the straw (owing to mildew) yielded less corn than that under ordinary treatment. These experiments are a valuable comment on the Lois Weedon system of wheat-growing, and it is curious to speculate as to the probable effect had the 27-inch spaces been sown with wheat the succeeding year.

The College results are embodied in Table IV. The wheat, a fine white variety, was drilled November 18th. A crop of barley had occupied the ground the previous summer, and the clover having entirely failed by reason of the drought the barley-stubble was ploughed and sown with wheat. This was then the second white crop, and the land was in poor condition. The surplus rows were removed as soon as the wheat appeared, and the spaces were forked, where required, from March 10th to 13th, and again in June. As might have been expected, the crops did not yield largely, the average of three unmanured and untouched plots being only 25 bushels per acre. The plots where two rows had been alternately removed and left without any interculture, except hoeing, gave respectively 60 and 80 lbs. less corn per acre than the unmanured and untouched plots; while two plots similarly treated, but with the addition of forking between the rows, showed a decrease of 175 lbs. and 165 lbs. respectively, when compared with the ordinary wheat. The potatoes planted between the wide-drilled wheat were a complete failure.

TABLE IV.—TILLAGE AND WIDE DRILLING EXPERIMENTS ON WHEAT, 1869—ROYAL AGRICULTURAL COLLEGE EXPERIMENTAL FARM.

PLOTS ($\frac{1}{40}$ Acre each)	PER PLOT.				GRAIN PER ACRE.		
	Grain.			Total Grain per Plot.	Weight per Acre.	Increase or Decrease.	Average Increase or Decrease.
	Forked.	Head.	Tail.				
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
2 rows removed and 2 left	..	30·25	3·25	33·05	1440	− 80	− 70
,, ,,	..	33·5	3·00	36·05	1460	− 60	
3 rows removed and 3 left	..	26·5	2·00	28·05	1040	− 470	− 470
Firmly pressed with the foot	Mar. 13	40·75	3·75	44·05	1780	+ 260	+ 175
,, ,,	,,	36·5	3·75	40·25	1610	+ 90	
1 row removed and 1 left forked	Mar. 10	31·5	2·05	34·00	1360	− 160	− 175
,, ,,	,,	31·25	2·00	33·25	1330	− 190	
2 rows removed and 2 left forked	,,	38·5	2·75	41·25	1650	+ 130	− 165
,, ,,	Mar. 11	25·25	1·25	26·05	1060	− 460	
Nothing	..	38·5	2·05	41·00	1640	(1520 = Average)	..
,, ...	..	35·75	3·25	39·00	1560		
,, ...	..	31·00	3·00	34·00	1360		

TABLE V.—WIDE DRILLING EXPERIMENTS ON WHEAT, 1869—MR. SMITH OF BIBURY.

PLOTS ($\frac{1}{20}$ Acre each.).	Grain per Plot.	Grain per Acre.	Increase over Untouched Plots per Acre.	Straw per Plot.	Straw per Acre.	Increase of Straw per Acre.	Proportion of Grain to Straw per Acre.
	lbs.	lbs.					
2 drills 9 inches apart, alternated with 27 inch spaces (potatoes between)	160	3200	440	213	4260	760	75·00
2 drills omitted and 2 left, spaces forked twice ..	151	3020	260	207	4140	640	72·94
2 drills omitted and 2 left, land pressed	154	3080	320	217	4340	840	71·00
2 drills taken and 2 left, and land pressed	164	3280	520	219	4380	880	74·08
Untouched Plot	138	2760	..	175	3500	..	78·08

The results obtained by Mr. W. Smith, of Bibury, were so satisfactory that he has sown a larger area of wheat upon the same principle this season. Here the wheat was at once drilled the required width, thus actually saving 1 bushel of seed per acre. The land was naturally good, and may be described as a quick free barley soil, dark in colour, and in excellent condition. The previous treatment of vetches fed, followed by turnips fed, was a good preparation for wheat. Table V. at once shows that a considerable, and in some cases remarkable, increase in yield was obtained by adopting the proposed plan of cultivation. A party of farming friends, who visited the experimental field, were greatly pleased with the wide-drilled portions, and considered that they would probably yield *as well as the plots manured with nitrate of soda.* The heads were exceedingly large and well filled, and the yield of both grain and straw fully attested the truth of these observations. In one case, where alternately two rows were omitted and two left, the interspaces *being firmly pressed*, there was an increase of 8½ bushels of grain and 880 lbs. of straw per acre! In a second plot, where the interspaces were planted with potatoes (and consequently, to some extent, worked between the rows), there was an increase of 440 lbs. of grain (above 7 bushels) and 760 lbs. of straw. In a third case, an increase of 320 lbs., or upwards of 5 bushels, of grain was obtained. And, lastly, where the spaces were twice forked, there was an increase of 260 lbs., or 4 bushels per acre. Such results indicate the importance of carrying out simultaneous experiments upon many farms if we desire to arrive at truth; they also teach the necessity of each farmer trying experiments upon his own land.

Table VI.—Mr. W. J. Edmonds's Experiments on Wheat, 1869—Wide Drills and Interculture.

PLOTS ($\frac{1}{20}$ Acre.)	Grain. Head.	Grain. Tail.	Total Grain.
	lbs.	lbs.	lbs.
2 rows removed and 2 rows left	49	7	56
,, ,,	54	7	61
2 rows removed and 2 left, spaces forked ..	53	9	62
,, ,,	57	7	64
2 rows removed and 2 left, spaces planted with potatoes	58	7	65
,, ,,	54	10	64
Firmly pressed with foot	71	6	77
,, ...	56	8	64
Ordinary drilling	93	10	103
,, ...	85	10	95
,, ...	82	11	93
,, ...	103	9	112

Mr. W. J. Edmonds's results, embodied in Table VI., are unfavourable to wide-drilling and thin seeding. It is difficult to account for the complete failure of the plan recommended for trial, little more than half the yield being obtained from the wide-drilled plots. The untouched portions were also much better than those which had simply been foot-pressed, an operation which could scarcely have injured the crops, and which in other cases was beneficial. This fact almost warrants the assumption that the unmanured and untouched plots in this series must have been in some particulars more favourably placed than the remaining plots.

Before making a few general remarks upon the foregoing experiments, it will be interesting to consider very briefly a similar series of plots, carried out simultaneously upon barley, &c., by Mr. Iles, of Kempsford.

In 1868, when experiments upon wide drilling were in progress upon the College Experimental Farm, a series of plots, treated similarly, was arranged for barley. The unfavourable character of that memorable summer for all spring corn-crops will long be remembered. There was, therefore, no special reason why an increased amount of light and heat should have exerted a beneficial result. The barley was sown March 19, the variety being Hallett's Pedigree, grown for two years previously on the College Experimental Farm. The plots were measured and staked off, and the necessary rows removed from April 29 to May 4. There were four wide-spaced plots, two of which were forked during the summer, and there were three unmanured and untouched plots for comparison. The results of this experiment were published in 'Practice with Science,' vol. ii., 1869. It will there be seen that the four wide-spaced plots, forked and unforked, were each and all better than any one of the untouched plots, and that by several bushels per acre. Mr. Iles, of Kempsford, kindly undertook a similar series of experiments in 1869, and treated the plots as already described. During the early part of the summer the wide-drilled plots did not appear to advantage; towards harvest they decidedly improved, the ears being exceedingly fine, and finally the weighing-machine recorded a greater yield of barley than upon the untouched plots. It will be seen in Table VII. that 30, 65, and 20 lbs. per acre were the average increases in the case of each pair of wide-spaced plots. The individual plots give less satisfactory results when taken singly, but in average results these three pairs of plots support the evidence of the previous year as to the advantages of wide drilling and thinner seeding. The barley was of good quality and was not appreciably coarser than that grown in the usual manner, neither was the weight per bushel sensibly less.

TABLE VII.—BARLEY EXPERIMENTS, 1869, BY MR. ILES, OF KEMPSFORD.

PLOTS ($\frac{1}{20}$ Acre.)	Applied.	Amount of Manure applied per Acre.	Weight of Grain.	Grain Manured.			Weight per Acre of Grain.	Increase over Average Un-manured per Acre.	Average Increase or Decrease per Acre.	Amount of Grain per Acre.			Average Yield per Acre.			Average Increase or Decrease.			Calculated Weight per Bushel.
		lbs.	lbs.	Bush.	galls.	pts.	lbs.			Bush.	galls.	pts.	Bush.	galls.	pts.	Bush.	galls.	pts.	
Nitrate of soda	April	168	136	2	3	2	2720	330	+230	48	1	0	46	7	4	+4	3	6	55·05
,, ...	,,	168	126	2	2	2½	2520	130		45	6	0							55.00
Lawes' superphosphate ..	,,	336	124	2	1	3½	2480	90	+390	43	5	0	50	2	0	+7	6	2	56·08
,, ,,	,,	336	154	2	6	6	3080	690		56	7	0							54·00
Untouched	,,	..	126	2	1	3	2520	(2390 = average.)	..	43	3	0	42	3	6		..		57·98
,, ...	,,	..	113	2	0	5	2260			41	4	4							54·03
2 rows cut out and 2 left	,,	..	116	2	1	0	2320	− 70	+ 30	42	4	0	42	4	0	+0	0	2	54·56
2 rows cut out and spaces forked	,,	..	126	2	1	4½	2520	+130		43	7	0	43	7	0	+1	3	2	57·03
Alternate rows cut out, spaces forked	,,	..	115	2	0	7	2300	− 90	+ 65	42	1	4	44	5	4	+2	1	6	54·05
,, ,,	,,	..	131	2	2	7	2620	+220		47	1	4							55·05
Alternate rows cut out ..	,,	..	130	2	3	2	2680	+210	+ 20	48	1	0	44	0	4	+1	4	4	54.00
,, ,,	,,	..	111	2	0	0	2220	−170		40	0	0							55·05

Two similar series are now in progress, and up to this date (June 22) I may mention that the wide-drilled barley on the College Experimental Farm is looking exceedingly stout and well; it is longer in the straw and fully as promising for a crop as the surrounding narrow-drilled barley.

Summary.—Such are the results of wide drilling and interculture obtained in 1869. In one case there was a remarkable increase of wheat and straw, in connection with a saving of one bushel of seed per acre. A second case gave an increased amount of straw per acre, and was thought up to harvest to promise a greater yield of corn; strict weighing, however, revealed a deficiency, probably due to mildew. A third series gave a slightly diminished yield upon land which had borne a barley crop the preceding year, and was consequently in low condition. Lastly, one of the four series gave an unequivocal answer in favour of continuing the usual system. It is a somewhat remarkable fact that all the experiments agree in condemning deep interculture between wide-drilled wheat. This has already been stated as an observed fact both in 1865 and 1868; and so many corroborative answers, extending over three seasons, go far to prove that in the district where these trials were made deep interculture in the case of wheat is unnecessary. With reference to barley, the results obtained were certainly encouraging, and the system of wide-drilling will again be tested in the present season. In addition to the increase in grain in the case of barley and the sowing of seed, the facility offered for working both hand and horse hoes must be looked upon as an additional advantage.

Manure Experiments.

These were restricted to superphosphate and nitrate of soda.

1st. Separate.
2nd. Combined.
3rd. Applied in winter.
4th. Applied in spring.

Simple as these experiments may appear, the following list will show that they entailed a formidable series of plots:—

- 2 plots dressed at the rate of 3 cwts. per acre of superphosphate, and 1½ cwt. of nitrate of soda, applied together in *winter*.
- 2 plots dressed at the rate of 3 cwts. of superphosphate, and 1½ cwt. of nitrate of soda, applied together *in spring.*
- 2 plots dressed with 3 cwts. of superphosphate *in winter*, and 1½ cwt. of nitrate of soda *in spring.*
- 2 plots dressed with 1½ cwt. of nitrate of soda *in spring.*

2 plots dressed with $1\frac{1}{2}$ cwt. of nitrate of soda, applied in two equal portions, the last dressing distributed one month after the first.

2 unmanured plots for comparison.

Several plots on the College Experimental Farm were, in addition to the above, dressed with similar applications, double the amounts per acre being employed.

In these experiments the following questions were put to the soil:—

1st. What is the measurable effect of nitrate of soda in increasing the wheat crop?

2nd. What increase is obtained by supplementing a dressing of nitrate of soda with superphosphate?

3rd. How does the period of application affect the result of a certain dressing?

4th. May nitrate of soda be applied at two periods, instead of at once, with advantage?

5th. Is a heavy dressing, say of 3 cwt. of nitrate of soda, more effective than a dressing of $1\frac{1}{2}$ cwt.?

These questions, to some extent, have been answered, in some cases clearly and definitely, in others with more or less uncertainty. Even the most definite answers must only be looked upon as correct for a particular soil and season, and therefore a repetition of some, if not all, the experiments is desirable.

Nitrate of Soda Results.—Table III. shows the main results obtained upon the Oakley Park Home Farm. The plots were made $\frac{1}{20}$ acre in extent, and each application of manure was repeated on a duplicate space. The greatest pains were taken to obtain absolute correctness in measuring the land, weighing the manures, harvesting and threshing the produce. The corn was cut by hand, taken to the barn when dry, and immediately threshed. A list of the plots has already been given. The most important column in the accompanying table has reference to the amount of increase per 100 lbs. of nitrate of soda used per acre. It will be seen that $1\frac{1}{2}$ cwt. of nitrate of soda was followed by an increase of 220 lbs. of wheat per 100 lbs., while an application of $\frac{3}{4}$ cwt. of the salt caused an increase of 178 lbs. of wheat per 100 lbs. of nitrate used, thus indicating the greater effect of the heavier dressing. Glancing at Table VIII., showing the results obtained on the College Experimental Farm with the same fertilizer, it will be seen that 166·6, 280, and 309 lbs. respectively represent the amounts of increase per acre obtained per 100 lbs. of nitrate when the dressing was at the rate of 168 lbs. per acre; the average of these three being 252 lbs. for every 100 lbs. of nitrate of soda used. In close proximity with these were three plots, manured with

TABLE VIII.—EXPERIMENTS UPON APPLICATION OF NITRATE OF SODA TO WHEAT, 1869—ROYAL AGRICULTURAL COLLEGE.

PLOTS ($\frac{1}{40}$ Acre each.)	When Applied.	Amount per Acre of Application.	Grain per Plot. Head.	Grain per Plot. Tail.	Grain per Plot. Total.	Grain per Acre. Total.	Grain per Acre. Increase.	Grain per Acre. Average Increase.	Grain per Acre. Increase per 100 lbs. of Nitrate of Soda.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
Nitrate of soda, 4½ lbs.	March 25	336	57·00	5·25	62·25	2490	970	863·3	288·6
,, 4 ,,	May 1								
,, 8½ ,,	March 25	336	47·00	5·25	52·25	2090	570		169·6
,, 8½ ,,	March 24	336	59·25	5·00	64·25	2570	1050		312·5
,, 4½ ,,	,,	336	..	..	..	..	..	..	..
,, 4 ,,	May 1								
* ,, 8½ ,,	March 24	168	82·25	7·75	*90·00	1800	280	423·3	166·6
* ,, 4½ ,,	March 25	168	92·00	7·05	*99·05	1990	470		280·0
* ,, 4 ,,	May 1								
* ,, 8½ ,,	March 24	168	94·05	7·05	*102·00	2040	520		309·5
Nothing		..	38·05	2·05	41·00	1640	1520 = average of 3 unmanured Plots.		
,, ...		..	35·75	3·25	39·00	1560			
,, ...		..	31·00	3·00	34·00	1360			

* Plots of $\frac{1}{20}$ acre each.

TABLE IX.—EXPERIMENTS UPON APPLICATIONS OF MANURE TO WHEAT, 1869—MR. SMITH OF BIBURY.

PLOTS ($\frac{1}{20}$ Acre).	Date of Application.	Quantity of Manure per Acre.	Grain per Plot.	Grain per Acre.	Increase per Acre.	Increase per Acre per 100 lbs. of Nitrate of Soda used.	Straw per Plot.	Straw per Acre.	Percentage of Grain to Straw.
Nitrate of soda	April	80	144	2880	120	150·0	222	4440	64·8
,, 4½ lbs.	April 10	168	164	3280	520	309·5	229	4580	71·6
,, 4 ,, ...	May 10								
,, ...	April	168	160	3200	440	261·9	206	4120	77·6
,, ...	April	168	160	3200	440	261·9	222	4440	70·2
Unmanured	..	..	138	2760	..	..	175	3500	78·8
Superphosphate	..	336	187	3740	980	583·0	295	5900	63·3
Nitrate of soda	..	168							
Superphosphate	January	336	203	4060	1300	773·0	308	6160	66·0
Nitrate of soda	..	168							
Superphosphate	..	336	161	3220	460	273·0	237	4740	67·8
Nitrate of soda	..	168							
Superphosphate	..	336	175	3500	740	440·0	271	5420	64·5
Nitrate of soda	..	168							

with 336 lbs. of nitrate of soda per acre. These show respectively 288·6, 169·6, and 312·5 lbs. as the amount of increase per 100 lbs. of nitrate of soda used, or an average of 257 lbs. Hence in both these cases the heavier the dressing, even up to 3 cwts. per acre, the greater was the relative effect. In the third place, taking the results obtained by Mr. Smith, of Bibury (see Table IX.), with dressings of 168 lbs. per acre, three plots in this case gave respectively 262, 262, and 309·5 lbs., or an average increase of 277·8 lbs. of grain per 100 lbs. of nitrate of soda employed. Comparing this with a solitary plot, also at Bibury, manured with 80 lbs. per acre of the salt, we find an increase of 150 lbs. of grain. In all these cases, then, we have a clear answer in favour of $1\frac{1}{2}$ over $\frac{3}{4}$ cwt., and a fair presumption that even heavier dressings may be applied economically.

Lastly, Mr. Edmund Ruck's experiments (Table X.) furnish the results of four plots, each manured at the rate of 168 lbs. of nitrate of soda per acre, the increases being as follows: 176, 212, 188, and 212 lbs. per acre, or an average of 197 lbs. per 100 lbs. of the nitrate applied.

Table X.—Mr. Ruck, Braydon Manor Farm, 1869—Experiments on Wheat.

Plots ($\frac{1}{20}$ Acre each).	Date of Application.	Quantity of Manure used per Acre.	Weight of Grain per Plot.	Weight of Grain per Acre.	Increase over Average of Unmanured Plots per Acre.	Increase per 100 lbs. Nitrate of Soda used.	Cost of Dressing Nitrate of Soda at 16s., Superphosphate at 6s.
		lbs.	lbs.	lbs.	lbs.	lbs.	s.
Nitrate of soda (applied at twice)	Apr. 13 May 13	168	123	2460	296	176·1	24
Nitrate of soda (applied at twice)	Apr. 13 May 13	168	126	2520	356	212·0	24
Nitrate of soda	Apr. 13	168	124	2480	316	188·1	24
,, ...	Apr. 13	168	126	2520	356	212·0	24
Lawes' superphosphate .. .. .. Nitrate of soda	Feb. 23 Feb. 23	336 168	117	2340	176	104·9	42
Lawes' superphosphate .. .. .. Nitrate of soda	Feb. 23 Feb. 23	336 168	135	2700	536	319·0	42
Lawes' superphosphate .. .. .. Nitrate of soda	Feb. 23 Apr. 13	336 168	136	2720	556	330·9	42
Lawes' superphosphate .. .. .. Nitrate of soda	Feb. 23 Apr. 13	336 168	130	2600	436	259·5	42
Lawes' superphosphate .. .. .. Nitrate of soda	Apr. 13 Apr. 13	336 168	131	2620	456	271·4	42
Lawes' superphosphate .. .. .. Nitrate of soda	Apr. 13 Apr. 13	336 168	168	3360	1196	711·9	42
Nothing	..	..	110	2200	2164 = average of 5 unmanured Plots.		
,, ...	.	..	114	2280			
,, ...	.	..	108	2160			
,, ...	..	..	103	2060			
,, ...	..	..	106	2120			

Gathering these results together, so as to obtain a general view, we are able to construct the following table:—

TABLE XI.—INCREASE IN PRODUCE per 100 lbs. of NITRATE OF SODA per Acre.

Experimenters.	When 80 to 90 lbs. per Acre was used.	When 168 lbs. per Acre was used.	When 336 lbs. per Acre was used.
	lbs. of Wheat.	lbs. of Wheat.	lbs. of Wheat.
Earl Bathurst	178	220	..
The College	..	252	257
Mr. Smith	150	277·8	..
Mr. Ruck	..	197	..
Average	Of 2 Plots— 164	Of 12 Plots— 234·7	Of 3 Plots— 257

Mr. Ruck's experiments, it must be remembered, were made upon stiff land, and illustrate a fact previously observed, that clay land does not respond to applications of nitrate of soda so freely as land of a lighter character.*

These results may easily be reduced to a money standard. Taking nitrate of soda at 16*s.* per cwt. then 100 lbs. will cost 14*s.* 3¼*d.*, and reducing the wheat increase into bushels of 62 lbs. each, we find that for an expenditure of 14*s.* 3¼*d.* :—

Earl Bathurst obtained 3½ bushels of wheat, which at 6*s.* per bushel = 21*s.*

The College for an expenditure of 14*s.* 3¼*d.* obtained 4 bushels of wheat, which at 6*s.* per bushel = 24*s.*

Mr. Smith, of Bibury, for an expenditure of 14*s.* 3¼*d.* obtained 4½ bushels of wheat or 27*s.*

Mr. Ruck, of Braydon, for the same expenditure obtained 3⅕ bushels, or, at 6*s.* per bushel, 19*s.*

Reference to the tables will also show a considerable increase of straw per acre.

Several trials were also made as to the advisability of applying nitrate of soda at two periods instead of all at once, but without any very definite result. (See Tables VIII. and X.)

Nitrate of Soda mixed with Superphosphate.—The Oakley Park Farm results were generally unfavourable to the addition of superphosphate. This was borne out by the average results on the College Experimental Farm. Mr. Morse, Lord Bathurst's bailiff, considered that the superphosphate applied in the spring

* We hear upon good authority that upon the tract of cold clay land in South Durham nitrate of soda is not so highly esteemed as a manure as sulphate of ammonia. The latter manure is said to be gradually superseding the former as a top-dressing for cereals in that locality.

exerted a prejudicial effect upon the young wheat by "burning" it.

Mr. Ruck's experiments (Table X.) upon the Braydon land are generally in favour of the addition of superphosphate. It is worthy of observation, however, that the good result is in a great measure due to the very superior excellence of one plot. This being removed from the calculation leaves 5 plots, the average result of which only gives 58 lbs. of corn as the increase over what had been obtained by nitrate of soda alone.

The Bibury land (see Table IX.) speaks unequivocally in favour of superphosphate as an addition to nitrate of soda. These general observations will be borne out by a careful study of the accompanying tables.

Comparison between Winter and Spring Dressings.—Three out of the four series of experiments are decidedly in favour of spring applications. Mr. Smith, of Bibury, is, however, here again exceptional, as is seen by inspecting Table IX. Looking at Earl Bathurst's results, it will be observed (Table III.) that 200 lbs. of superphosphate and 100 lbs. of the nitrate applied in January gave an increase of 101 lbs. of grain *per* 100 *lbs. of nitrate used.* The same dressing applied on March 25 gave a corresponding increase of 148 lbs., while a third plot in which the superphosphate was applied in January, and the nitrate of soda was subsequently applied in spring, gave the largely increased yield of 290 lbs.

When superphosphate has been added to nitrate of soda, I have calculated the increase upon the nitrate of soda only to make the results comparable with those in which the nitrate alone was used, the difference in the results obtained by the use of the mixed substances being then clearly traceable to the addition of the superphosphate. Next, taking the College results (Table XII.), it will be seen that a winter application gave the very feeble increase of 89 lbs. per 100 lbs. of nitrate of soda used. Unfortunately the result of the duplicate to this plot was lost, but every one who inspected the two while growing, was struck with the poor effect of the winter dressed portions when compared with the beautiful luxuriance of the plots dressed in the spring. Two plots, which received 3 cwts. of superphosphate and 1½ cwt. of nitrate of soda in the spring, gave respectively an increase of 416 and 240 lbs. of grain per 100 lbs. of nitrate used.

Mr. Ruck (see Table X.) obtained an increase of 105 lbs. from a dressing with these two substances on February 23. Again, calculating the result upon 100 lbs. of nitrate of soda, but when the superphosphate was applied in the winter, and the nitrate of soda in the spring (April 9), or both substances were applied in the spring, the increases, calculated in the

TABLE XII.—EXPERIMENTS ON THE APPLICATION OF SUPERPHOSPHATE AND NITRATE OF SODA TO WHEAT, 1869—ROYAL AGRICULTURAL COLLEGE.

PLOTS ($\frac{1}{10}$ Acre).	When Applied.	Dressing per Acre.		Grain per Plot.			Grain per Acre.			
		Super-phosphate.	Nitrate of Soda.	Head.	Tail.	Total.	Total.	Increase.	Average Increase.	Increase per 100 lbs. Nitrate of Soda.
Mineral superphosphates, 17 lbs.	Jan. 11	680	336	42·00	3·05	45·05	1820	300	600	89·28
Nitrate of soda, 8·4 lbs.										
Mineral superphosphates, 17 lbs.	Jan. 11	680	336	56·00	4·05	60·05	2420	900		267·84
Nitrate of soda, 8·4 lbs.	Mar. 25									
Mineral superphosphates, 17 lbs.	Mar. 25	680	336	59·05	4·25	63·75	2550	1030	1000	306·05
Nitrate of soda, 8·4 lbs.	Mar. 25									
Mineral superphosphates, 17 lbs.	Mar. 25	680	336	56·75	5·05	62·25	2490	970		288·07
Nitrate of soda, 8·4 lbs.	Mar. 25									
* {Mineral superphosphates, 17 lbs.	Mar. 25	340	168	*102	9·00	111·00	2220	700	552·5	416·00
{Nitrate of soda, 8·4 lbs.	Mar. 25									
* {Mineral superphosphates, 17 lbs.	Mar. 25	340	168	*87·05	8·75	96·25	1925	405		241·00
{Nitrate of soda, 8·4 lbs...	Mar. 25									
Nothing	..	..	..	38·05	2·05	41·00	1640	1520 = average of 3 unmanured Plots.		
,, ...	..	...	..	35·75	3·25	39·00	1560			
,, ...	..	..	..	31·00	3·00	34·00	1360			

* $\frac{1}{20}$ acre plots.

same manner as above, were respectively 319, 331, 260, and 271 lbs., with one exceptional plot, which gave an increase of 712 lbs. Mr. Ruck is therefore firmly convinced in favour of the spring application. Not so Mr. Smith, of Bibury, who singularly, but most decidedly, declares in favour of a winter application. In similar experiments, which are being carried out during the present season, sulphate of ammonia has been substituted for nitrate of soda as a better substance for testing the merits between the two periods of application.

Comparison between Nitrate of Soda alone and Nitrate of Soda and Superphosphate.—While nitrate of soda gave upon an average of two plots an increase of 220 lbs. of grain per 100 lbs. of nitrate of soda (the dressing being 1½ per cwt.), the addition of 200 lbs. of superphosphate reduced the above increase to 180 lbs.! This was the result at Oakley Park.

On the College Experimental Farm, the average of 6 plots (5 of which were spring applications) manured with the mixture gave an increase of 268 lbs. per 100 lbs. of nitrate employed; or of 303 lbs., if we take the average of the 5 spring dressed plots; the nitrate of soda plots gave a comparable increase of 252 lbs. This is not therefore an inducement to add superphosphate to nitrate of soda.

Mr. Ruck obtained an average of 197 lbs. increase from four nitrate of soda plots (respectively 176, 212, 188, 212 lbs.), for every 100 lbs. of the fertilizer; and from 6 plots to which the addition of superphosphate was made, he obtained a comparable increase of 333 lbs.; but if the one extra good and exceptional plot be eliminated from the calculation, an increase of only 252 lbs. was the result. The difference, according to this latter figure, in favour of the additional expense is not satisfactory, scarcely coming up to 1 bushel of wheat. Again, the four spring dressed plots give an average increase of 295 lbs. per 100 lbs. of nitrate. The Bibury land appeared to derive special advantage from the addition of superphosphate, as is at once seen from the table.

Pecuniary Statement.—In the foregoing remarks the increase due to the superphosphate is clearly indicated, when the results obtained by nitrate of soda alone are compared with those obtained by the same substance associated with superphosphate. These two substances were combined in the ratio of 1 to 2; usually 1½ cwt. of the one and 3 cwts. of the other. It is therefore easy to determine whether the additional cost of the superphosphate has been remunerative. Lord Bathurst and the College at once condemn it, so far as one season's trial can decide.

Mr. Ruck obtained a further increase (beyond that of the nitrate alone) of 136 lbs. for every 200 lbs. of superphosphate applied. At 6*s.* per cwt. this 200 lbs. cost 10*s.* 8*d.*, therefore 10*s.* 8*d.* has produced 136 lbs. = $2\frac{1}{5}$ bushels of wheat, which at 6*s.*, = 13*s.* 2*d.* In this calculation the superphosphate has paid; and if the winter-dressed plot is excluded, and the comparison is made with the spring plots alone, it will be seen to have paid very fairly.

Mr. Smith's results, looked at from a money point of view, may be thus stated:—

	lbs.
Average increase of three plots per 100 lbs. of nitrate of soda ..	278
" " four " {100 lbs. of nitrate .. .. / 200 lbs. of superphosphate}	517
Difference due to 200 lbs. superphosphate	239

And 239 lbs. = 4 bushels nearly, which, at 6*s.* per bushel, = 24*s.*

As the 200 lbs. of manure only cost 10*s.* 8*d.*, the profit is very satisfactory in this case, and the addition of superphosphate has well nigh doubled the effect of the nitrate.

Barley Experiments.

It is not often that barley is top-dressed, the land usually being in high condition when it is sown. From the experiments undertaken last year, as well as in 1868, upon the College Experimental Farm, there appears to be a much greater uncertainty in the results obtained from applying dressings to this crop than to wheat. Thus, Mr. Iles's experiments consisted of two plots manured with superphosphate, 3 cwts. per acre, and two plots manured with $1\frac{1}{2}$ cwt. per acre of nitrate of soda. These were compared with two unmanured plots, and the results can only be spoken of as puzzling in the extreme. A nitrate of soda plot and one of the superphosphate plots gave the same return as an unmanured plot, while the duplicates in each case gave a moderate increase favouring the application of superphosphate. Mr. Little of Norcote's experiments upon top-dressing barley were also contradictory, and both these indefinite results bear out what I had observed in 1868, namely, that top-dressings applied to barley after roots are uncertain in their effect. Local disturbances (owing to changes of weather while the sheep are upon the land) rendering the soil in some cases worse fitted for the reception of the seed, and thus interfering with the accuracy of the experimental plots, goes far to explain this observation.

Root Experiments.

These experiments had but one object in view, namely, how far increasing the amount of superphosphate would correspondingly increase the crop. The results obtained by Mr. Plumbe, of Ashton Fields, as embodied in Table XII., show that when 3, 5, and 7 cwts. of Lawes' superphosphate were respectively applied, no marked increase in crop was obtained by using the larger quantities of manure. This result was on the whole borne out by similar experiments carried out upon Earl Bathurst's home farm in 1868, although the results obtained during such a dry season upon swedes could not alone be considered satisfactory: as confirmatory evidence they have a certain value. In 1867 (Table XIV.) I tried the effect of heavy dressings upon swedes, and although I obtained a better result from 6 cwts. of superphosphate per acre than from 5 cwts., the crop produced by 8 cwts. of superphosphate was no better than that grown by 6 cwts.

Table XIII.—Swede Experiments, 1869—Mr. Plumbe's Results.

Plots.	Dressing per Plot.	Amount of Dressing per Acre.	Produce per Plot.			Produce per Acre.				Number of Swedes per Acre.
	lbs.	lbs.	Cwts.	qrs.	lbs.	Ts.	cwts.	qrs.	lbs.	
Lawes' superphosphate	39	780	8	2	19	8	13	1	26	16,560
,, ,,	26	520	9	0	8	9	1	1	20	16,800
,, ,,	17	340	8	3	19	8	18	1	26	17,340
,, ,,	17	340	9	2	4	9	10	0	8	17,240
,, ,,	26	520	12	2	0	12	10	0	0	17,840
,, ,,	39	780	10	1	10	10	6	3	2	16,180
A bone superphosphate	26	520	10	0	25	10	4	1	24	17,880
,, ,,	26	520	11	0	23	11	4	0	12	18,960

Table XIV.—Result of Experiments upon Swedes, 1867—Royal Agricultural College Experimental Farm.

Plots ($\frac{1}{13}$ Acre).	Dressing per Acre.	Produce per Plot.			Produce per Acre.			Number of Plots per Acre.
	lbs.	Cwts.	qrs.	lbs.	Tons	cwts.	lbs.	
Lawes' turnip manure	540	17	0	22	12	17	106	16,155
,, ,, ...	540	15	1	12	11	10	40	..
,, ,, ...	667	17	2	4	13	13	4	15,740
,, ,, ...	667	20	2	17	15	11	3	15,900
,, ,, ...	900	17	0	2	12	15	30	16,305
,, ,, ...	900	20	0	11	15	1	53	12,585
No Manure	..	12	3	20	9	12	66	16,245
,, ...	..	12	0	19	9	1	23	14,310

Appendix I.

The manures used in the above experiments were analysed in the College laboratory by Professor Church. The nitrate of soda was a very good sample, containing nearly 95 per cent. of the pure salt, as will be seen by the following statement:—

	Per cent.
Water	2·62
Sand	0·11
Chloride of sodium	2·48
Nitrate of soda	94·79
	100·00

Analysis of the Lawes' superphosphate showed its composition to be as follows:—

	Per cent.
Water	12·58
*Organic matter and water of constitution .. .	15·35
†Mono-calcic phosphate	19·47
Tri-calcic phosphate	7·59
Sulphate of lime	37·47
Silica	4·07
Alkalies, iron, &c.	3·47
	100·00

These two manures were applied, in four different proportions and combinations, to the wheat crops experimented upon:—

1½ cwt. nitrate of soda per acre.
3 cwts. nitrate of soda per acre.
1½ cwt. nitrate of soda, 3 cwts. superphosphate } per acre.
3 cwts. nitrate of soda, 6 cwts. superphosphate } per acre.

Having thus obtained the analytical data, it is easy to estimate the percentage of the chief elements of plant-food in the manures, which appear in the increased yield caused by their application. In the following table Professor Church has regarded the experiments from this point of view, and with reference to one manurial element only, namely, nitrogen. The table, for the most part, explains itself, but one or two points may be premised. For full details as to the period and mode of application, reference must be made to the earlier portion of this Report, and such circumstances ought certainly to be taken into account in examining the leading results of the applications of manure used. The last column requires a word of comment, but may, perhaps, be best explained by taking as an example the first line of the table. 168 lbs. of nitrate of soda per acre gave an increased yield of corn, as the average of eleven plots, of 416·5 lbs. This amount of grain contained 8·33 lbs. of nitrogen (= 2 per cent.), while the manure employed contained 26·1 lbs. Thus the proportion of nitrogen in manure to that in the increase of grain may be thus represented:—

$$26{\cdot}1 : 8{\cdot}33 = 100 : 31{\cdot}9$$

* Containing traces only of nitrogen.
† Equal 25·79 of bone-earth rendered soluble.

The corresponding percentage proportions, thus calculated, are given in the last column:—

TOP-DRESSINGS ON WHEAT.

Nitrate of Soda per Acre.	Number of Experimental Plots.	Average Increase of Corn per Acre over Unmanured Plots.	Proportion of Nitrogen in Manure to Nitrogen in increase of Corn.
168 lbs.	11	416·5	100 : 31·9
336 lbs.	3	863·	100 : 33·1
168 lbs., with 336 lbs. superphosphate	2	552·5	100 : 42·3
336 lbs., with 672 lbs. superphosphate	2	1000	100 : 38·3
168 lbs., with 336 lbs. superphosphate	4	870	100 : 66·7
Ditto ditto	2	826	100 : 63·3

The best results in this series are those obtained by the application of 1½ cwt. nitrate with 3 cwts. superphosphate, in one case an amount of nitrogen equal to two-thirds of that in the manure appearing in the increase of grain, leaving out of calculation that in the excess of straw produced. It is only when an amount of nitrogen equal to 23 per cent. of that in the nitrate applied appears in the increase of grain that the cost of the manure is defrayed, supposing the nitrate is bought at 16*s.* 6*d.* per cwt., and the grain sells at 5*s.* per bushel. So if 1½ cwt. of nitrate has been employed, about 5 bushels of extra grain are demanded; the worst of the above results shows just 7 bushels.

APPENDIX II.

It has been observed that where wheat is allowed abundance of room, the growing plant speedily assumes a dark-green vigorous appearance, very similar to that of wheat manured with some highly nitrogenous manure. This effect is not confined to any particular season, but may be seen wherever thin sown can be contrasted with thicker sown wheat. This similarity in appearance between a thin plant of wheat and a crop which has been top-dressed with nitrate of soda suggests the idea that in both cases the improvement is due to a more liberal supply of nitrogen to the individual plants. Is it not also worthy of note, that both thin planted crops and those top-dressed with nitrate of soda are more subject to the attacks of parasitic fungi than crops more ordinarily cultivated? So much so is this the case that many farmers object to top-dress for fear of inducing mildew, while others shun thin seeding for a similar reason. The relations of thin sown crops to the amount of nitrogen contained in the grain was strikingly exemplified in 1868. Professor Church, in Vol. I., 'Practice with Science,' called attention to the amount of nitrogen found in different samples of wheat. On examining almost any variety of this grain, it was observed that the sample might be readily divided into three parts: the first containing all the horny or translucent ("strong") grains; the second, those of a medium appearance; and lastly, a class of softer, opaque, dull-looking grains. Analysis of each section of a sample thus divided showed that the amount of nitrogen contained in the translucent grains considerably exceeded that found in the opaque grains; and this was rendered the more striking when the nitrogen was calculated into its equivalent of albuminoids. The following table, from Professor Church's paper on this subject, is illustrative of the above fact:—

PERCENTAGE OF ALBUMINOIDS.

Variety of Wheat.	Translucent.	Opaque.
Spalding's	11·19	8·75
Hallett's	13·06	9·50
Archer's	10·69	8·87
Mean	11·85	9·04

In examining the various samples of wheat grown during both the past season and in 1868, under the different cultivations pursued, a marked difference was observed in their apparent quality. This was especially the case in comparing wheats which had been wide spaced with those grown under more ordinary circumstances. This difference was chiefly owing to the much larger proportion of horny or translucent grains in those plots which had been allowed a freer circulation of air. A simple analysis was made by taking three portions of 100 seeds each from the produce of each plot, and counting the number of translucent, opaque, and medium grains in each portion. The accompanying table will show the average of the three determinations in the case of all the plots subjected to this examination.

PERCENTAGE OF TRANSLUCENT, MEDIUM, AND OPAQUE GRAINS.

Plots.		Translucent.	Medium.	Opaque.
1	Every alternate row obliterated, spaces forked	54	29	17
2	Every alternate row obliterated, wheat hoed in the row into "tufts."	82	14	4
3	Ordinary wheat for comparison	32	20	48
6	Alternate rows removed, and remaining rows tufted as in 2	79	17	4
4	3 rows obliterated, and 3 rows left, forked	61	25	14
5	Alternate rows obliterated, spaces not forked	70	22	8
7	3 rows obliterated, and 3 rows left, spaces not forked	73	17	10
9	3 rows obliterated, and 3 rows left, spaces forked	58	25	17

The most striking fact to be observed in examining the foregoing table is the very much larger proportion of translucent grain in the widely drilled than in the ordinary wheat. The "tufted" plots especially seemed to indicate the much larger proportion of nitrogen that wheat, under such cultivation, is capable of absorbing from the air and soil than when under more ordinary conditions of growth. It may further be observed that *space*, and not the forking of the land, is the cause of this increase in the proportion of horny grains, the highest amount being found in the samples of wheat from 2, 5, 6, and 7, none of which were subjected to interculture.

Royal Agricultural College, Cirencester, June, 1870.

XVI.—*On the Dairy-Factories of Sweden.* By M. Juhlin-Dannfelt, Superintendent of the Experimental Farm and Agricultural College at Stockholm.

[In Two Letters to the Editor.]

Previous to laying before you the information which I have obtained, at your request, on the subject of Swedish dairy-factories, I must in a few words direct your attention to several circumstances, peculiar to our country, which exercise an essential influence on its farming, and especially on the keeping of cattle. I take the liberty, first, to refer to a short description of the agriculture of Sweden, which I have furnished at the request of my friend Mr. James Howard, and which you will find in No. 1985 of the 'Mark Lane Express.' You will see from it that the greater part of the land of Sweden is divided into small farms, which are cultivated by the peasants owning them, and on which the number of cows kept for breeding, or for the production of milk, seldom exceeds ten or fifteen. The quantity of milk obtained on these farms is therefore small, especially as the animals generally receive insufficient nourishment during the long winter. One consequence has been that, as large quantities of milk are indispensable for a regular and rational method of dairying, this branch of husbandry has not until lately been developed to any considerable degree, although the climate, the nature of the country, and the manner of living of its inhabitants, are all favourable to its advancement. In order to further this object, various measures have been taken during the last ten years, both by the Government and by agricultural societies, and efforts have been directed towards drawing the attention of the small farmer to the advantages to be gained by the application of the idea of association to this branch of husbandry. These endeavours are, however, of too recent a date to have as yet produced any very obvious results; but from what has already been gained, it is evident that the dairy-factories constitute the most powerful means of obtaining on small farms a considerable revenue from dairy-produce. The price which the milk has realized by such associations greatly exceeds what the small farmers—especially those in the northern provinces—have hitherto been able to obtain for it single-handed. The system is therefore gaining ground daily, and is exercising a beneficial influence on this class of farmers, as well as stimulating a more careful treatment of the cattle; and this influence is already re-acting in a salutary manner on other branches of agriculture.

The modes in which dairy-factories have hitherto been arranged varies in different places. In some districts a person

—generally some tolerably wealthy farmer—purchases, at a certain price, the milk produced on neighbouring farms, and subsequently prepares butter and cheese from it; the owners or tenants of the farms taking no part either in the profits or losses. In other places, on the other hand, where more agreement and confidence prevail between neighbours, several persons residing within the same village, or in each other's neighbourhood, have established a dairy-factory, which is worked on the account of all the proprietors, and the profits of which are divided *pro rata parte.* The best results have been obtained by the latter method; and it will, beyond doubt, become the more general, being of incomparably greater advantage to all concerned.

After these brief introductory remarks, I now proceed to answer your queries.

1. *Average Number of Cows.*—From 50 to 200; the average number about 100. Experience has, however, proved that wherever a factory has been established the number of cows has speedily increased.

2. *Size of Buildings.*—This depends to a great degree on local circumstances, and the system followed in the management of the milk. Most of the dairies are managed according to the so-called cold-water system; by which expensive cellars are avoided. Such a dairy generally consists of a building from 50 to 60 feet long, and from 25 to 35 broad, containing a *milk-room* (being either a cellar, on the Holstein system; or, where the cold-water system is introduced, a room with splint walls and a water reservoir); a *curd-kitchen*, where the cheese is made; a *cheese-room*, where the ready-made cheese is kept and ripened; a *butter-cellar*, and one or two dwelling-rooms. There are, besides, in several dairies, a *churn-room* and a room used for the sale of part of the milk, where either the skimmed or new milk, or the buttermilk, is disposed of directly from the dairy. Most of these dairy-houses are built of wood.

3. *Cost of Buildings.*—The cost of such a building greatly depends on the price of the timber and the labour, the disposition of the interior, &c., &c. Thus, in the northern provinces, where there is an abundance of timber, and where the labour is generally performed by the associates themselves, it is stated not to exceed 50*l.* to 70*l.*; but in the middle and southern provinces, on the other hand, it probably amounts to from 120*l.* to 150*l.*

4. *Cost of Machinery.*—The machinery is generally exceedingly simple, especially in the northern provinces. There it is stated that this cost amounts, at the most, to only 15*l.*; in the middle provinces, to from 30*l.* to 50*l.*; and in the southern, to as much as 100*l.*, in which, however, are included a boiler, with a system of tubes or pipes leading to a double-bottomed curd-tub, a hot-

water tub, &c., a churn with a horse-gear, English screw-lever cheese-press, &c., &c.

5. *Capital invested.*—In most cases the requisite capital for the construction of the buildings and the purchase of the machinery, is obtained by loans from the respective agricultural societies. These loans vary between 60*l.* and 300*l.*, and are to be repaid by annual payments within 5 to 10 years, being partly exempt from interest, and partly not. In the case of a company raising the loan, all the shareholders are liable for the same.

6. *Workpeople employed, and Wages.*—For the management of a dairy-factory one woman and a maid are generally sufficient. In some dairies a man-servant is employed besides, to perform the more heavy labour, and to convey the products to market; this, however, is an exception. The wages of the dairy-woman amount to from 6*l.* to 9*l.* per annum, besides 12 bushels of rye, 12 bushels of barley, several bushels of potatoes, and 1½ bushels of peas, and milk, butter, and cheese sufficient for her own wants; or, in some cases, a certain amount of the two last-mentioned articles. The wages of the maid amount to from 3*l.* to 4*l.* 10*s.* in money, and somewhat less than the dairy-woman in natural products.

7. *Quantity of Milk received.*—This quantity has hitherto varied greatly, being from 10,000 to 25,000 gallons a year. A considerable quantity of the milk produced on the farms of the partners of the factory is consumed in their own households, especially during the summer, when milk is the general drink of the people. The quantity delivered to the factories is, however, continually on the increase.

8. *Distance, Maximum and Average, from which the Milk is brought.*—The average distance is about one English mile; maximum, 10 miles. When the making of butter is the chief object of a factory, it has been found that in order to obtain a good result, the milk should be carried to the dairy, and not conveyed in a cart, because less butter is always obtained from milk that has been shaken. The distance should, therefore, in such cases not exceed one mile. When cheese is to be made, the milk may, on the other hand, be brought from far greater distances, taking care only to let the milk get well cooled previous to transporting it.

9. *Quantity of Cheese made per annum.*—In general, nearly whole-milk cheese is made during the summer, and butter and skimmed-milk cheese during the winter. By one of my reporters it has been stated that, on an average, dairy-factories at present produce from 500 to 4000 pounds of butter, and from 2000 to 8000 pounds of cheese.

Fig. 1.—*Side Elevation and Entrance of a Dairy-Factory, worked on the Cold-Water System, at Marielund, Sweden.*

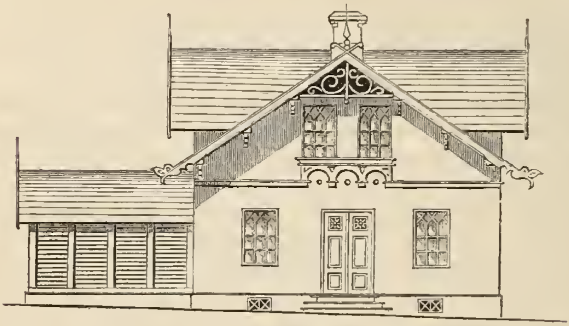


Fig. 2.—*Back Elevation of the same.*

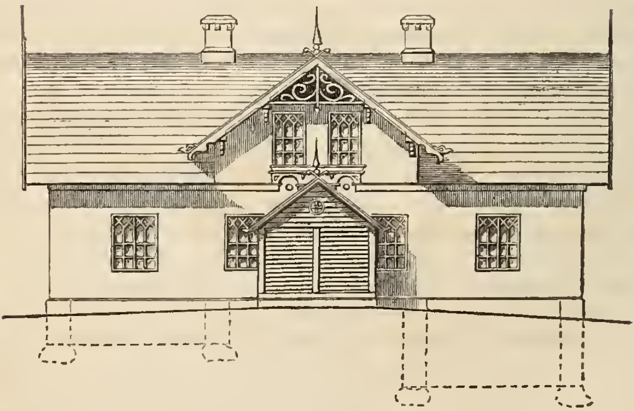


Fig. 3.—*Plan of the First Floor.*

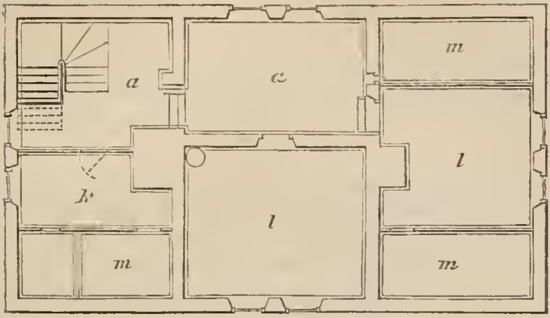
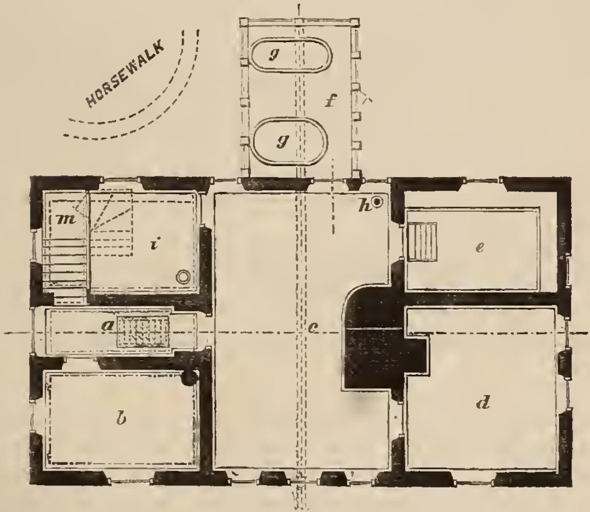


Fig. 4.—*Plan of the Ground Floor.*



a, *a*. Entrance, landings, &c.	*g*. Water and ice vats.
b. Dairymaid's room.	*h*. Pump.
c. Dairy.	*i*. Churn-room.
d. Cheese-room.	*k*. Dairymaid's kitchen.
e. Butter-cellar.	*l*. Workroom, cheese-curing room, &c.
f. Milk-room.	*m*. Closets, storerooms, &c.

By one dairy-factory it was stated that, in 1868, 3820 gallons of milk were used in making butter; 9830 gallons of milk were used in making new-milk cheese; and 2430 gallons of milk were used in making skimmed-milk cheese.

The quantities of cheese and butter obtained from the above amounted to—

1640	English pounds of	Cheddar cheese.
6660	,, ,,	Swiss cheese (Emmenthaler).
1725	,, ,,	Skimmed-milk cheese, and
1385	,, ,,	Butter.

With regard to the dairy-factories in the northern provinces, it is stated that on an average 2 "kannor" of milk (1·15 gallon) are needed for 1 Swedish pound * of fat cheese, and 5 "kannor" (2·8 gallons) for 1 Swedish pound of butter. While the cattle are feeding on the rich pastures of the mountains no more than $3\frac{3}{4}$ "kannor" are required for 1 pound of butter, and $1\frac{1}{2}$ "kannor" for 1 pound of fat cheese.

10. *Charge for making, and Mode in which the Charge is made.*—In the north, where the cost of fuel is not reckoned, this charge is stated to amount to from 1 to 2 öre; in the middle provinces to $2\frac{1}{2}$ öre; and in the southern to 3 öre per "kanna" of milk,† all the costs of management being included in this.

11. *Disposal of the Whey.*—In the north, where the whey is of very little value, it is used for making butter and cheese, which fetch from 12 to 15, and even 18 öre per pound ($1\frac{3}{4}d.$ to $2\frac{1}{2}d$). In other parts of the country, the whey is mostly given to pigs, and in that case realized at a much lower rate, scarcely 1 öre per kanna ($\frac{1}{7}$ penny for 0·6 gallon). It has, however, of late been used also for feeding calves.

12. *Average Dividend to the Proprietors of the Factory.*—The average price of the milk sold at the factories, owned by companies, has amounted to 20 öre per "kanna" (5*d.* per gallon); and sometimes to much more, having even exceeded 26 öre ($6\frac{1}{2}d.$ per gallon.

The above answers to your queries are, certainly, incomplete, but they are such as it has been in my power to give you. In order to give you an idea of one of our best dairy-factories, I have procured a drawing of it (see pp. 326 and 327). This dairy is managed according to the cold-water system,—a method, the more general introduction of which has exercised an extremely beneficial influence on the rational management of the dairy in our country. Supposing whey-cheese to be unknown in your country, I have,

* The Swedish pound is equal to about 15 ounces avoirdupois.
† Seven öre are equal to one penny; and $1\frac{3}{4}$ kannor go to an imperial gallon.

likewise, taken the liberty of forwarding you a sample of it, which, however, is of a better quality than the whey-cheese generally occurring in the market, and which would fetch about 50 öre per pound (7*d.* per lb.). It is prepared from the whey of cow and goat milk. In those parts of the country where fuel is cheap, the preparing of the common cow-milk whey-cheese conduces essentially to raise the price of milk. As it chiefly consists of milk-sugar, it constitutes a wholesome food for the lower classes, among whom it is largely consumed.*

To what I have previously stated regarding the dairy-factories, I beg to add some notices respecting one which was little known when I last wrote to you, but which has now attracted general attention.

A farmer who resides in the neighbourhood of Stockholm, and who, though almost blind, has nevertheless devoted himself, with unshrinking energy and great perseverance, both to the theoretical study and the practical management of butter and cheese-making, commenced a few years ago purchasing milk from neighbouring farms for making butter; the skim-milk being partly sold in the markets of Stockholm, and partly made into skim-milk cheese. The favourable result of his endeavours caused him gradually to extend this business, for which purpose, and in order to obtain an easy sale for the butter-milk, he established a central dairy in the capital, to which cream was brought from the numerous places where the milk was received from neighbouring farmers; the unsold skim-milk, on the other hand, being made into cheese at the places where the milk was delivered, and where branch dairies were erected. This business has, within a few years, been extended to such a degree, that during this spring the quantity of milk purchased by the farmer and employed in the above-mentioned manner has amounted to 4000 gallons per day. During a previous year he had associated with himself a capitalist, likewise warmly interested in this branch of husbandry. The production of milk, however, being constantly on the increase, and its price having on account of that considerably diminished, the partners have now decided upon transferring the entire business to a limited company, for the purpose of extending it in such a manner as circumstances may require, and render profitable. Of this company, they themselves are the largest shareholders. Feeling a warm interest in the development of this industry, so important to our agriculture, and being likewise a shareholder of this company, I have taken an active part in its organisation, and

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* *Vide* the following Paper by Dr. Voelcker, p. 333.

am therefore able to give trustworthy information relative to this dairy-factory, which perhaps may prove of some interest to you also.

The object of the company is to purchase milk at different places, situated within the provinces surrounding the lake "Mälar," for the making of butter, cheese, and other dairy products, partly on the spots where the milk is delivered from the surrounding farms, and partly at the central-dairy at Stockholm. The branch factories are to be established partly near railway stations in daily communication with the central factory, and partly at places from which a daily communication with the capital cannot be reckoned on all the year round, and which latter, on that account, must be so arranged as to be able to carry on a more independent existence.

All these dairy-factories are under one and the same direction, consisting of five shareholders, annually elected at the general meeting of the company, among whom the Chairman and the Managing Director must reside in Stockholm, or its neighbourhood. The salary of the chairman amounts to 1000 Sw. dollars (55*l.*); that of the managing director to 5000 Sw. dollars (275*l.*); and that of the three other directors to 500 Sw. dollars (27*l.* 10*s.*) each. The board of directors authorizes both the purchase of the milk, and the manner of employing the same, as also the sale of the manufactured produce. The board appoints and dismisses the assistants and clerks.

The managing director has to effect the purchase of the milk and the selling of the produce; both, however, in conformity with a plan previously drawn up by the board of directors; he alone engages and dismisses workmen and women, both at the central and the branch dairies.

The board of directors meets once a month at least, the chairman exercising a general supervision in the intervals. To other members of the board is committed the superintendence of certain districts, according to a division agreed upon between themselves.

Branch dairies, at places which are in daily communication with the capital all the year round, are established by the board of directors whenever and wheresoever they find it advisable. The establishment of branch dairies in districts which are deprived of daily communication with the capital requires more direct co-operation between the company and the neighbouring dairy farmers; but such dairies are always established as soon as sufficient means, by subscription for shares, have been obtained at the place, and a guarantee has been given for the delivery of the requisite quantity of milk.

The annual profits of the company, after all the expenses and disbursements, as well as salaries, have been paid, and 20 per cent. of the value of the plant has been deducted, are to be disposed of in the following manner:—

(*a*) 6 per cent. interest is to be paid to the shareholders on their presenting the coupons of interest.

(*b*) Of the remainder, one-tenth is to be set apart for a reserve fund, which, in the event of a bad season or other circumstance causing the balance to be so small as not to cover the interest at the rate of 6 per cent. on the shares, may be employed in supplying the deficiency.

(*c*) What thereafter remains is to be divided between the directors, the shareholders, and the purveyors of the milk, in such a manner that the directors receive one-fourth, and the shareholders and milk-purveyors the remaining three-fourths.

(*d*) The amount falling to the share of the directors is divided in such a manner that the managing director receives one-half, the chairman one-fourth, and the other directors the remaining fourth, to be divided in equal shares among them.

(*e*) The division of the balance between the shareholders and the purveyors of the milk is made so that those purveyors who have furnished the factories during the whole of the previous year with milk to an amount of not less than 5000 "kannor" (2900 gallons), shall for each 2500 "kannor" (1450 gallons) delivered at any dairy of the company, partake in the division equal to one share.

The milk from the different farms that have entered into contracts with the company for the delivery of that produce is conveyed, every morning and evening, immediately after the milking, to the nearest of the sixty stations at present fixed by the company for receiving the milk. It is there poured into tin vessels holding about 14 "kannor" (8 gallons), 20 × 13 inches each, which are placed in water, cooled so as to be from 36 to 40 degrees Fahrenheit, and are left there until the cream has risen. The skimmed cream is conveyed by railway or steamer (during the winter also on roads) to the central factory, where it is made into butter in five churns, worked by a steam-engine of 4-horse power, by which 5000 pounds of butter can be churned per day. At some of the branch factories, where at least 500 gallons of milk per day may be obtained, the company intend to try the production of Cheddar cheese, but at present that description of cheese is not made. The butter is exported; the skim-milk cheese, prepared in the Dutch manner, finds a good market at home. With regard to the quality of the butter, the most flattering testimony has lately been received from London factors.

The capital of the company is fixed at 55,000*l.*, but as soon as 8000*l.* were subscribed—which was done in two days—the company commenced its operations. The calculation on which the company was formed is abridged as follows:—

Receipts.

	Dollars.
Supposing that 3 million "kannor" milk (= 1,700,000 gallons) are furnished per year, and that $5\frac{1}{2}$ "kannor" of milk (= 3·0 gallons) are requisite for the production of 1 pound of butter, 545,000 pounds of butter will be obtained, and sold at a price of 85 öre per pound (= 11·3 pence per Swedish pound), which will yield	463,250
From 3 million "kannor" milk, after deducting the cream and the evaporation, $2\frac{1}{2}$ million "kannor" of skim-milk are obtained. Of this milk, about 2000 "kannor" per day, making 600,000 "kannor" per year, are sold in the capital at an average price of 15 öre per "kanna" (= 3·6 pence per gallon), after deducting the commission, which makes	90,000
Of the remaining 1,900,000 "kannor" of skim-milk, calculating that $2\frac{1}{2}$ "kannor" of milk are requisite for the production of 1 pound of cheese, 760,000 pounds of cheese are obtained, making, at 22 öre per pound (= 3*d.* per pound)	167,000
Of the cream employed in the making of the butter, viz. 500,000 "kannor," 250,000 "kannor" are left after the churning, making, at 8 öre per "kanna" (about 1*d.* per gallon), at which price this buttermilk is sold in the capital	20,000
Of the milk employed in curding, 85 per cent. is left in the form of whey; consequently, of the above stated 1,900,000 "kannor" of skimmed milk, 1,600,000 "kannor" of whey would be obtained. Whey is here generally used as food for swine, considered worth 2 öre per "kanna" (= $\frac{1}{2}$ *d.* per gallon), which in this case would be equal to a sum of 32,000 dollars; but in this calculation we have only considered it as equal to the amount that may be required for fuel at the branch factories, and for the covering of unforseen expenses.	
Total receipts (40,713*l.* 15*s.*)	740,250

Expenses.

	Dollars.
For the purchase of 3 million "kannor" milk, the price of which is at present 19 öre per "kanna" (= $4\frac{1}{2}$*d.* per gallon)	570,000
Annatto, salt, spices for the cheese, rennet, barrels, &c.	12,500
Ice for cooling the milk; average price $\frac{1}{4}$ öre per "kanna" milk (= $\frac{1}{37}$*d.* per gallon)	3,750
Wood and coal employed at the central factory	1,000
Salary of the directors	7,500
,, ,, ,, clerks in the office	10,000
,, ,, 10 mechanics and manservants	6,000
,, ,, 5 travelling controllers	5,000
,, ,, 20 dairymaids at the central factory	7,000
,, ,, 60 ,, ,, ,, branch factories	15,000
Rent and hire of buildings	10,000
7 horses at the central factory	5,000
Other costs of carriage and transports	30,000
Amortisation of the expenses of buildings, machinery, &c.	10,000
Sundry expenses, such as writing materials, postage, medical attendance, &c.	2,500
Total expenses (38,238*l.* 15*s.*)	695,250
Surplus (2475*l.*)	45,000

The attention this enterprise has here called forth has given rise to proposals for the forming of several similar companies within different parts of this country, to which result perhaps also your very interesting description of the cheese factories in North America, translated by me into Swedish and lately published, has not a little conduced.

XVII.—*On a Peculiar Kind of Swedish Whey Cheese, and on Norwegian Goats'-Milk Cheese.* By Dr. Augustus Voelcker, F.R.S.

The following is the composition of a kind of whey cheese made in Sweden, which was sent to me recently for examination by Mr. Jenkins:—

Water	24·21
Fatty matters	20·80
*Casein and albumen	9·06
Milk-sugar, and extractive matters	41·01
Mineral matter (ash)	4·92
	100·00
* Containing nitrogen	1·45

The composition of this peculiar kind of cheese differs materially from that of ordinary skim-milk cheese, as will be seen by comparing the preceding figures with the subjoined analyses of 2 samples of skim-milk cheese, which I published some years ago in my paper on the Composition of Cheese in this Journal.

Composition of Two Samples of Skim-milk Cheese.

	No. 1.	No. 2.
Water	43·87	45·39
Fatty matter (pure butter)	15·89	9·97
*Casein	28·93	33·12
Milk-sugar, lactic acid, and extractive matters	6·47	6·39
Mineral matter (ash)	4·84	5·13
	100·00	100·00
* Containing nitrogen	4·63	5·34

Ordinary skim-milk cheese, especially when made from milk which had been skimmed several times like that employed in making the second sample of skim-milk cheese, is poor in fatty matter (butter) and in milk-sugar. The latter constituent of milk for the greater part remains dissolved in the whey, from which the cheese is separated by straining and pressure. On the other hand, skim-milk cheese, although firm, contains a great deal of water, and the solid matter of which it is composed consists principally of curd or casein.

The Swedish whey cheese analysed by me was soft, and had a sweetish, though anything but a savoury taste. Its sweet taste evidently is due to the large proportion of milk-sugar which the analysis revealed. The amount of fatty matter (butter) in this cheese is nearly as high as in the poorer qualities of Gloucester cheese. Of the prevailing constituent of ordinary skim-milk cheese, that is curd (casein), I find so little that it occurred to me a mistake probably may have been made in the determination of this substance. A second determination, however, gave a result closely agreeing with the first, and confirmed the correctness of the preceding analysis, which shows only 9 per cent. of curd.

The Swedish dairy product analysed by me can thus hardly be called with propriety skim-milk cheese. It is prepared, I am informed, by evaporating the whey, which is obtained in the manufacture of common cheese. This whey, however, must have been much richer in butter than it is ordinarily in well conducted English dairies.

In my paper on the Composition of Cheese, to which reference has been made, a number of whey analyses will be found, all of which show that when cheese is carefully made, the resulting whey is poor in butter and cheesy matter. Thus, taking for illustration the first sample of the 15, the analyses of which are given in my paper, we have in 100 parts of whey:—

Water	92·95
Fatty matter (butter)	·65
*Casein and albumen (curd)	1·20
Milk-sugar, and lactic acid	4·55
Mineral matter (ash)	·65
	100·00
* Containing nitrogen	·19

Supposing this whey had been evaporated so far that a solid mass containing 24·21 per cent. of water—that is, the same amount of water present in the Swedish cheese—had remained behind, the composition of this evaporated whey would be as follows:—

Water	24·21
Fatty matter (butter)	6·98
Casein and albumen (curd)	12·92
Milk-sugar, and lactic acid	48·91
Mineral matter (ash)	6·98
	100·00

Had there been more butter in the whey than is actually contained, the evaporated cheesy product of course would be much richer in fatty matter, and poorer in casein and milk-sugar, and probably resemble much more closely in composition the peculiar Swedish cheese analysed by me.

It thus appears that this product is obtained by evaporation of whey comparatively rich in butter. It is not a very palatable, but is unquestionably a concentrated article of food, which is usefully employed in Sweden for supplying in some measure the wants of the poorer classes.

In connection with this subject, I may mention that in Norway a peculiar kind of skim-milk cheese is made from goats'-milk. Some years ago the late Dr. Rosing, of Christiania, sent me a Norwegian cheese, which is much relished in Norway, and known there under the name of Gamelost. This cheese, I am informed, is made from very poor skim-milk, and has to be kept for a long period before it is considered to be fit for consumption. The specimen presented to me by Dr. Rosing was considered one of choice quality. It had a brownish colour like dark-yellow bees'-wax, and an unctuous texture, which allowed its being spread with a knife on bread and butter, the form in which it is usually consumed in Norway. Thus spread, a little of this cheese goes a long way, for it has a most penetrating pungent smell and rotten cheese taste, and cannot therefore be partaken of in the same way in which cheese of ordinary quality is usually consumed.

A portion of this cheese submitted to analysis gave the following results:—

Composition of Norwegian Skim-milk Cheese called Gamelost.

Water	42·44
Fatty matter (butter)	3·36
*Casein (curd)	42·12
Milk-sugar, and extractive matter	9·85
Mineral matter (ash), containing only traces of common salt	2·22
	100·00
*Containing nitrogen	6·74

This Norwegian cheese, notwithstanding its unctuous appearance conveying the impression of its being rich in butter, it will be seen is extremely poor in fatty matter, and, notwithstanding its strongly saline taste, contains merely traces of common salt. Further examination proved the saline taste to be due to ammoniacal compounds with peculiar fatty acids, produced during the ripening process of the cheese. Like sal-ammoniac these compounds have a strongly saline and pungent taste. A red-coloured litmus-paper held in a moist state at some distance over the cheese rapidly turned blue, showing that the cheese emitted ammoniacal vapours, which, it may be observed, are freely given off from all kinds of well ripened old cheese. As a matter of curiosity, I determined both the amount of free ammonia and that contained in the cheese in the form of ammoniacal salts, and found in 100 parts:—

Free ammonia	·74
and	
Ammonia in a state of ammoniacal salts	1·69
Total ammonia	2·43

Treated with water the Norwegian cheese yielded, calculated for its natural state:—

Water	42·44
Matters soluble in water and containing 2·52 of nitrogen ..	23·17
Matters insoluble in water	34·39
	100·00

Newly made, this cheese is quite insipid, and it takes a year or longer to develop the full flavour, which becomes, indeed, quite overpowering to an English nose and palate at the time when the cheese is considered in Norway to be in prime condition.

London, 11, *Salisbury Square*, *Fleet Street*,
July, 1870.

XVIII.—*On Recent Improvements in the Cultivation and Management of Hops.* By Charles Whitehead.

Introduction.

Varium et mutabile semper is peculiarly applicable to the hop, for no plant is more fickle or so difficult to manage. Rustics have a clumsy joke upon its ever-changing nature, saying, that it is rightly named 'hop,' for it *hops* from one extreme to another with wonderful celerity. It is especially sensitive to changes of temperature, so that, at certain stages of its growth, a white frost, or any sudden atmospheric change, may check its vigour, and, by producing abnormal action, render it liable to blight, mould, and other numerous ills which it is heir to. These characteristics of the plant formerly rendered it such an attractive subject for betting—the collection of the hop duty then affording convenient data for the operation—that members of Tattersall's even condescended to put their money upon hops; and merchants, factors, growers, with many others more or less connected with hops, made their annual venture upon the amount of the duty. It is very interesting, giving besides a forcible illustration of the uncertain nature of the plant, to trace the changes and chances of the crop from June to September, as clearly evidenced by the fluctuations in the betting "sets" or estimates. For example, in the year 1840 the duty was estimated in June at from 140,000*l.* to 160,000*l*; on the 14th of July at from 90,000*l.* to 100,000*l*; on the 24th of the same month at 40,000*l.*; and it paid only about 34,000*l.* in duty. Again, in the year 1834 the duty was set in July at from 80,000*l.* to 90,000*l.*, and it paid over 180,000*l.* Blights and other causes of failure in the hop crop were not looked upon as unmitigated calamities while the duties upon foreign hops were in force. The high prices obtained for the few hops grown frequently proved more remunerative than low prices for a larger crop; and a stimulus was imparted to the trade for a year or two after a partial failure. This natural result of a practical monopoly probably tended to make growers of hops somewhat apathetic and careless about improvements in cultivation and management, and in devising means to make the chances of a crop more certain. Until the last ten or fifteen years quality was not much considered; colour was not thought an essential;* nor was the sort of hop much regarded by the brewers. The mighty thirst for pale ale has changed all this, and hop-growers find that colour and quality are indispensable; that if they cannot produce hops to meet these requirements, there are innumerable foreign producers who are vigorously competing with them under more favourable conditions. The Bavarian, French, and Belgian hop-growers have the advantages of climate, of a plantation in the full vigour of youth, of comparatively low rents and taxes, with cheap labour. The American growers, whose acreage is immense, whose improvement in cultivation and management has been very great, have thousands of square miles of virgin soil in which hops will do well for years without manure, a more equable summer temperature, and a proverbial commercial energy. The New Zealanders, in the garden of the world, are making efforts to be represented in the "Borough"—*absit omen!* and the Tasmanians boast that their somewhat despised country will some day be the great hop-growing centre of the universe. The rents of hop-land in England have been put up generally, local taxation has nearly doubled, and home competition is greater; for the repeal of the home duty had the effect of increasing the home hop acreage

* Mr. Boys, in his "General View of the Agriculture of the County of Kent," in 1805, remarks, that "those late picked hops, though of a *bad colour*, are often very strong, and the most experienced planters are of opinion that it is better to be too late than too early in the picking."

in a wonderful degree, as in 1861, the last year in which the hop duty was levied, there were only 47,941 acres in full plant in the United Kingdom; whereas the agricultural returns for Great Britain showed 56,562 acres in 1866, and 64,273 acres for the year 1867. The abolition of the Customs' duties also stimulated the production of foreign hops to a certain extent. The enormous prices obtained for good foreign hops in 1860 and 1861, on account of the almost utter failure of the English crop in the disastrous season of 1860, tended far more to encourage the foreign growers. The unusual and accidental circumstance of a succession of small and indifferently grown crops in this country for the following seven years, taking the average, has given a general impetus to foreign hop-growing, which has now probably culminated in the extraordinary importation of 322,515 cwts. during the year 1869. This combination of causes has awakened the English growers from lethargy, and has opened their eyes to the real position of affairs; and they are now generally making vigorous efforts to improve their system of cultivation and management, so that it may be said that in no previous decade in the history of hop-growing has such intelligent attention been paid to both the scientific and practical phases of the question as in the years from 1860 to 1870. This is shown by the greatly increased number of well-managed first-class samples to be seen upon the boards of the factors in the Borough, by the various experiments that have been made to stay the ruinous devastations of blight, mould, red spider, and other hop pests and diseases, by the introduction of early and improved sorts, and by a more systematised and judicious course of grubbing and planting.

It is proposed to give a concise history of these improvements in cultivation and management within the last few years, by which it will be seen that although they are considerable, there is yet a great deal to be done in this direction, if the English planters wish to beat the foreign producers, in spite of their many advantages.

Improvements in Cultivation.

General Management.—There was a great ceremony observed formerly in preparing land to be planted with hops. Pasture land was usually preferred, for some unknown reason, and ploughed up by 10 horses from 12 to 16 inches deep. Other land was trenched by workmen, the sticky subsoil thrown on the top, and the good surface mould buried underneath. This made the surface soil unkindly for years, and the delicate "fibres," which are even of more importance as food providers to the plant than the large roots, were sadly hindered in their operations. Land intended for hops is now ploughed in the ordinary way, or rather deeper; the subsoil plough following in the furrow, where subsoiling is possible or requisite. The turf of old pasture land is, or ought to be, pared and burned, in order that the larvæ of the numerous destructive insects may be destroyed; of these the larvæ of the "ghost" moth (*Hepialus Humuli*), of the small "swift" moth (*Hepialus Lupulinus*), and of the wireworm (*Hemirhipus lineatus*), are most injurious to young hops. The latter larva was ignorantly mistaken for the centipede (*Scolopendra*), whose natural habitation is in decaying fibres, and it is only comparatively recently that the ravages of the wireworm have been duly estimated, and checked by traps of pieces of potatoes, turnips, or rape cake, put into each "hill,"* and regularly watched.

With regard to the actual planting, the custom of cramming as many plants as possible into an acre is exploded. It is thought desirable that there should be at least 6 feet 6 inches between every hill, which would give about 1030 hills to the acre if planted on the square, and about 1200 if planted triangularly. A thousand hills are quite enough for an acre; quite as large crops are grown with such a plant as from one of 1200, or even 1400 hills, which it was once thought wise to adopt. It is obvious in the adoption of the system of the lesser number of hills to the acre, that there is at once a great saving of labour and of expense for poles; and what is of more importance still, the sun and the air permeate more freely through the alleys.

Two good "sets," or cuttings that have been one year in a nursery, are usually put to form a hill. Even one very good set occasionally suffices, and it has been observed that the fewer the sets the better the stock or centre hereafter, and not so liable to decay or rot away *in partibus*, especially in "Goldings." The careless practice of planting cut sets taken directly from the hill is fast going out.† Four, or even five, of these were formerly crowded together to form the nucleus,‡ and it frequently happened that in very dry seasons they failed to grow, while the bedded or nursery sets rarely fail. Very great care and pains are now taken with these sets, to keep varieties distinct, to select the

* "Hill" is the technical term for each plant centre. So called from the custom of earthing, or putting earth on such centres for preservation, &c., during the winter, which thus forms a little mound or "hill."

† The Americans still plant 2 or 3 cut sets in this way; but their land is rich, unexhausted, and cheap, so that they do not care about the duration of their grounds.

‡ Mr. Rutley, in his Prize Essay upon Hops, in the 'Royal Agricultural Journal' for Dècember, 1848, says:—"The cheapest and best way is to plant cut sets where they are to remain. Five cut sets is a sufficient number to raise a hill, and what is most generally planted."

most true and strong, to have their nursery well manured and cultivated. Until lately they were put into any corner of the farm all together, "Colegates" and "Goldings," "Grapes" and "Jones'," forgotten probably until they were required. Moreover, some planters actually used to plant up the dead hills in their grounds with any sorts they happened to have; thus Goldings—the best sort—were filled up with Colegates, the worst sort; and Grapes were jumbled up with Jones' in the most haphazard manner. From time immemorial certain plantations were filled up or renewed with scions, taken solely from their own stock—cut from the hill and put directly in—to preserve the supposed superiority of quality, and to hand it down in unsullied line. The cuttings from traditionally celebrated grounds were hoarded as carefully as Dutch tulip bulbs, and planters had jealous fears lest their neighbours should obtain even a rootlet from their "old ground." The consequences of this are plainly evidenced by the greatly diminished productiveness of these grounds, their greater tendency to decay at the root, and their predisposition to blight and mould. It is admitted readily that the quality of their fruit is very fine, but this does not by any means counterbalance the disadvantages above mentioned. It is as wrong to propagate plants from the same stocks perpetually, as to breed animals "in and in," without a change of blood. Great delicacy of constitution and diminished fertility are the known results of the inbreeding of animals of all kinds. In each successive generation the evil consequences are increased, in the case of animals as well as of plants, and there is a natural process of selection to degeneracy, as well as for the development of desired and useful qualities.

With regard to new hop-grounds, planters in the Mid and East Kent, and the Farnham districts, are now, as a rule, planting only the very best sorts, such as Goldings and Golding Grapes, Whitebine Grapes, or noted varieties of these kinds. In the Weald of Kent, in Sussex, Worcester, and Hereford, Grapes, Jones', and Mathons, are usually planted. Colegates are not now esteemed; for though they are heavy croppers, and not so liable to blight or mould as the more choice sorts, they are coarse, and have a rank smell resembling somewhat that of new inferior Americans. In some parts of Kent and Sussex, Colegates produce as much as from 20 to 30 cwt. per acre in a kindly year; but in spite of this they are not planted to any great extent.

It is almost the general practice to obtain sets for planting new ground and for filling up, from a distance,—from some planter who has a good growth, and a reputation for being careful in selecting and managing his sets. A change of sets is thought as desirable as a change of seed in the cases of wheat, barley, and oats. There have been several new and improved sorts of hops introduced within the last few years, raised from seed and from cuttings; in the former instance by mere accident or chance, in the latter by a careful process of methodical selection.* As Dr. Carpenter says, the usual principle is, that propagation by seeds will only produce the species, the race not being continued with any certainty.† The tendency is to revert back to the original type. This is seen in apples, plums, and in a marked degree in peaches, nectarines and apricots. Seeds taken from the same hop-plant will, it is well known, produce different varieties, whose tendency is generally to degenerate to the wild hedge hop. This inherent tendency to reversion is augmented by the uncertainties of fertilisation peculiar to diœcious plants, and the prepotency of the pollen of the original type over that of all others.‡ Hence those sorts which have been raised from seed are, as a rule, coarse and inferior, as in the case of a sort called "Prolifics," which, though large croppers and of a hardy nature, are comparatively of low quality and not liked by the brewers. Some very valuable new sorts have been obtained from cuttings taken from solitary plants, which have been observed to differ from their congeners in certain characteristics. These specialities were further continued by a careful methodical selection of plants, in which the desired qualities were most prominently displayed. A very good sort of early Golding was obtained in this way by Mr. George White, of Hunton, Kent, which not only comes to pick a fortnight or three weeks before other hops, but has a fine quality. It is a very great thing to get such a sort of hop, of first-rate Golding character, which arrives at maturity early, in order that the English grower may be able to supply the market before foreign hops come in, and to ensure good colour before the winds, the hot sun, and the heavy night fogs of late autumn have browned the delicate light-golden hue so sought for by pale ale brewers. To get this much desired colour it has been the common custom to pick hops too soon, which tends to injure the stock of the plant, especially in the case of the Golding hop, more delicate by nature than other kinds, to lessen its produc-

* "Methodical selection is that which guides a man who systematically endeavours to modify a breed according to some predetermined standard."—Darwin's 'Animals and Plants under Domestication,' vol. ii. p. 193.

† Carpenter's 'Principles of Physiology,' p. 985.

‡ But few planters allow male hop plants in their grounds, trusting that the pollen, for mere purposes of fructification, will come from somewhere. It is clear that artificial fertilisation must be resorted to systematically if it is wished to obtain true and satisfactory sorts from seed.

tiveness, and to cause its premature decay. These combined causes are leading growers to reorganise their plantations upon a new system. In the first place, by gradually grubbing the very old grounds, many of which are practically effete from old age, the exhaustion of specific chemical elements from the soil, and unnaturally early picking. Secondly, by introducing a well-arranged succession of altogether earlier sorts to follow each other in regular rotation.*

It is quite clear that new plantations must be raised upon such principles as will meet the changed requirements of the market; for it is utterly useless to endeavour to "level up" the old plantations to these altered conditions, and, independently of these, it is beginning to be understood that the once dearly cherished pet grounds of a century old and upwards are very costly luxuries. In the rare cases where a large percentage of the hills of such grounds do not die away annually, and where the stock is still fairly sound, there is a large decrease of productive power, with a greater predisposition to blight and mould, and diminished ability to grow away from their attacks. There are many of these almost historically famous hop-grounds where a large proportion of the hills die away each year, so much so as to make a fair crop impossible. As many as from 5 to 10 per cent. of the hills in some old Golding grounds have to be renewed every year. I have a Golding ground, with an almost fabulous reputation for fruitfulness in past years, whose first planting not even the "oldest inhabitant" can remember. The average annual amount of hills to be renewed is 200 out of 4000 hills, or just 5 per cent. As sets planted to fill up do not bear fruit until the second year, 10 per cent. of the hills in this old ground are actually non-productive each season. The quality of the fruit is very fine when, by happy accident, the ground gets through a blight or the mould; but the quantity obtained from the strongest hills is always very small. The situation is most suitable; the soil is a rich, friable, deep mould, with a substratum of hassocky ragstone, or limestone, which is the best possible soil for hops, affording perfect drainage and being naturally rich in the mineral constituents necessary to the plant. The best bedded sets have been obtained from several planters for filling up this ground for the last ten years, without causing any very marked decrease of dead hills or increase of fruitfulness. As probably nearly every hill has been replanted in the last twenty years by this yearly process of filling-up, the

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* In the Hereford hop district growers are generally improving their plantations by planting early sorts of better quality and character.

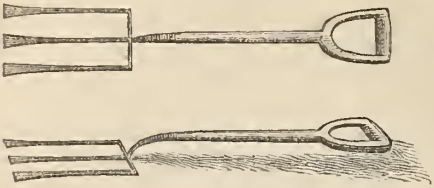
old age of the stock cannot be the cause of the decay, which must be rather attributed to the unnaturally early picking, and to the failure in the supply of requisite ingredients in the soil. This will not seem astonishing, when it is realised what an enormous amount of these ingredients is taken away in a crop of hops, leaves, and bine. The most judicious and lavish supply of those manures which chemical science has taught to be suitable, cannot adequately replace the potash, the lime, the phosphoric acid, the silica, and the other essential elements annually absorbed. Mr. Nesbit says, in his elaborate Report upon the analysis of the hop,* that it is well known to farmers that hops require more manure for their proper development than any other plant which they cultivate. In this same Report Mr. Nesbit gives detailed statements of the quantities of each mineral ingredient taken from the land by a given crop of hops. Though he and Professors Way and Johnstone differ slightly, yet, if an average of the estimates of these three great authorities is taken, it leaves no doubt as to one great cause of the gradual failure of hop-grounds. The American hop-growers are quite aware of this, and as soon as a ground displays signs of having exhausted the soil it is grubbed up. They manure very little, just putting a spit or two of dung on the crown of the hill, rather for the purpose of protection from frost, while the average of the duration of their grounds is not more than nine years even in the limestone district.

Digging and Ploughing.—After a ground has been planted for a year, it is dug or ploughed in the winter. The latter practice prevailed extensively at one time, as it holds universally in America, on account of the scarcity of labour. In an old treatise upon hops, dated 1578, it is said, "Before winter you must till with the plough, *if* your ground is large; if small, with the spade." † Several growers have introduced ploughing lately with a small implement like a potato-plough, or a modification of the vine plough (charrue). This makes but poor work; the weeds are not buried, the large pole-stack places are not touched, and the appearance is slovenly and unfinished. If one of the many new systems of poling, whereby the poles are left standing permanently at the hills, is approved and generally adopted, one great obstacle to ploughing will be overcome. However, an entirely new implement is most necessary for this special purpose; and I have suggested that the Council of the Royal Agricultural Society should offer a prize for the best and most economical substitute for digging hops. Digging is

* 'Journal of the Royal Agricultural Society of England,' vol. vii. p. 211.
† Quoted in Lance's 'Hop Farmer.'

performed by a three-pronged "spud" or fork, as shown in the illustration, with a handle like a spade; if this is done in a workmanlike manner, it is a thoroughly satisfactory operation, and as cheap as any mode of ploughing that has yet been invented, at the present rate of payment, viz., from 16*s.* to 21*s.* per acre.*

Fig. 1.—*The Spud.*



Poling.—There have not been many great changes in the manner of poling hops. Four-pole work, or putting four poles to each hill, is not so much practised as formerly in East and Mid Kent. It prevails still in the Weald of Kent and in Sussex to a considerable extent in the Jones grounds. In the former district, before creosoting was introduced, the Jones and sometimes the Grape were poled with four stout old poles from the Golding grounds. This supply has, fortunately, to a great extent failed, owing to the preservation of the poles by the creosoting process; and Grape and Jones are now poled with three 12-feet or 11-feet poles, much better suited to their habit and nature. Two poles are very frequently put to each hill in Golding grounds; or one row of hills is poled with two poles, and the next with three poles, and so on alternately. Planters do not as a rule pole their hops with such large long poles now. The feet of the poles are so effectually preserved that there is not the gradual diminution of length and consequently of girth which formerly took place from decay and annual sharpening. The bine, therefore, does not get that relief which, though uncertain and accidental, was yet appreciable in a considerable degree. So in old Golding grounds, where the poles are still very stout and the bine is weak, it is usual to help it by placing the fine tips of old poles 3 or 4 feet long, close by the larger poles. The bine is tied to these smaller poles; when it has reached their tops it coils round the larger poles and goes up them with vigour.

Creosoting or "Dipping" hop poles has become almost universal. It may fairly be said that this is one of the most important improvements that have been made lately in hop cultivation, as by its operation the prices of large hop poles have been reduced at least 22 per cent., and of smaller poles 14½ to 15 per cent. during the last eight years, while in the same

* Mr. Boys, in his 'Survey of Kent,' shows that the price paid for digging hops was, in 1795, from 15*s.* to 1*l.*; in 1803, from 1*l.* to 1*l.* 5*s.*

period the hop acreage has been increased by over 10,000 acres. Before dipping was introduced it was usually estimated that in hop grounds poled with 16-feet and 14-feet poles, one-sixth part of the whole number required renewing each year; and in those grounds poled with 12-feet poles about a fourth part. It is now calculated that in grounds where dipping has been practised for eight years, only one-fifteenth part of the larger poles and a tenth part of the smaller poles per annum are wanted. The labour expenses of poling, carrying in, and throwing out, have diminished in a proportionate ratio. On the other hand, there are the extra expenses of loading and carting to and from the dipping tank, of the preparations for dipping, and of the process itself; but taking every pro and con into consideration, it is generally reckoned that where creosoting has been steadily persevered in for eight years, from 40 to 45 per cent. has been taken off the whole expense connected with the poling of hops. The operation of dipping is very simple. The poles are put upright into an iron tank of about 2½ feet to 3½ feet deep, 7, 8, or 9 feet long, 3 or 4 feet wide, with a small furnace underneath it, and a scaffold around to keep the poles upright. The fixed tanks are far the best, as there is much wear and tear indispensable from moving the tank from ground to ground, or from farm to farm. As much creosote * is poured in as will cover from 1½ to 2¼ feet—according to their size—of the ends of the poles in the tank, with due allowance for boiling. The bark is previously shaved off from the ends of the poles so that the boiling creosote may permeate through the pores and sap-vessels of the wood. It is better to dip poles when green than to bed them for a year before dipping, as less creosote is required; the cellular tissues being soft, and the vascular layers full of sap, the preserving composition is more easily driven up and distributed by the atmospheric pressure. The watery parts of the tissues and sap are evaporated, the creosote takes their place, preventing decay from wet, air, and the attacks of insects.†

The poles are left in the tank for twenty-four hours, during at least twelve hours of which time the composition should be kept well boiling. It should be made to boil again before the poles are taken out, or it will become viscous and adhere to the poles. The price of creosote is now from 2*d.* to 2½*d.* per gallon, and the whole cost of dipping ranges from 2*s.* 6*d.* to 3*s.* 6*d.* per 100 poles.

New Modes of Poling and Training.—During the last few

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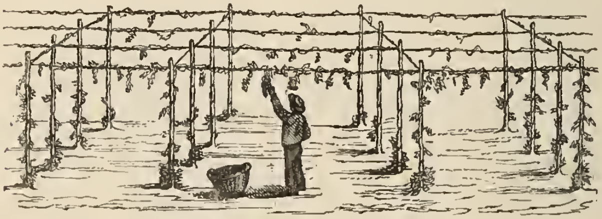
* Creosote is the residuum of gas tar, after the extraction of aniline, benzoline, &c., and varies much in quality, according to the coal used.

† In France poles are steeped in sulphate of copper, or the solution is forced up by heat, as in the creosoting process.

years many new plans for poling hops have been devised, the primary notions of which came from America, where poles and labour are dear, and inventive genius is particularly fertile. According to one of these plans, for which a patent was taken out in this country by Mr. Collins, one pole is put to each hill, and stout string or cocoa-nut fibre yarn is stretched horizontally at a distance of from 8 to 10 feet from the ground from pole to pole. The appearance is very picturesque, as may be imagined from the slight sketch (Illustration No. 2) given here; but the

Fig. 2.—*American mode of training Hops on String.*



system is not by any means satisfactory, and has been discontinued by many planters who gave it a fair trial. I have tried it for three years upon 3 acres planted with the Jones Hop, whose habit renders it more suited to such methods of training than any other sort of hop; I found that the expense of tying the bine to the horizontal strings was very great, the bine never took kindly to the string, so that the tyers were perpetually required throughout the summer, and that the produce was each year considerably less per acre than in another part of the ground poled in the usual manner, though in every other respect treated the same as the string piece. It is right to state that Mr. Gunner, of Alton, has had several acres trained in this way for some years, and is quite satisfied with the result. This gentleman writes as to the extra expense of tying. "It is really nothing when you think how much is saved in poles, how good the quality of the hop is, how little liable to damage from wind, and how strong your plant will always be, for I believe if the string training is properly carried out there would be no such thing as weak bine."

Training on wires, variously fixed, is practised in America, in Germany,* and in France. In many districts of these countries poles are dearer than in England. At Spalt a grower states that they cost as much as a franc each, but then they are from 20 to 24 feet in length. Mr. Farmar of Kyrewood, Tenbury, has patented

* The Austrian Central Agricultural Society have offered prizes for a satisfactory solution of the question as to the relative superiority of wire and poles.

a system of training hops on wire, consisting of an arrangement, according to the fancy of the planter, of vertical wires communicating with horizontal wires. Large posts, stouter than telegraph posts, are fixed at the end of each row of hops, to which wires are fastened at the top and bottom. These wires run horizontally from post to post, and at every hill vertical wires are fixed between these two parallel horizontal wires, to which the bines are tied. By an improvement in Mr. Farmar's process, the iron work is so fixed that it may be easily taken down at picking time.

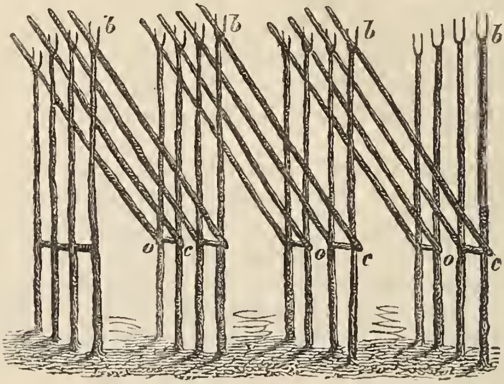
Several planters in the Hereford, Worcester, and Farnham districts have adopted this method and speak favourably of its advantages. The first cost of it is put at 46*l.* per acre, and it is calculated that it will last for twenty years in an efficient state, while the usual method of poling is estimated at 37*l.* 10*s.* as first cost, independently of the necessary yearly renewals of poles. The main objects of these patentees have been economy of cost and labour, and to obviate the necessity of cutting the bine. The latter has at all events been achieved, and time will prove whether the former has been attained. The great objection to the string plan is that it is unnatural for the hops to be trained horizontally. The nature of this plant is to climb spirally towards the light, making its revolutions with the course of the sun. Besides these "normal axial twistings" round the support near, each internode of the plant during its own development makes independent revolutions, varying in number according to its growth and other circumstances.* Mr. Darwin remarks that "the purpose of this spontaneous revolving movement successively directed to all parts of the compass, is obviously in part to favour the shoot finding a support." It is manifest that a horizontal line would be quite out of the natural upward sweep of this movement, and that each internode must be fastened down to the slender string, as it commences its separate course. The axial twistings will be consequently multiplied, and the vigour of the whole plant diminished by these constrained efforts. In the case of vertical wires, it is believed that the bine would require constant tying, as its reflexed hooks would not have a firm hold upon the smooth wires, and that "short turns" would be general, which are usually thought to be indicative of want of vigour in the plant, and fatal to the chances of a good crop.

The late Mr. H. Boys, of Northfleet, Kent, patented a method of training hops along diagonally inclined hurdle rods, or old small

* 'On the Movements and Habits of Climbing Plants.' By Mr. Darwin. Williams and Norgate.

poles fastened to uprights; Mr. Coley, of Maidstone,* invented a plan in 1868, on somewhat similar principles, which has been

Fig. 3.—*Mr. Coley's vinery system of poling hops.*



already largely adopted, and has many advantages. According to this plan, two stout thoroughly creosoted poles—16 feet or 14 feet, reduced to about 12 feet long—are firmly pitched to each hill east and west. These have at the point "*b*" in the annexed drawing, two pieces of wire lashed to their tips to form a fork to receive a diagonally inclined pole of from 12 to 14 feet long, which rests at the point "*c*" in a staple fixed to the upright pole of the opposite hill. A stout piece of wood, "*o c*,". is nailed to the uprights at each hill, to keep them firm. These uprights are fixtures; the diagonal poles are lifted out at picking time and stacked away for the winter, after a new method of Mr. Coley's; but there can be no reason why this expense should not be saved, by simply replacing the diagonal poles, when stripped of bine, in their resting places in the staples and wires. They would hardly be more exposed to the weather than if they were stacked as at present, a great deal of labour would be saved, and the ground would be clear for all operations of manuring, digging, or ploughing. In Mr. Coley's system the evils of horizontal training are greatly modified, and the bine has a congenial support to cling to. High winds do not damage the hops, and the plant being cut high does not bleed to any extent. Mr. Coley says in his pamphlet, writing of last year's crop of hops, "In the early hops we picked at the rate of

* See a pamphlet called 'The Vinery Principle of Growing Hops.' By Mr. Coley. Published by West, Maidstone.

1 cwt. 3 qrs. 4 lbs. per acre extra on the patented plan, and in quality worth 10*s.* per cwt. more than those of the same sort grown upon upright poles. In a Colegate ground, picked after the severe gale of wind, we found on the new plan 4 cwt. per acre extra; these were sold at 5*l.* 8*s.* per cwt.; those adjacent of the same sort, grown upon the upright poles fetched 5*l.* 2*s.* per cwt."

The first cost of poling an acre in this way is given as 52*l.* 3*s.* 4*d.*, as against Mr. Coley's estimate of 41*l.* 6*s.* for the old mode, while the after expense per acre for keeping up the poles for fourteen years is estimated to average 15*s.* per acre in the former, and in the latter instance 4*l.* This applies to Golding grounds poled with best poles. Mr. Coley has invented a whole set of implements and tools suited for the working of his system, among which may be mentioned a long-handled bill hook with prong attached, for cutting the bines high up and pushing them off the uprights, and a 3-wheeled dung-cart for use between the rows.

Lately it has been the custom of some growers at picking time to cut the bines growing on the ordinary poles, 4 or even 5 feet from the ground, and to push the upper part of the bine with the hops upon it over the poles, with forked sticks, as the bine when cut high and thus left on the pole is supposed not to bleed so much as if cut low and left on the ground.

Hops are now poled as early as possible, that the bines may be tied up to the poles before they run along the ground. It is usual to pull out the most forward or rank growing, called locally "pipy" bines, and to tie two or three bines according to fancy to each pole. It is now understood that it is a mistake to put more than 3 bines to a pole. After tying, the ground is dug close round the hills about a foot and a half from their centres, to loosen the soil which cannot be touched by the nidgetts—implements something like horse hoes, only wider, and having more tines, which are drawn by one or two horses in the alleys, between the rows of plants, to pulverize the soil and to kill the weeds. The first nidgetting is generally done with two horses, to get the soil deeply moved, afterwards one horse will suffice. Deep nidgetting is continued at intervals until the middle of June or the end of July, when the "fibres" begin to "work" and run all over the ground. After this time it is a huge mistake, as a rule, to nidgett deep. To kill seedling weeds, and to break the crust formed by the beating of rain and the baking of the sun, a much more shallow nidgetting is performed, or a hop harrow, a nidgett with shorter pointed tines, is used. The form and make of nidgetts have been much improved, many planters have iron ones which are better and more workmanlike looking implements, as may be seen from a comparison of an old with a new nidget, (figs. 4 and 5).

Fig. 4.—*The old Wooden Nidgett.*

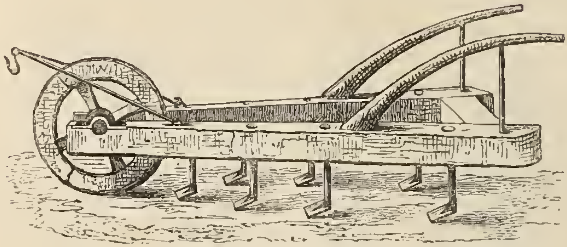
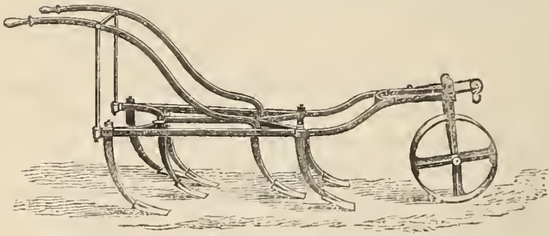


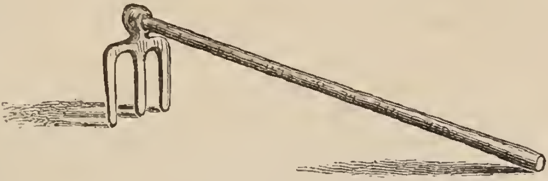
Fig. 5.—*The new Iron Nidgett.*



Very late deep nidgetting is much discontinued, as well as late digging. In blighting years these operations are occasionally resorted to to let the draught into the ground, thereby to check the flow of sap and starve the aphides and green lice. If proper weather follows, the results of these processes have been traditionally known to prove successful; but experience has shown that the chances are quite against a favourable issue, and that if the besiegers are starved away by these *derniers ressorts*, the fortress itself will be so much reduced as to be practically useless. The ancient Chinese mode of obtaining roast pig, according to Charles Lamb, is almost as defensible as these roundabout practices. Earthing, or putting a few shovelsful of earth on each hill to keep it from wet, and to get strong sets for bedding, is done about the end of June; but the operation is not performed so usually, nor so much as a matter of regular routine as it used to be; hop plants that have not been earthed always come stronger and more forward than those that have been earthed, and if it were not for the necessity of saving sets, and the untidy appearance caused by the bines running all over the ground, it is questionable whether earthing would not be a custom "more honoured in the breach than the observance."

In July and August, the space round the hill which was dug in May is chopped round with that most excellent tool, which "Talpa" would fully appreciate, known in Kent as the "Canterbury Hoe." This operation breaks the hard crust and

Fig. 6.—*The Canterbury Hoe.*



admits the air, at the same time displacing the weeds. No leaves should on any account be stripped from the bine; whether blight or mould appears, the leaves should be left on. It was an old custom to strip the leaves off the bine 4 or 5 or even 6 feet up the poles, thus in the first place bleeding the plant according to the most obsolete Sangrado doctrines, and limiting its capacity to receive and assimilate those gases from the air which are congenial,* and to exhale those which are uncongenial to its nature, or are in excess of its requirements. By lessening the leaf area of the plant, the wonderful action of light upon it in the decomposition of carbonic acid is proportionately diminished,† and it is a question whether the growth of mould fungi may not be thus encouraged, by causing an abnormal or diseased condition, or in other words by the retention of an excess of carbonic acid.

Manures.—Rags, shoddy, farmyard manure from oilcake-fed animals, sprats and other fish, rape-dust, guano, superphosphate, fur-waste, bone-dust, and blood-manure, are the manures most suited for hops, according to the nature of the soil, as science or experience dictates. There are many others, and the list has much increased in the last quarter of a century. Rags, sprats, and farmyard manure were the chief manures before then; but

* "If the experiments on the functions of the leaves be duly considered, it seems difficult to avoid the conclusion that the greatest addition to the materials for the formation of the solid tissues of plants is made through their agency."—(Dr. Carpenter's 'Principles of Physiology, par. 558.)

† "This fixation of carbon by the decomposition of carbonic acid is the most essentially dependent of all the processes of the vegetable ecouomy upon the influence of light."—(Dr. Carpenter's 'Principles of Physiology.')

farmyard manure was the manure *par excellence* in the opinion of the grandfathers of present planters.

Great mixens lay reeking and rotting as close as possible to the farmhouse door, draining out their valuable essences into the adjacent horse-pond with every shower, all through the summer and autumn, until the winter frosts hardened the land sufficiently for carting. Then the manure was laid in lumps on the land, not spread, perhaps, for weeks. Now, however, most farmers know better. The scientific papers on this subject which have appeared from time to time in this Journal, and especially the exhaustive one by Professor Voelcker,* have changed all this; farmyard manure is now generally made in the late autumn and winter, and, if the weather permits, used directly, or it is put on in the spring, when the hops are poled, with the dung-dolly—a low narrow 4-wheel cart, drawn by one horse in the alleys. The nidgett mixes it with the soil, rains wash the more soluble parts gradually down to the roots, and the innumerable fibres moving about just below the surface of the ground with almost intuitive sagacity, in search of aliment, seize upon and weave themselves into the coarser structures and extract their properties. It was a common practice to put lumps of wet unctuous manure into trenches hoed out close round each hill, in seeming ignorance of the fact that the rootlets and fibres are spread all over the ground, and that the requisite changes in the crude natural *vile corpus* of the manure, necessary to render it fit pabulum for the plant, are arrested by burying it from the air and light. Rape-dust, or finely crushed rape-cake, is a fine manure, on account of its abundance of nitrogen, for forcing bine and stimulating the plant; it is more lasting than guano, and its effects may be seen for two seasons. "Fur waste" is another recent and most valuable manure, whose market value has been doubled within the last few years. Planters generally manure more highly and much more rationally and systematically than they did a generation since, both as regards the selection and the mode of application of manures. Their choice of manures has very much extended, and the cost has also largely increased; so that it is difficult to thoroughly manure an acre of hop-land under from 5*l.* 10*s.* to 7*l.* 10*s.* A machine like a large chaff-cutter, worked by three men and a boy, has been brought into general use lately for cutting hop-bines into short lengths of about three-quarters of a foot. The bine thus cut is either spread on the land green as it is, or taken into the yards, where it quickly absorbs manurial

* See 'Farmyard Manure, the Drainings of Dung-Heaps, and the Absorbent Properties of the Soil.'—'Journal of the Royal Agricultural Society of England,' vol. xviii. part 1.

matters, and, being put into the mixen, is ready for carting after once or twice turning. This is a great improvement upon the old system of putting the bundles of bines, 3 feet long by 2 feet wide, green into the yards, or the alternative of putting them in stacks for a year, to become brittle and be more easily trodden to pieces by bullocks. Covered yards or covered mixen places are not thought necessary; but the latter have either brick and cement dams where the ground falls, or the ends and sides of the mixens are carefully plastered with mud to prevent the escape of the liquid manure.

Blights.

Aphides, or *Plant-lice.*—Various and wild have been the theories and speculations as to the origin of aphides, the cause of blight in hops. It has been gravely maintained, even by close observers, that the eggs of these aphides are wafted by the east wind in that peculiar blue mist or haze which so often accompanies it. Some scientific men asserted that the atmosphere is laden with the eggs of insects; but as the specific gravity of the eggs of every known species of insect is greater than air, these were manifest delusions. Moreover, the fertilized eggs of aphides, according to Latreille, are covered with a sticky substance, so that they remain through the winter where they are deposited in the autumn, and those that escape the action of wet, frost, and other accidents, are hatched in the spring as the perfect winged insects.

It is true that blight most often occurs after cold east winds, dark gloomy weather, and in seasons of sudden variations of temperature. These variations affect and alter the juices or sap of the plant, causing an excess of saccharine matter, at the same time affording suitable and attractive food for the aphides, which are always present, ready to seize upon the opportunity, their increase and power of blighting depending solely upon the quality and quantity of the food thus provided for them. With regard to the "honey dew," the viscid substance which is spread on the upper surface of the leaves after the aphides have been at work for some time, the effect has been mistaken for the cause. It has been thought that this was a morbid exhalation of the leaves, and that it attracted the aphides by its sweetness. That generally accurate observer White, of Selborne, was deceived as to this, failing altogether to perceive that it is caused by the insects themselves;* that it really is the excretion of the countless generations

* "The reason of honey-dew seems to be that in hot days the effluvia of flowers are drawn up by a brisk evaporation, and then in the night fall down with the dews, with which they are entangled."—White's 'Natural History of Selborne,' p. 304.

of lice swarming on the under surfaces of the leaves.* The pores of the leaves are soon choked up, the exuviæ of deceased generations adhere to the sticky fluid; and the oxygen of the air, acting upon the whole, soon turns a green flourishing hop-ground into a black mass of desolation. Until the last few years, no remedy had been discovered at all successful or satisfactory. Some burned green faggots, or heaps of green rubbish, weeds, bushes, or turf, to windward of their plantations, that the smoke might stifle the invaders; some threw lime, rape-dust, or powdered tobacco over the plant; some, as has been noticed before, tried to starve out the intruders through the diminution of the sap of the plant by excessive cultivation. By 'Kirby and Spence' the hop-growers are censured for their ignorance of entomology and their supineness, because they did not set persons with ladders to catch, and crush "between the thumb and finger,"† the aphides (fly) which first make their appearance. This astonishing advice is gravely repeated by Mr. Wood in his work called 'Our Garden Friends and Foes.' Hop-growers have tried a good many absurd experiments to stop a blight, but, to their credit, it must be said that they never attempted such a wild-goose crusade. Washing or squirting the bine all over with water, soft soap, and sometimes tobacco-juice, is the best means of prevention, and is tolerably efficacious if the operation is carefully performed by the workmen and judiciously timed by the grower. It is a mistake to begin washing upon the first appearance of fly, as, if they are washed off to the ground, they may recover and fly up again, or others later hatched may take their places. When the great green lice are reproducing their kind by the process of "gemmation"—believed to be an unique instance as regards insects‡—one washing, if thoroughly done, causes great slaughter and may clear the plant thoroughly. The washing may be repeated at intervals of ten days, once or twice if necessary; but it must not be done while the plant is in "burr," or bud, nor when the flower is beginning to ripen, lest the "condition" or farina be injured.

The process of washing is carried out by means of a common large garden engine, with a pump and a long gutta-percha hose on each side, fitted with a simple jet and rose, or "spray"

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* "By means of a lens we have actually seen the aphides ejecting the honey-dew."—(Knight's 'Library of Knowledge—Insect Transformation,' p. 19.)

† Kirby and Spence's 'Entomology,' p. 101, seventh edition.

‡ "The aphis is capable of propagation by a process that appears to be analogous to the gemmation of the salpæ: the new individuals being budded off, so to speak, from internal stolons, instead of being developed from ova provided by the female, and fertilised by the male. This method of propagation may be several times repeated; the individuals thus generated being all apparently of the female sex and generating others like themselves."—(Dr. Carpenter's 'Principles of Physiology,' p. 385.)

syringe, to be used as the height of the plant and other circumstances require. This engine, filled with the mixture, is pushed along each alley by three men, one of whom also pumps; the other two take a hose each, which is long enough to enable them to wash two rows each. Two, three, or even four men are required to bring the mixture to the engine from the tubs at the nearest point on the outside of the hop-ground. The usual wash is composed of 28 lbs. of soft soap to 100 gallons of water, with ¼ lb. of tobacco. Some use soft soap and water, without tobacco, as they think that tobacco kills the "negur," the larva of the ladybird or fly-golding Coccinella, which feeds upon aphides.* The cost of once washing is estimated at from 30*s.* to 36*s.* per acre, being 18*s.* for soap, 12*s.* for labour, 6*s.* for tobacco. Growers who have a very small plantation use hydronettes, or small hand-syringes with a long hose which goes in a pail.

Red Spider.†—The injuries done by this little insect, *Acarus Telarius*, had been, until quite recently, attributed to other causes. The peculiar appearance of the leaves of the hop, called in England "fire-blast," and in Germany "copper-burnt," produced by this mite, were thought to be due entirely to drought and excessive heat. It is only in very hot dry weather, that the red spider does much mischief. So it is easy to understand how the effect of its absorption of the juices of the plant came to be attributed to drought. In the unusually hot dry summer of 1868, this spider did immense damage in England and on the Continent. The leaves turned brown, dried up, and came off the bine as if it were late autumn, and thousands of acres produced nothing. Washing or syringing with plain water would stop their progress, did they not envelope themselves in a thick downy web; not for food-providing purposes, like other spiders, but for protection from cold, wet, and other attacks. Mr. Barling, of Maidstone, recommended in 1868 a solution of sulphur to be thrown up by the washing-engines. This was tried by Mr. Reeves, of Staplehurst, whose experience was "that it certainly killed the spider, but it was done too late to save the crop." Now that the cause of "fire-blast" is discovered, washing with this solution of sulphur will be generally adopted when the conditions of the temperature again favour an extraordinary development and increase of the red spider.‡

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* I washed some hops in the last disastrous blight with soft soap and tobacco, and some with soft soap without tobacco. There was no difference in the very favourable results of these respective mixtures.

† Latreille divides Acaridæ into the following groups:—1. Mites (*Trombidites*); 2. Ticks (*Ricinites*); 3. Water Mites (*Hydrachnellæ*); 4. Flesh Worms (*Microphthira*).

‡ The fumes of sulphur destroy the red spider in greenhouses and hothouses, and sulphur ointment kills the mite causing the itch.

Mould (*White Blight or Mildew*).—This white blight was more dreaded than the black blight. As to the latter, there was a chance of a thunder shower, or other atmospherical agencies, clearing it off; but when once the former had appeared it usually went on with its work of destruction until the bitter end.*

Now this was, until lately, thought to be the result of a morbid state of the tissues of the hop plant; whereas the microscope has proved beyond a doubt that it is a fungus, whose spores are floating about in the air, ready to develope themselves wherever and whenever the fitting conditions of food and temperature are offered them.† Mr. Cooke, the careful mycologist, classifies this fungus as *Sphærotheca Castagnei*, of the group *Erysiphe*, and states that it is a common form found upon hops, meadow-sweet, and various other plants. It is allied to the rose mildew, *Sphærotheca pannosa*. The vine disease is another form of an *Erysiphe*, and all these, as Mr. Cooke states, "are not in themselves perfect plants, but merely conditions of other fungi of a higher order, little differing, it is true, in external appearance to the naked eye, but offering material differences in structure under the microscope.‡ This dimorphic habit of parasitic fungi was noticed by Professor Henslow years ago, especially with regard to *Uredo* and *Puccinia graminis*, as to the one form being capable of development into the other,§ and the doctrine of alternation of generation of fungi has been lately further illustrated by Dr. A. de Bary, and by observations made in France by M. Piret, both of whom have ascertained that one of the fungi which produce the rust in cereals, the *Puccinia graminis*, and the fungus which causes the well known orange spots on the leaves of the Berberry, the *Œcidium Berberridis*, are, in reality, different forms of the same plant; the spores of which will not reproduce itself, but the other form.‖ So that farmers were not altogether wrong in their prejudice against the Berberry, nor hop-growers in their decrees of banishment against this and other plants and trees from the vicinity of their hop-grounds.

Looking at all these revelations of science, it is wonderful that mould is not more prevalent in hops; and it is fortunate that an almost certain preventive against, and destroyer of, these fungoid growths has been discovered in sulphur, which has

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* Mr. Buckland, in his prize essay in the 'Royal Agricultural Journal,' in 1845, upon the Farming of Kent, writes of the mould in hops, that "its causes and nature are very little known, and the means of preservation is a matter involved in even greater obscurity. Its destruction of the crop is frequently complete."

† Carpenter's 'Principles of Physiology,' par. 272.

‡ Cooke's 'Microscopic Fungi,' (Hardwicke), p. 35.

§ 'Annals of Natural History,' vol. vi.; also Carpenter's 'Principles of Physiology' on the same subject.

‖ See 'Journal of Botany' for 1866; and the 'Quarterly Journal of Science' for April, 1870.

been largely and most successfully used on the Continent, since 1857, to prevent and check the fearful ravages of mould—vulgarly called oïdium—in the vineyards. M. Vialles, in 1857, in a clever pamphlet upon sulphuring vines,* remarks:—"Si cette méthode eut été connue en 1853 ou 1854, la viticulture universelle aurait évité une perte de plus d'un milliard de francs qu'elle à subie seulement dans les trois dernières années;" and from this work generally much useful information may be gathered as to this process, which is performed systematically at regular times, and not in the haphazard way in which it is done in England. In France the vines are sulphured three times: there is the "Premier soufrage avant la floraison; second soufrage pendant la floraison; troisième soufrage après la floraison." In Spain, where sulphur has been used for seven years, the process is performed twice, but neither in France nor Spain is it ever done after the grape has commenced to ripen, as the sulphur would then impregnate the wine with a nasty flavour.

Those hop-growers who have sulphured upon a similar principle, looking upon sulphuring as an essential part of cultivation, and have first sulphured when the bine is just up the poles, about midsummer, whether mould has or has not appeared, again in about a fortnight or three weeks, and still again in ten days if requisite, have experienced the best results. Too frequently sulphuring is not resorted to until mould is fairly established, or when the hop is in full flower; so that, as in the case of ripening grapes, the flavour of sulphur is imparted to it. This practice of late sulphuring, which, besides checking mould, also makes the hops keep their colour, is wrong, and has made the brewers take a not unreasonable objection to all sulphuring whatever, although it is certain that sulphuring before the flower is fully formed does not injure the flavour of the hops. Growers who have used sulphur legitimately, and who in some seasons would not have grown a sound hop if they had not so sulphured, are gravely asked to give a guarantee that they have not used sulphur.† A guarantee might in justice to the brewer be required that sulphur had not been used after the hop was in flower, but should not in common justice to the grower be extended over the whole season. It has been demonstrated over and over again, that sulphur does stop the mould if it is properly applied, and there are many theories as to its action. One is that it acts as an escharotic, and that other fine powder, such as road-dust, would have a like effect of absorbing moisture from the

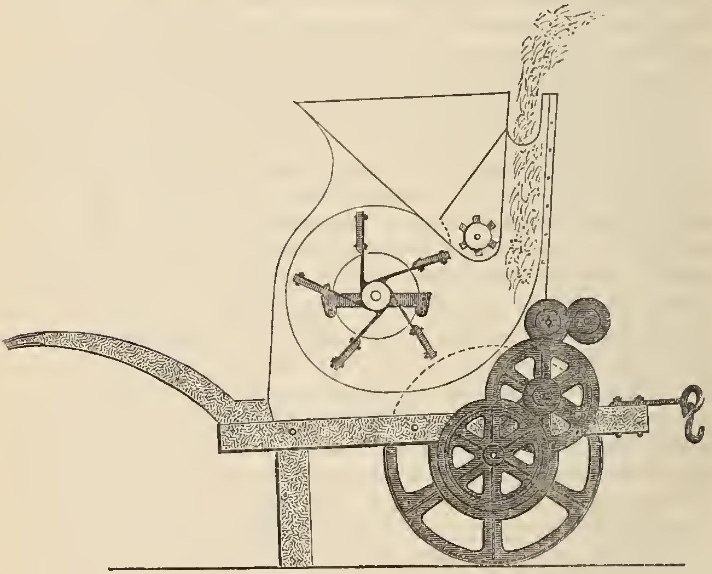
* 'Guide pour la préservation des vignes par la méthode préventive.' Beziers, 1857. Paul Libraire.

† In the code of regulations of 1860, decreed by the pundits of the little town of Spalt, sulphur is forbidden to be used.

mould-germ, and so causing its destruction; or by chemically uniting with and absorbing its oxygen.* M. Vialles holds this former opinion, and believes that the theory of *volatilisation* is a deplorable error. It must be confessed, however, that it does seem more feasible that the sulphur, combining with moisture and oxygen, gives off fumes and vapours of sulphurous acid, which are prejudicial to the development of fungi, at the same time being so gradually evolved as not to injure the other vegetation. And this is probably why it acts more quickly in damp weather.

The sulphur is thrown up evenly over the plants by the revolving fan of the sulphurator, as here illustrated. The quantity

Fig. 7.—*The Sulphurator.*



thrown up is regulated by a screw, so that from 40 lbs. to 2 cwt. can be put on per acre. From 50 to 80 lbs. suffice for each application. The weather should be calm, and night is the better time for the operation, as the moisture fixes the sulphur on the plant. Great quantities were showered down when sulphuring was first introduced, from large dredges, like those which

* Professor Brazier, Professor of Chemistry at Aberdeen University, holds this opinion from having noticed the effect of road-dust upon mould in the parts of gardens adjoining roads.

are used in the vineyards. The cost of each sulphuring ranges from 11*s.* to 15*s.* per acre. One horse with a man and boy are required. The best, or sublimated, sulphur is usually preferred, but some growers who have watched and carefully compared the action of this with what is called sulphur vivum, or black sulphur, much prefer the latter. This, as M. Vialles terms it, *Soufre brut*, or the crude sulphur merely melted by heat, and the stones and foreign matters disengaged, allowed to cool and then broken up for sale, is more highly esteemed for vines than the refined or the sublimated sulphur.

Harvesting.

Picking.—The legitimate time to pick hops is when they are quite closed up at the tips, rustle or crackle on being touched, when the farina is of a rich golden colour, and the seeds perfect and firm. The longer, in reason, they are allowed to hang, the better they weigh and the more condition they gain if they are free from mould, aphides, and flea.*

As the brewers will have bright hops, which they say are essential for pale ale, the growers' great aim is to secure their hops before they are tinged by the weather, or assume the naturally darker shade accompanying full ripeness. The loss of weight consequent upon this early picking is very great, much injury is inflicted upon the stock of the plant, and the genuine brewing qualities of the hop are decreased. As many as 80 bushels of green hops are required for 1 cwt. of dried hops at the commencement of picking, and from 65 to 70 at the close; while in the old times, when picking did not begin until the hops were quite ripe, the average number of bushels to the cwt. was about 65. Picking is now much expedited; it rarely lasts longer than three weeks. The largest growers, who are well off for kiln-room, get their hops picked in fifteen or seventeen days. Five weeks used to be the usual time, and six weeks in years of heavy crops. At the latter end of these very protracted picking seasons many of the hops were "flyers," and when there were aphides present they got "black at the strig," or as brown as coffee-berries from sun and air. This did not matter much then. They were put into "bags"—traditionary receptacles of refuse and rubbish—made of very coarse fibrous hemp, holding 2½ cwts., and used for porter, whose dark colour covered a multitude of sins, and which no doubt formed a highly nourishing drink. If these

* This insect (*Haltica concinna*) is very injurious to the bine in the early spring, particularly in dry weather, and where the land is rough and badly cultivated. In some seasons it follows the plant all through its stages into the very flower itself, making it light and comparatively worthless.

hops were too palpably bad, the growers bided their time, waiting for a blight and extravagant prices for everything like hops. These were the halcyon days of duties, before America and Bavaria were dreamed of quâ hop-growing countries in the philosophy of hop-growers, when there were only about 44,000 acres to supply the world, when each noted "growth" was as eagerly bought up as the grand crûs of Chateaux Margaux and La Tour. Hops are not only picked in much less time, but they are much better picked. More care is taken to keep the leaves from them, and to pick them singly. As leaves and branches spoil the "sample," great pains are taken in East Kent and Farnham to have the hops picked well, and "Mid" Kent and the other districts have certainly followed their example lately in some degree. An improved "bin," or portable frame, to which a cloth is fastened for picking hops into, is coming into general use. The improvement in this consists in its being made so as to fold up, and may thus be easily carried by one man in moving from ground to ground, besides taking up much less room in waggons or carts than the old-fashioned, stiff, unwieldy frame.

Attempts are being made by a Society* to establish a system of agency for the better regulation of the supply of hop-pickers in Mid Kent, and to bring about an improvement in their lodging-accommodation, and in its general sanitary arrangements. At present a certain number of persons, some time before hopping, flock down to the hop districts upon the chance of being engaged for picking. They fill the casual wards of the Unions in these districts nightly until picking commences; and they are, to all intents and purposes, vagrants until then. A large majority of the hop-growers, however, have their regular hoppers, to whom they communicate the time when their picking will commence. The Society has not yet done much, owing to the bad hop-crops of the last few years; but, in one or two instances, it has promptly found pickers to take the place of others upon strike; and it is probable that, if it is well supported, it will be the means of introducing a better and more orderly class of pickers, who will take more pains and care in picking the hops, and over whom the growers will have more control than at present. In the Farnham hop district the pickers are, in most cases, collected for the growers by agents, who are paid about 2*d.* per head.

The lodging accommodation is, on the whole, far better than it was twenty years ago, especially upon large plantations. Upon most of these now there are brick and tile built dwellings, water-tight and warm, with places for cooking, and, in some cases,

* The Society for the Employment and Improved Lodging of the Hop-Pickers. President, the Earl of Romney; Secretary, the Rev. J. Y. Stratton, Ditton, Maidstone.

decent provisions. In many places tents—cast soldiers' bell-tents—are used, which are very much liked if the weather is fairly warm. A large grower near Maidstone puts under canvas nearly the whole of his pickers, whose fires at night make it seem as if an army were encamped. Formerly cattle-sheds, straw huts, and temporary erections of any sort were thought good enough for hoppers, even by the largest growers.

Drying.—To prevent the green hops from heating in the pokes or sacks in which they are conveyed to the oast-houses, whereby their colour would be greatly injured, they are laid upon scaffolds that the air may pass through them, and the wet, in case of rain, drain from them. With regard to the drying process, the principle has not greatly altered though the practice has certainly improved. There is, however, a certain absence of scientific data with regard to the process, and experience or practice unassisted usually directs an operation which requires, one would imagine, a knowledge of chemical principles, as well as of the effect of heat at various temperatures upon volatile essences and vegetable tissues.

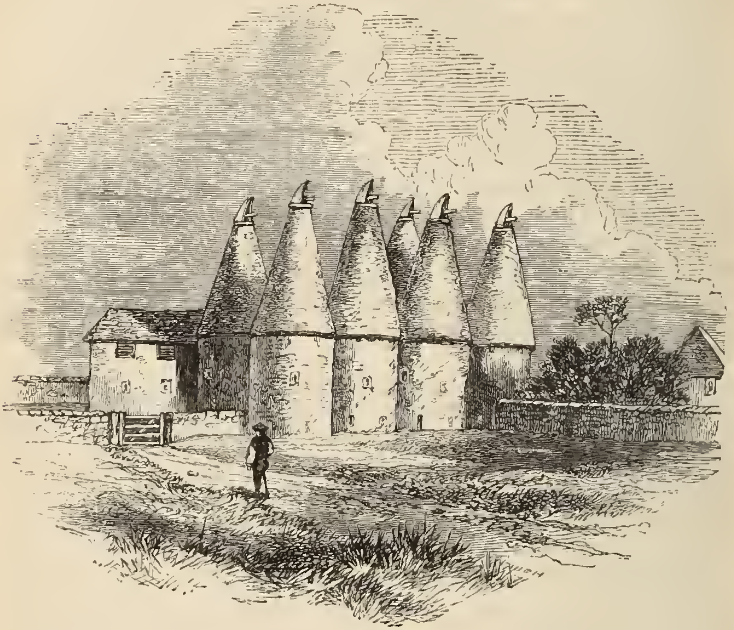
A slight excess of heat, or an irregular application of it, spoils the look of the sample, makes the hops brittle and harsh and "smell of the fire." The lupulin escapes bodily from the petals in remarkable quantities, falls through the interstices of the hairs,* adheres to the sides of the kilns, to the floors of the cooling-rooms, and to the clothes of the dryers. Growers now check such a waste of this appreciable golden lupulin, and do not exult, as their ancestors did, at seeing their dryers in thick yellow crusts, composed of the best part of the hops; but the greater number of growers do not think of, or perhaps are ignorant of, the far greater though imperceptible loss, by the action of excessive heat, of those aromatic essences from the hops which are all valuable to the brewer—of that essential oil † which gives aroma to beer—of that bitter principle, or lupuline, which preserves it and makes it so wholesome and grateful. The gradually-dried hops of Spalt—to take one Bavarian district—are highly esteemed for their superior flavour, due to the retention of all their valuable properties; and the English growers who have plenty of kiln-room, and are thereby enabled to dry their hops more gradually, without subjecting them to very high temperatures, invariably get better prices than their neighbours who crowd their hops on their kilns and subject them to great heat. But far more attention is paid

* Hops are dried upon horsehair stretched over stout laths above the fireplaces of the kilns.

† Professor Brazier writes:—"In an experiment with beer I extracted all bitter flavour; at the same time I obtained a fragrant aromatic oily body, reminding me more than anything I have ever smelt before, of the beautiful odour in an oast-house where hops are being dried."

to the general subject, more time is allowed, and the fires are kept up with more system and with more evenness of temperature. In many oasts* thermometers are always kept for the guidance of

Fig. 8.—*Group of Kilns.*



the dryers, and in some few self-registering thermometers by which the grower or his bailiff may see at a glance whether the statements of the dryers, as to the wet state of the hops or the coldness of the night, are valid excuses for mismanaged hops. Before colour and choice quality were indispensable, there was comparatively very little oast-room in proportion to the hop acreage. Great loads of green hops were put on the kilns; from $1\frac{3}{4}$ to $2\frac{1}{4}$ bushels were heaped upon every square foot of hair, making it almost impossible for the heated air to pass through with anything approaching to uniformity; the under hops were drawn down to the hair, while those above remained in *statu quo* until they were turned, which process was several times repeated. Good managers have plenty of oast-room, put their hops very lightly upon the

* Oast, or Oast-house, means a group of kilns with stowage, an illustration of which is given here, for which thanks are due to the kind courtesy of Dr. Macaulay, the editor of the 'Leisure Hour' (See a paper in the 'Leisure Hour' for August, 1865, by the Rev. J. Y. Stratton, entitled 'Hop and Hop-pickers."

hair, no more than a bushel or a bushel and a quarter to a square foot, and rarely have them turned more than once, and in some cases not at all. It is held that they should never be turned, as the temperature in the hops immediately above the hair ought not to be higher than it is just under or about the upper hops. In other words, the load should be so light as to offer no resistance to the thorough permeation of heated air through every part, and every hop should be simultaneously dried.

After the load came off, the old custom was to leave the hops for as long a time as possible spread over the cooling-room in a thorough draft; then they were raked about, sometimes screened or sifted, and finally trod into pockets or bags by men, the continuous action of whose feet broke the hops more or less into pieces. The load or oasting is now put into a lump, and after six or eight hours the hops are pressed into pockets* by a machine, called a hop-presser, which is fast superseding treading by foot. This machine relieves the men of a work both laborious and injurious to health, and packs hops that are properly managed nearly as whole as they were picked, with a great saving of time and expenditure. By this machine hops are put together much more closely than by the old way of treading, while their aroma and general brewing qualities are better preserved. The presser made by Messrs. Garrett of Maidstone is much used in Kent and in Worcestershire. This is a capital machine, by which a greater amount of direct pressure can be obtained than by any other yet offered: the price is 27*l.* with weighing apparatus complete. At Farnham † and in parts of Kent a more simple machine is used, costing 13*l.* This is not so easily worked, and does not put the hops so tightly or so evenly together as Messrs. Garrett's presser, which may also be used for straining or packing them more tightly when the market is lost, and they must be kept, or for exportation.

The kilns of old days, a few of which may still be seen in parts of the Weald of Kent and Sussex, were built upon the cockle principle, having chimneys to carry the smoke away from the hops. These were necessary when wood and household coals were principally burnt; but since anthracite coals and coke have been introduced, chimneys have been abandoned, and open stoves, or stoves horsed over with brickwork, or with an iron plate hung over them, are generally prevalent. The hair-level of these primitive kilns was only about 7 feet from the fire; the distance from the hair to the cowl and the width of the

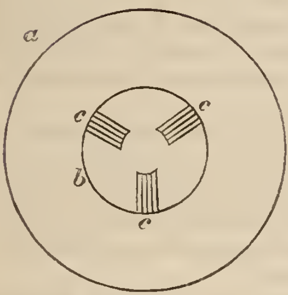
* Pockets are made of coarse canvas, $2\frac{1}{2}$ ft. wide by $5\frac{1}{2}$ ft. long, containing from $1\frac{1}{2}$ to 2 cwts.: they have entirely superseded "bags."

† Mr. Elliott, of Farnham, makes an improved hop presser, which is used to a considerable extent in the Farnham district.

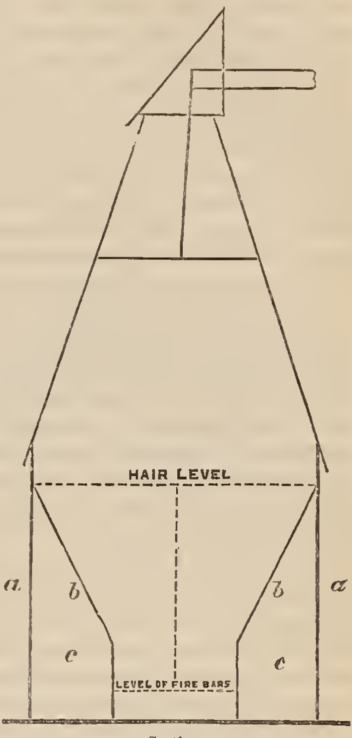
aperture at the base of the cowl were matters of no calculation or consideration. In the modern kilns the hair-level is, at least, 13 feet from the fire, and in all these buildings, whether circular or square, the relative proportions, length, and width of the various parts, are carefully observed. It has been ascertained by scientific researches as to the weight, velocity, and desiccating power of heated atmospheric air, and confirmed by experience, that the height of a circular kiln above the hair should be one and a half times its diameter at the hair-level, and that the opening at the summit for the egress of air should be one-seventh of the same diameter. It is also calculated that, according to the present method of drying hops, apertures for the admission of atmospheric air should be judiciously arranged and carefully regulated in the lower part of the kiln under the hair, upon the following scale, viz.: 6 feet of aperture (superficial) for a 16-feet kiln, 8 feet of aperture (superficial) for an 18-feet kiln, and so on, in order that the greatest possible amount of moderately heated air may pass quickly through the hops. Hops were formerly stewed dry by concentrating stove-heat upon them. Now the great object is to desiccate them—to drive off their moisture—by a process as nearly resembling the action of the sun and wind as can be suited to the circumstances.

Hops while stewing, according to the old receipt, give out a sweet odour, which may be smelled a long way to leeward of the oast. This escape of essential aroma, once hailed with delight as satisfactory evidence of the good qualities of the hop, is deprecated and avoided by growers of the present day. It is understood that the temperature to which hops should be subjected ought not to exceed 130°: beyond that point it is generally admitted that a serious loss of essential principles occurs. In the opinion of those who have studied the question, a mean temperature of 110° would be far better; but the brewers do not recognise the increased value of samples so treated by giving a corresponding increase of price, and the expenses of such management being nearly doubled, it follows that the practice of drying two loads in twenty-four hours, at or about a heat of 130°, is universal. The circular is the most usual form of kiln, as it occupies less room, while it affords more available space than any other shape. Air apertures may be more easily arranged, and there is not so much resistance to the circulation of air as in square kilns, which are preferred by some, because they may be converted into cottages or like useful buildings. Some prefer an inner circle or chamber; others hold that it is superfluous. According to the usual mode of drying at a high temperature, the inner chamber or circle has many advantages, as it diminishes the loss of heat by radiation, at the same time confining it and concentrating its action. For this reason illustrations of a ground plan and a section of a kiln with an inner chamber are here appended.

Figs. 9 and 10.—*Ground-plan and Section of a Kiln with an inner chamber.*



Ground-plan.



Section.

In the Farnham district many of the oasts are long narrow buildings, looking more like a row of cottages than anything else; in fact they are so built that they may be turned into dwellings, if occasion should require. The ends of the roofs are left open for the escape of air and reek. Mr. Collins, of Maidstone, a few years since patented a process for drying hops, by means of hot air passed through rows of pipes immediately under the hair. Mr. Sampson, of Wittersham, also took out a patent in 1867 for an invention, called an "atmospheric regulator for oast-houses." The principle of this consists of an air-tight kiln, with two iron doors to the furnace, fitted with louvres or sliding bars to admit draughts of air.

There have been several other inventions of a somewhat similar character, none of which have been adopted to any extent. Steam would be the best and most easily regulated medium for drying hops; but the application of it would be costly, as it would probably necessitate the reorganisation of existing buildings,* and there always has been and always will be such an uncertainty as to the future of hop-growing, that no one has liked to incur extraordinary expenditure or to try experiments upon an important scale. With regard to the firing used for drying, there are different opinions. From experience, Welsh coal, with plenty of charcoal, produces the "softest" sample, most free from any smell of smoke. The usual practice, however, is to use coke and Welsh coal, in equal proportions, with charcoal for lighting up and making up the fires. Brimstone is not so lavishly applied as formerly to hops while drying. Mr. Rutley says of this that the burning of brimstone "should be begun soon after the hops are laid on, and continued gradually and slowly burning for from four or five hours."† A small quantity is now used just after evaporation of the moisture of the hops has commenced. It is burned off as quickly as possible, and very rarely used more than once. The effect of brimstone at this particular stage is to bleach the hop to a certain extent, and to make it generally brighter. Hops which have been brimstoned at several various times during the drying have been compared with others of the same kind in every way, only brimstoned once, and not the slightest difference in colour could be detected between them.

It is believed that there is nothing else to chronicle as new with regard to the cultivation and management of hops; and it is hoped that the sketch of the improvements which have taken place within the last twenty years will serve to show that these are very important, and well worthy of honourable mention in the records of general agricultural progress.

No doubt the progress in the next twenty years will be much greater, as the Council of the Royal Agricultural Society of England have decided to offer special prizes for implements and machinery calculated to improve and cheapen the production of hops; and hop-growers themselves seem determined to use their utmost energy and skill to raise the standard of the English growth, and to drive the "foreigner" from the field.

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* It was suggested that a prize should be offered by the Council of the Royal Agricultural Society for the best and most economical adaptation of steam to existing buildings for drying hops.

† Mr. Rutley on the Culture of Hops, vol. ix. part 2, 'Journal of the Royal Agricultural Society.'

XIX.—*An Account of an Embankment and Cutting in the Parishes of Standlake, Northmoor, Stanton Harcourt, and Eynsham, in the County of Oxford, made to protect the District from the Flood Waters of the River Thames.* By S. B. L. Druce, Barrister-at-Law.

The drainage of the Upper Thames Valley, and the confining within narrow boundaries the flood-waters of the river in the district above Oxford, have long since been a subject of controversy, and have even of late occupied the attention of the Legislature; therefore a short account of an embankment and cutting which have lately been executed, for the purpose of keeping back the flood waters in a part of the above mentioned district, will probably find an appropriate place in the 'Journal of the Royal Agricultural Society,' more particularly on account of its proving to be, so far as it has gone at present, a very decided success.

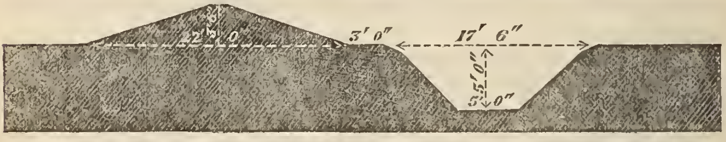
The district which is protected from floods by the works now being described commences about ten miles (following the course of the river) above Oxford, and is situate within the parishes of Eynsham, Stanton Harcourt, Northmoor, and Standlake. The whole of the valley of the Thames above Oxford, as is well known, is very subject to floods, particularly the low-lying lands in the above mentioned and bordering parishes. It was well-ascertained that a great part of these floods was attributable to the fact that there was not sufficient outfall for the water of the river Windrush, a tributary of the Thames flowing into that river in the parish of Standlake, close to New Bridge. The waters of this stream, when very high, met the main body of the flood water of the Thames, and were forced, as it were, by the greater strength of the latter, and driven out into the surrounding country. The first point to be considered, therefore, in protecting this district from flood, was to keep these flood waters of the Windrush within reasonable bounds, and prevent them from flowing unrestrained over the surrounding country.

We may then, for the sake of convenience, consider the embankment and cutting, the subject of this paper, as divided into two distinct parts or sections. The first of these extends from a point on the Windrush rather more than a mile from New Bridge, where, as before mentioned, that river joins the Thames, as far as the latter river, and which point is 8 feet higher than the point at which the works end. The second part commences where the first ends, and runs alongside of the river bed through the parishes of Northmoor, Stanton Harcourt, and Eynsham, all in the county of Oxford, at a distance averaging

150 yards from the river, almost as far as Eynsham Bridge, a distance of about 5 miles and a quarter. The works, although called "an embankment" generally and throughout this paper, really consist of an embankment and cutting, the latter being the farther away from the river, and varying from 17 feet 6 inches in width at the top, in its widest place, to 14 feet in its narrowest, and from 5 feet 2 inches in depth in its deepest part to 4 feet 3 inches in the shallowest. The embankment also varies in height and width at the base, its greatest height being 5 feet, and its lowest 1 foot 9 inches, and the widest part of its base being 25 feet and the narrowest 8 feet.

The following cut represents a section of the works; the figures in it show the actual dimensions of the embankment and cutting respectively at a particular point.

Section of the Embankment and Cutting.



The whole range of the country through which the embankment passes is very low indeed; on the Oxfordshire side there is no hill, or even rising ground, through the whole of this district less than a mile from the river; but on the Berkshire side there are places where the hills, on which are situate the villages of Cunnor, Eaton, and Besselsleigh, run down to within a very short distance of the river's bed. From this it will be easily perceived that the Oxfordshire side of the river was more subject to the floods, not only than the opposite side of the stream, but also than it would have been had the land on both sides of the river been equally level. So vexatious, indeed, were the floods over a part of this tract, and to such an extent were the farmers damaged thereby, that some years ago some of them, under the direction and guidance of Mr. Lord, of Stanton Harcourt, the largest tenant farmer in the district, carried out an embankment and cutting at a longer distance from the river than the one the subject of this paper, along some part of the same tract of country as is embraced by the embankment now under description. This small embankment was so great a success, and the country which was protected by it from being flooded so greatly increased in value, that, as soon as an opportunity occurred, the occupiers of the land contiguous to the river, who are chiefly tenants of the Rev. W. V. Harcourt, of Nuneham Park, near Oxford, bestirred themselves to have an embankment and cutting, similar to the one which they had then found to be so useful, carried out on a much larger scale. Mr. Harcourt's agents were applied to in the first instance, and they, being practical agriculturalists living in the neighbourhood, and perceiving how greatly the land would be improved by such an undertaking, represented the matter to the proprietor. Mr. Harcourt and his eldest son, Colonel Harcourt, foreseeing as well the benefit their property would acquire by such an undertaking, if successfully carried out, as also that the sanitary condition of the district would be much improved thereby, at once consented to the scheme, and, in fact, became its principal promoters.

Steps were immediately taken to carry out the design, and Mr. Ripley, of Bracknall, Berks, an engineer of much practical experience in all matters connected with land-drainage, was consulted, and commissioned to survey the district and report on the feasibility of the proposed scheme and its probable cost. In the early part of the year 1866 this gentleman sent in a most favourable report. The necessary legal steps were next taken. A petition, accompanied by a map, was presented by Mr. Harcourt and the other principal landowners (comprising, amongst others, St. John's, Christ Church, and Magdalene Colleges, at Oxford, and the University of Oxford itself) in the proposed district, under the Land Drainage Act, 1861,* to the Inclosure Commissioners, praying them to constitute the proposed district a separate drainage district, and to appoint a Drainage Board. The Inclosure Commissioners, in pursuance of the provisions of the Act,† sent an Inspector to report as to the propriety of constituting the proposed district, and as to the assent of two-thirds of the proprietors thereto, and the Inspector's report having satisfied them on these points, they made a provisional order on the petition on the 2nd June, 1866, which order was confirmed, in further pursuance of the before-mentioned Act,‡ by an Act of Parliament which received the Royal Assent on the 6th August, 1866.§ By this confirmed provisional order, which is deemed to be a public general Act of Parliament, the proposed district was constituted a separate drainage district under the Act of 1861, and a Drainage Board was appointed, which is commonly known by the name of "The Northmoor and Stanton Harcourt Drainage Board." It was also ordered that the qualification of any subsequent member of the Board should be, that he should be the proprietor or heir apparent, or agent of the proprietor, of not less than ten acres of land within the area of the

* 24 and 25 Vic. c. 133.

† Part II. sec. 64, pars. 2 *et seq.*

‡ 24 and 25 Vic. c. 133 sec. 64, par. 6.

§ 29 and 30 Vic. c. 80.

district.* The total amount of acreage comprised in the drainage district is about 2185 acres, divided amongst about eighty proprietors. The total sums expended by the Board up to the present time, including the cost of the works and all repairs up to last June, as well as all preliminary and necessary expenses, has been 3648*l.* 8*s.* 5*d.* This sum includes, as will be seen, the amount of compensation paid to the single unwilling landowner in the district, and the costs of the arbitration which was held to assess its amount. The above sum of 3648*l.* 8*s.* 5*d.* was expended as follows:—

	£.	s.	d.
Preliminary Survey, Plans, &c.	240	5	1
Law expenses (including advertisements) ..	167	14	3
Construction of the works, including labour, building bridges, &c.	2714	17	3
Surveyor of Works	120	0	0
Compensation and arbitration	305	8	4
	3548	4	11

The remainder of the total sum spent, about 100*l.*, has been expended in repairs and general expenses of the Board, since the completion of the works about three years ago.

In consequence of the unanimity of the proprietors, the money required to carry out the works was not borrowed, as is usually the case in works of a public nature, but was provided by each proprietor in proportion to the extent of land owned by him in the district, and the benefit which it was estimated would accrue to such land from the works when completed. The occupiers of the lands so protected from the floods pay to their landlords 10 per cent. per annum on the outlay; and although this, perhaps, at first sight appears rather a high percentage, yet the result is most satisfactory to the tenants. The estimate of the improved annual value of the land, which was made at the time of the constitution of the Board, was 521*l.* 17*s.* 6*d.*, varying from 6*d.* to 8*s.* 6*d.* per acre; and experience has shown that this does not represent the actual improvement, although the exact amount is difficult to arrive at.

The works were commenced in November, 1866, and were completed about the end of July, 1867, the very wet winter of 1866-67 having considerably retarded their progress and materially increased their cost. Mr. Ripley, who, as before mentioned, made the preliminary inspection and report, directed and superintended the execution of the works throughout. During the latter part

* For the constitution, general powers and regulations as to the mode of election of Drainage Boards in general, see 24 and 25 Vic. c. 133, secs. 66-71.

of the winter and the early spring of the present year the works underwent a very severe test. Not only was there a very high flood in the river, but at the same time vast masses of ice were hurried down the stream, and in places where they got blocked the water came with very great weight and violence against the new embankment; but in no instance did the works give way, and in no place did the floods overflow the embankment. The cutting, the earth dug out of which forms the embankment, not only serves to carry off the water naturally flowing from the lands now protected from flood, but it affords a 4-feet outfall for under-drainage in all but a very small part of the lowest portions of the district.

The greater part of the lands contiguous to the embankment produced, before its formation, nothing else than herbage of the worst description, made up, in fact, of hassock and carnation grass, and this, too, poor and scanty. The water lay on the lands for months together, all through the winter without a break, and often during the summer. It need scarcely be said that the lands were, for the most part, never mown: occasionally, perhaps, a small piece here and there might be so, but it was quite the exception; and the hay, when made, was naturally of the most inferior description. The floods sometimes came and carried off the crop, such as it was: I have, indeed, been informed that on some occasions the mowers have mowed the grass without either shoes or stockings on, so wet and damp was the land. Cattle were usually turned out to pasture on these lands about the end of May or beginning of June, and were kept on them up to about the middle of October, provided that they were not, as was too often the case, driven up by reason of the floods during that time. In the course of one summer the before-mentioned Mr. Lord was obliged on two occasions to drive his stock up on account of the floods, and to keep them up for a fortnight each time. The lands were, as a rule, stocked with an equal number of yearlings and two and three years' old heifers and steers, at the rate of about one beast (taking them all together) to an acre and a half of land; care was taken not to keep them too well during the previous winter and not to turn them out too "fresh:" had they been kept too well previously and were they in too good condition when turned out, they always deteriorated; the farmer, indeed, with all his care as to their condition when he turned them out, always considered that he did well if they kept in *statu quo* during the time they were on these lands, for they never improved. The yearlings had generally a small quantity of oil-cake given them, about 1 lb. per head per day. Sheep were scarcely ever turned out, sometimes in a very dry season a few were, but it was always considered that in doing so the farmer ran a great risk.

We have now to consider the method employed in breaking up those parts of the district which have been brought into tillage in consequence of the formation of the embankment, and the results arising therefrom, so far as they can be ascertained at present. In the spring of the year in which the works were completed (1867), the land intended to be broken up was breast-ploughed and burnt, at a cost of about 1*l.* 1*s.* per acre. The ashes were then scattered, and the land ploughed up by the ordinary horse-ploughs about 2 inches deep, and prepared in the usual way for receiving seed. It was then sown with roots—partly mangold, partly swedes, and partly turnips, without manure of any kind, and produced good crops of all. The roots were of good feeding quality, and were for the most part fed off on the ground. The sheep fed on them had nothing except the roots given them, beyond a little hay, and were from time to time sent to the butcher direct from the ground. The average number of sheep so fed was about six per acre during the whole of the winter. The rotation of crops during the first five years on this newly broken ground is as follows:—First year—Roots. Second and third years—Spring corn, usually barley. Fourth year—One half Italian rye-grass, followed by turnips, one half roots. Fifth year—Spring corn again. After this the usual four-field system is pursued. The land is ploughed about half an inch deeper each year than it was the year preceding. In some few instances the first crop in the newly broken land was oats instead of roots; but this did not succeed nearly so well as the roots, as the land produced only about 2 qrs. to the acre, and the barley crop in the second year was not nearly so good after the oats as after the roots. No wheat is sown during the first few years, that crop not being considered suitable on newly broken ground. The crops on the newly broken land this year (the fourth) are partly Italian rye-grass, partly roots; but the rye-grass has been already eaten off on the land by the ewes and lambs in the spring and early summer, and the land on which it grew has been ploughed up and sown like the rest, with roots. The ewes and lambs were folded upon this in the usual way, the lambs being allowed to run forward through a lamb-hurdle, and the flock being put on a fresh piece of pasturage each day, but the portion over which they had previously been folded being left open to them. To sum up in a few words this part of the subject, the land, before the embankment, was worth at the most 15*s.* per acre; now, where it is broken up, and when it shall have got into actual ordinary cultivation, it is, or rather will be, worth at least 30*s.* per acre.

The following is Dr. Voelcker's analysis of the soil of some of the land which has been broken up, with his remarks thereon.

"My dear Sir, "London, July 26, 1870.

"I have the pleasure of enclosing a careful analysis of the soil from Stanton Harcourt, which you sent me for examination some time ago.

"Like all soils which have been in grass for some time, it contains a good deal of organic matter. The soil may be described as a clay-marl, for it contains nearly as much carbonate of lime as clay, and no appreciable quantity of sand. The proportions of alumina and oxide of iron soluble in acid are not large, and the soil, though difficult in character, certainly is not a stiff clay soil.

"It contains rather more phosphoric acid and available potash than usually occur in soils of fair productive powers, and in my opinion, when broken up early in autumn, will yield two good white crops without manure.

"When well worked in autumn I believe this soil will be found productive, and specially well adapted for corn-crops (wheat in particular), and clover and seeds.

"For root-crops it ought to be ploughed up as roughly as possible before frost sets in, and left exposed to the air in ridges, and not be ploughed again in spring, but merely harrowed down.

"This soil from Stanton Harcourt, in my opinion, is better adapted for arable culture than for pasture, and I have not the slightest doubt that it will pay far better to put this land under the plough than to lay it down in permanent pasture.

"Believe me, my dear Sir, yours faithfully,

"Augustus Voelcker.

"*Joseph Druce, Esq.*"

Composition of a Sample of Soil from Stanton Harcourt.

	Soil dried at 212° F.
Organic matter and water of combination	13·97
Oxide of iron (chiefly protoxide	5·11
Alumina	7·29
Carbonate of lime	32·51
Sulphate of lime	·65
Magnesia	·67
Potash	·56
Soda	·21
Phosphoric acid	·17
Insoluble siliceous matter (fine clay)	38·86
	100·00

With regard to its capabilities, Dr. Voelcker further observes, "its gravelly subsoil adapts it to be used as arable rather than as meadow land, and requires no underdraining, being in itself sufficiently porous to carry off the rainfall."

Before concluding, the benefits which have accrued to the village of Northmoor, which is situate in the very heart of the *quondam* flooded district, ought to be noticed. During the winter season this village was almost unapproachable, the roads in many places being under water, and the streams through which the roads passed by means of fords being so much swollen that it was often dangerous to go through them. The houses in the village were also damp and unhealthy. Since the formation of this embankment and cutting, and the keeping back the floods of the Windrush and the Thames, the appearance of the village has completely changed. Access to it is easy at all times of the year; there is not the mass of water to block up the outfall of the streams and ditches as there used to be, the cutting along the embankment providing a most excellent outfall for it.

In conclusion, I may say that this embankment is a benefit to all interested in the district it protects from floods; to the landowners, from the value of the land being materially increased thereby; to the occupiers of the land, from its having been the means of enabling them to grow good crops of cereals and roots, where before was barely a pasturage for a few cattle; and to the labourers and all others dwelling in the district, from their homes having been made more dry and healthy. The benefits, too, which accrue to the country at large, when any of its poor and almost unproductive grass lands are brought into a high state of cultivation, and thereby increase the national resources, must not be overlooked.

XX.—*The Agriculture of the Scilly Isles.* By Lawrence Scott, M.R.A.C., and Harry Rivington, F.G.S.

Physical Features.

Geography.—The Scilly Islands, situated in latitude 49° 40′ N., and longitude 6° 20′ W., are due west of the Lizard, and from twenty-seven to thirty miles W.S.W. of the Land's End. They consist of six principal islands, eleven smaller ones (varying in size from 10 to 80 acres), and an immense number of apparent or sunken rocks.* Some authors assign a definite number to the rocks, but their statements differ widely, one reckoning "300 isles, islets, and rocks," and another, writing only five years later, speaking of the whole group as consisting of 145 rocks.

The names and acreages of the six principal islands, together with the population in 1851 and 1861, are represented in the following table:—

* Woodley on the Scilly Isles (1822).

	Acres.	Population. 1851.	1861.
St. Mary's	1640	1668	1532
Tresco	880	416	399
St. Martin's	720	211	185
St. Agnes (including the Gugh)	390	204	200
Bryher	330	118	115
Sampson	120	10	..
	4080	2627	2431

Whitfeld says, that "the seeming diminution of the population is caused by a stop having been put to the ruinous and demoralizing subdivision of land, which was carried to such a frightful extent, that sons and daughters were portioned off with a few square yards of ground."*

Heath, writing in 1750, makes the total population about 1400, of which half belonged to St. Mary's.

St. Mary's is about $2\frac{1}{2}$ miles in length, $1\frac{1}{2}$ miles in breadth, and 9 miles in circumference. Its highest point is 140 feet above the level of the sea.

Climate and Water Supply.—Frost and snow are almost unknown in the Scilly Isles. The mean temperature in summer is 58° Fahr., and that in winter 45° Fahr.† Constant breezes mitigate the heat in summer, and the climate throughout the year is considered very healthy. Its mildness is shown by the plants which flourish all the year round in the cottage gardens. Among these may be mentioned geraniums and fuchsias of large size, the myrtle, the American aloe, a pretty climbing species of sedum, which trails over many of the walls, and the box myrtle, which is frequently grown as a hedge.

Gales of wind are frequent and severe. The crops are often injured, and even destroyed, by their violence, especially when blowing from the W. or W.S.W.

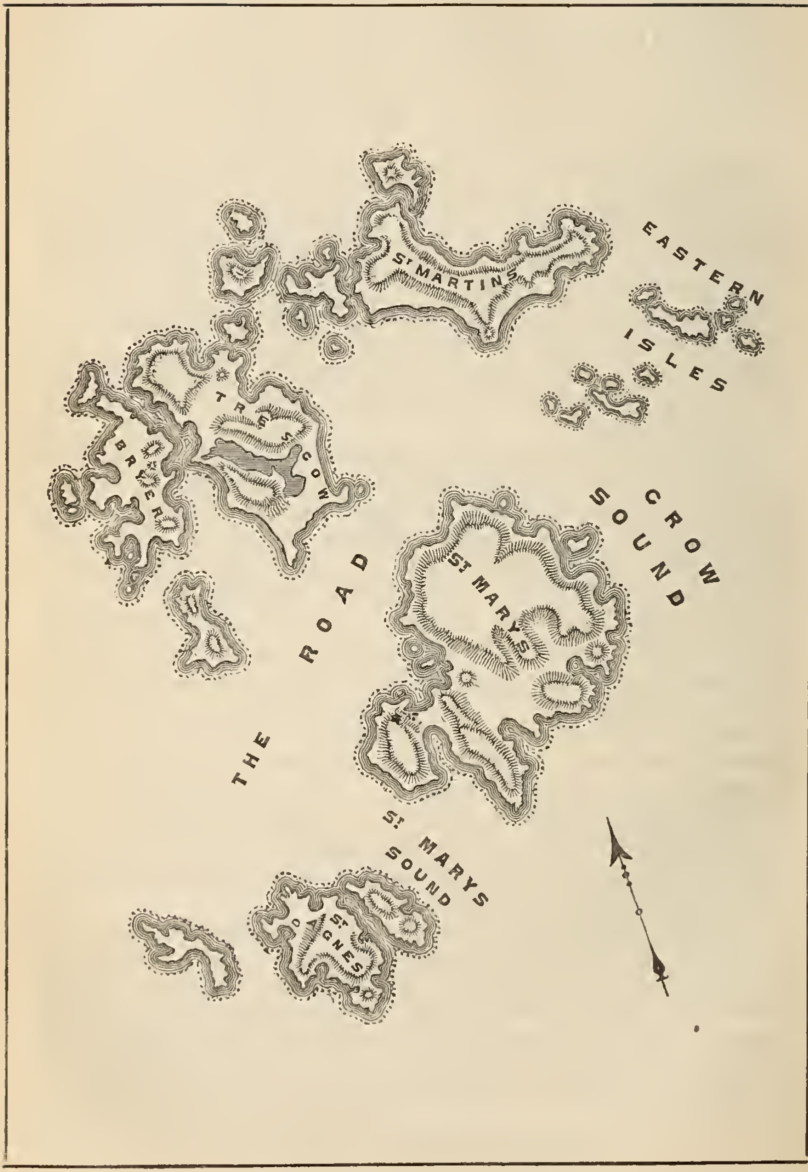
The average rainfall is 31 inches. Wells of from 15 to 18 feet in depth furnish an unfailing supply of excellent water. There are, also, a few large ponds, but these suffer occasionally from the encroachments of the sea.

Geology.—These islands are almost entirely granitic. "Formed of a multitude of rocks and small islands, they may be compared to Dartmoor, sunk to such a level that the sea should run among its tors and more elevated masses of land, thus keeping a large portion of the tors above the sea-level, forming the smaller masses usually termed rocks, while the larger and more extended masses would constitute islands of various sizes. The granite is

* 'Scilly and its Legends,' Whitfeld (1852).

† 'A Week at Scilly, North' (1850).

Sketch-Map of the Scilly Isles.



usually a somewhat coarse compound of quartz, felspar, and mica, both dark-coloured and silvery, and a finer-grained granite is not unfrequently detected in it in the form of veins."*

The rock is remarkably loose in texture, readily disintegrating, and liable to rapid decomposition. It is much jointed, especially at the surface. This favours disintegration. "At Watermill Bay the joints are so close to each other, and so highly inclined, as to give to the whole mass the appearance of stratified granite."†

Dr. Paris, to account for the fertility of the soil at Scilly, mentions the presence in the granite of large quantities of iron and felspar. These constituents would, as he justly remarks, induce speedy decomposition.‡ The grey granite is the prevalent variety. The red is present in much smaller quantity. The sand in some of the bays is very micaceous.

Soil.—The soil varies from an almost pure sand to a dark sandy loam, and is very free from stones. Woodley tells us that "the vegetable soil is a black peat, intermingled with granitulous particles, and known in Cornwall by the name of growan or gritty. This stratum is about 2 feet in depth, becoming of a lighter and greyish colour in proportion to its distance from the surface. Next to this is a yellowish loamy clay, found in a stratum of 5 or 6 feet in depth, and intermingled with stones. The colour of the clay becomes darker, and the stones imbedded in it are larger, in proportion to their depth from the surface. Under the whole are found large masses of granite rock, fit for building and other purposes."§

This description is not altogether correct; for the soil, considered as a whole, is not a black peat, though it may, in some districts, be of that nature. Nor did our observation confirm the statement in regard to the "yellowish loamy clay." We heard, indeed, of a clay subsoil in one locality; and, in all probability, it is present in other parts, but it is not generally distributed. The soil is more sandy, and consequently lighter, on St. Martin's and St. Agnes than on Tresco and St. Mary's. Its depth varies very much.

All the islands contain many acres of waste land or downs, more or less studded with masses of rock, among which may be found a scanty herbage of poor short grass, ferns, and heath, and several clumps of strong-growing furze.

On St. Mary's there is a limited area of marshy land.

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* 'Report on the Geology of Cornwall, Devon, and West Somerset,' by Henry T. de la Beche, F.R.S (1839).

† From a Paper read before the Royal Geological Society of Cornwall, September, 1850.

‡ 'Transactions of Royal Geological Society of Cornwall,' vol. i. (1818).

§ Woodley on the Scilly Isles (1822).

Economic Features.

Farms and Fields, Fences and Roads.—The farms of Scilly are small. On St. Mary's they vary from 5 to 15 acres. One is said to be 30 acres, but this includes a large breadth of untilled down. On the off-islands they are still smaller, there being many of about 3 acres. On St. Agnes the largest is 12 acres.

The fields on St. Mary's contain, upon an average, about 1 acre. They vary in size from 1 rood to 3 acres. On the off-islands, again, they are proportionally smaller.

The fields are divided by walls of granite, which consist of rough blocks piled up without mortar, and often topped with sods. The fence is made more perfect in some cases by the addition of furze, planted on one or both sides. The gateways are narrow. Blocks of granite answer the purpose of gateposts, one block being occasionally used for the support of the two gates of adjoining fields. A curious substitute for the ordinary stile is often adopted. Where the stile is usually placed a large hole is dug, across which are laid blocks of granite to form stepping stones for pedestrians. Cattle and sheep do not attempt the passage. For greater security an additional block is frequently set upon the middle one, thus making a stile in miniature. The roads are mended with granite. The majority are smooth and good, but some are rendered rough by the cropping out of the subjacent granite. There is a pleasing absence of mud and dirt.

Farm Buildings, Cottages.—Farm buildings are insignificant; and cottages, though of good construction, are not sufficiently numerous. Most of the latter are built of granite. Of the former, some are of granite, some of wood. Thatched and slated roofs are common in both. Tiles are more sparingly used. Thatch is tied down with ropes of rye or oat straw. The ropes are fastened to pegs, which are driven in under the wall-plate. On St. Martin's we saw one set of tolerably conspicuous farm buildings, but a nearer approach revealed sheds without roofs, and walls half fallen. Still, there were well built stacks on stone steddles, a well filled stackyard, decent stabling, and good calves' house—all characteristic of the largest farmer on St. Martin's.

Implements.—Implements are neither numerous nor of the best construction. Light iron ploughs, drawn by one horse, iron cultivators, and small one-horse carts are ordinarily used. For the conveyance of seaweed a wooden framework in the shape of a W, the middle part fitting on to a horse's back, is employed.

There are several small thrashing machines on the islands; and yet we found, one morning, a man thrashing wheat by beating it upon a barrel. Winnowing, too, is still done on a breezy day in the open air, the wind separating the chaff from the grain, which is allowed to fall through a sieve. But winnowers are gradually being introduced, as are also chaff-cutters and turnip-cutters.

Crops.

Potatoes.—The cultivation of early potatoes receives much attention. This crop, indeed, forms the main support of the Scillonian farmer, and is grown in all sheltered spots. Late potatoes are only planted in poor soils, and exposed situations, or after the failure of the early crop. The Gillyflower is the early kind generally grown. Its tuber is round, with a white skin, shallow eyes, and a purplish-pink marking on one side. We were told that this was the only variety of potato which could be grown with success every year on the same land.

Regents, roughs, robins, rocks, flukes, and Irish are also planted.

The preparation of the land is well attended to, every effort being made to render it thoroughly light and clean. Large quantities of sea-weed and farmyard manure are used. Some farmers prefer to apply them in the form of a compost. Others first plough in a dressing of farmyard manure, and then proceed to collect seaweed for future application.

The seed time for early potatoes extends from the end of November to the beginning of January. Later sorts are planted in February and March. The preservation and preparation of the seed are carefully considered, three points being kept in view:—

1st. That the seed should be preserved in thin layers on shelves, with the crown end uppermost.

2nd. That it should be evenly "shot."

3rd. That it should be cut into sets.

Even small seed-potatoes are cut, because the plants come earlier. To this rule an exception is made in the case of flukes, which are said to be more liable to disease when cut.

Potatoes are planted either in beds, 4 feet in width, or on the flat. When farmers adopt the latter plan they prefer to dig in the sets, only using the plough to economise time. In the former, which is the more common method, rows 1 foot apart are made across the beds, 6 to 9 inches being left between each set in the row. In all cases the sets are barely covered with soil. In ploughing, they are placed half-way down every second furrow.

15 cwt. of seed-potatoes are used per acre in planting on the flat, 20 cwt. in beds.

We were told that the outside plants in the bed are the most productive.

Soon after the plants appear above ground the earth is drawn round them with the hoe. The land is then kept thoroughly clean by horse and hand hoeing till harvest.

The general harvest of early potatoes is in the beginning of May, though in forward seasons it takes place in April. They are usually dug. When ploughed the horse hoe is afterwards passed through the land.

The potatoes are harvested before coming to maturity, that they may be sent to market as soon as possible. Farmers consider 5 tons per acre a good yield. In the spring of 1869 the plants, which gave promise of an early and abundant crop, were almost destroyed by a violent gale. In some parts the wind blew the young shoots completely out of the ground. The potato disease also is often very destructive. Early potatoes are sent to London, Birmingham, and Manchester, in baskets of 1 cwt. each. The trade with London has not been so good of late years. Manchester is now said to be the best early market. 16*l.* to 20*l.* per ton is considered a good price, but 1*s.* 6*d.* per lb. is sometimes received for a few baskets, and 2*s.* 6*d.* per lb. *has been* realised in Covent Garden. When the price falls to 12*l.* per ton, they are shipped in bulk to South Wales, where, however, the Jersey growers soon compete successfully.

The cost of carriage to London is 8*s.* 4*d.* per cwt.; to Birmingham 4*s.* per cwt.; to Manchester 5*s.* per cwt.; and to South Wales 1*s.* per cwt. Salesmen charge a commission of 7½ per cent. on the price obtained.

Walter White, who visited Scilly in July, 1854, gives the following account of the trade in early potatoes:—

"A young man of Hugh Town (St. Mary's) told me that he had the weighing of all the potatoes shipped from the port. London is the best market; 15,000 baskets had been sent away since the commencement of the season, the last cargo on the previous Saturday. A Scilly pilot-boat carries 300 baskets, each containing 1 cwt. of potatoes, to Southampton for 1*s.* the basket. From Southampton they are forwarded to Covent Garden; and as some of the earliest parcels in February realise 1*s.* per lb., on the average, there remains a handsome profit. 'But the price gets lower every week,' said my informant; 'and sometimes, about midsummer, all that a man gets in return for a dozen baskets is a dozen postage stamps in a letter. We think it time to stop then.' The year had been one of the best for potatoes ever known in Scilly. In 1853 the people of St. Martin's got 2000*l.* for their crop, the potatoes of that isle being considered the best. . . . The young merchant went on to tell me of the origin of the potatoe trade. About fifteen years ago his father, Alexander Gibson, when off the Isles with the quarantine boat, hailed a Spanish vessel, and while on board saw some fine-looking potatoes, of which the captain gave him a few. These he planted, and saved the produce, finding them to ripen remarkably early for successive seasons, and at last had a surplus stock to sell his neighbours. One after another took to planting the early sort, and now, as we have seen, the supply is 15,000 cwt. in the first half of the year."*

The potatoes are at the present time taken by steamer to Penzance, instead of by pilot-boat to Southampton.

Wheat.—"The ground of this isle" (St. Mary's), says Leland, "berith exceeding good corn, insomuch that if a man do but cast corn wher hogges have rotid it wyll cum up."†

In 1750 we find that very little wheat was grown, but "enough barley to serve the whole island for making malt (and bread for the poorer families) with an overplus" for cattle and swine.‡

More wheat is now grown, especially on St. Mary's and Treseo. The land is too light for its successful culture on St. Agnes and St. Martin's.

Both red and white wheat are sown, sometimes together, sometimes separately. In the latter case the red is planted on the poorer land.

The seed time for wheat is in February. If sown in December the land gets foul and the birds are more troublesome. Broadcast sowing is almost universal. When the wheat first appears it is rolled with a stone roller. Some cover the young plant with seaweed.

The harvest is in August. Most farmers cut wheat with the hook, a few use the scythe.

The sheaves are small. Forty bushels of red wheat per acre is considered a good crop. Some wheat is exported; but flour, in greater than corresponding quantity, is bought for home consumption.

Other Grain Crops.—Barley is grown in considerable quantity, especially on St. Agnes and St. Martin's. Oats are little grown. The latter are sown about the middle and the former towards the end of April. They are cut with the scythe on St. Mary's, with the hook on St. Martin's.

Rye is chiefly cultivated on St. Martin's, being sown at the beginning of April. The grain is given to the pigs and the straw twisted into ropes for thatching.

Asparagus.—This vegetable is grown for the London market, and is as profitable as early potatoes. The quantity pro-

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* Walter White's 'Walk to the Land's End' (1855), pp. 264 and 265.

† Leland's 'Itinerary.'

‡ Heath on the Scilly Isles (1750).

duced, however, is small, only a few baskets, we were told, being sent away "even in the height of the season." It thrives best on a sandy soil, and is grown in beds, as in our own gardens. In winter the beds are levelled and manured with seaweed, which, in this case, is found to produce more effect than farmyard manure. In 1869 some sticks were cut as early as February. In ordinary seasons there are none ready before the end of March.

Occasionally at the beginning of the season, a few bundles are sold at the rate of ½*d.* per stick, but the price is soon reduced. One farmer informed us that, after paying all expenses, he realized 8*d.* per bundle (of twenty-five sticks) for his earliest, and 6*d.* per bundle for his latest produce.

Clover and Grass.—Clover is grown extensively and successfully. A mixture of red and white clover, yellow clover (*Medicago lupulina*), and Italian rye grass is generally sown on the barley land in the spring. But sometimes the seeds are hoed in among the mangolds or turnips in the summer or autumn. Where they fail, scarlet clover (*Trifolium incarnatum*) is frequently sown. Seeds are not usually left down more than three years. There is an abundance of good grass.

"The productiveness of the fields is seen in the broad swathes of grass in the hay-fields, and the vigorous appearance of the grain and roots crops, clothing the slopes with refreshing verdure."*

The Scillonians speak of 2 tons of hay per acre as an average crop, even more being gathered in from the low-lying land.

In early records we find the quality of the grass commended. For, says Leland, "there be countid 140 islettes of Scilley that bere grass, exceeding good pasture for catail."†

Root Crops.—Mangolds and turnips do well. Swedes were cultivated with success at one time; but now they are liable to premature decay. They are, therefore, only grown on poor soils. 1868 and 1869 were bad years for roots.

Mangolds are generally sown on the land which has produced the early potatoes. Two crops are thus obtained in one year. After the digging of the potatoes little or no tillage is required. The cultivator, or tormentor as the Scillonians prefer to call it, is sometimes passed through the land, the haulm cleared away, and the mangolds drilled. Both long and globe mangolds are cultivated; 5 lb. of seed per acre is drilled in rows 16 in. to 20 in. apart. Guano is sometimes applied at the rate of 1½ cwt. per acre. During growth all roots are frequently hoed, by horse and hand.

* Walter White's 'Walk to the Land's End.'
† Leland's 'Itinerary,' vol. iii. p. 7.

A general practice prevails of gradually stripping off the leaves of the mangolds in the autumn for the use of cattle. The roots are not, as a rule, pulled till January or even February. They are then thrown into heaps, and left *uncovered.*

Swedes and turnips are drilled in rows 16 inches apart. White carrots are produced in limited quantity. The soil of Scilly appears well adapted for them. Beans, peas, and vetches are not grown except on the proprietor's farm.

Rotation of Crops.—The following courses of cropping are employed:—

(1) 1st year. Wheat, laid down with seeds.
2nd year. Seeds.
3rd year. Early pototoes, followed by mangolds.

In this rotation the manure is only applied to the potatoes.

(2) Early potatoes, followed by mangolds, the same crops being repeated year after year.

This practice is only carried out in sheltered fields, which are well suited for the growth of early potatoes. We saw a field of mangolds which had been so cropped for twenty years in succession.

(3) 1st year. Wheat, laid down with seeds.
2nd year. Seeds.
3rd year. Seeds.
4th year. Seeds.
5th year. Potatoes.

(4) 1st year. Barley, laid down with seeds.
2nd year. Seeds.
3rd year. Seeds.
4th year. Potatoes, followed by mangolds.

The seeds are sometimes only left down for one year. In exceptional instances, where there happens to be a very good plant, they are allowed to remain six or seven years

(5) 1st year. Potatoes, followed by mangolds.
2nd year. Rye.

This rotation is used in St. Martin's, on poor sandy land near the shore. On better land barley is sown instead of rye.

Manures.

Seaweed abounds on the rocky shores, and the Scillonians use it freely. During the gales, for which these islands are famous, large quantities are washed up by the waves. At Old Town, St. Mary's, the farmers join together to cut seaweed, bringing what men and horses they can muster. The heaps thus obtained are afterwards fairly divided. In other districts each farmer supplies himself. After a heavy gale many work night and day till the storm-washed produce is all collected.

In applying the seaweed, they often carefully separate the species. Experience has taught them that particular species are suitable for particular crops. Thus, to use local terms, they find that Thongs (*Himanthalia lorea*), Sedge (*Enteromorpha*), and Blade Ore (*Laminaria*) are specially adapted for potatoes; whilst Crabby Ore (*Fucus serratus*) is best for wheat.

Seaweed is frequently mixed with farmyard manure. It greatly assists decomposition, the plants taken from deep water rotting faster than those found above low-water mark. Seaweed is considered as good as farm-yard manure for the first year after its application, but it has no lasting properties. Some of the islanders say that it encourages the growth of stem and leaf in potatoes rather than of tubers.

Little artificial manure is used at present. Guano is imported in moderate quantity. We heard of no other kind.

Weeds and Wild Plants.

Besides such ordinary field weeds as thistles, docks, yawl (the local name for couch), groundsel, bind-weed, and chenopodium, we found that the common erodium (*Erodium cicutarium*), bothum or corn marigold (*Chrysanthemum segetum*), and millefoil (*Achillea millefolium*) gave much trouble.

Among other wild plants, we noticed the sea samphire (*Crithmum maritimum*), navelwort (*Cotyledon umbilicus*), sea lavatera (*Lavatera arborea*), musk erodium (*Erodium moschatum*), black solanum (*Solanum nigrum*), Portland spurge (*Euphorbia segetalis*), and the small-flowered sage (*Salvia clandestina*.

Fern is largely collected, and stacked near the cottages and farm-buildings for lighting fires and for use as litter.

Trees are few in number and much stunted. The tamarisk is generally distributed.

Live Stock.

On St. Martin's the numbers of the principal live stock are:—horses, 15 or 16; cattle, 24; sheep 90 to 100.

Horses.—The farm horses are of indiscriminate breed, small, hardy, and active. Few are bred on the islands. The majority come from Penzance, and are worth from 15*l.* to 20*l.* each. As a rule, each farmer keeps one horse.

In summer, the horses are turned out on the downs. In winter, they are fed with barley or oats, "in the sheaf," mangolds, and a little hay. Fifty years ago they lived upon furze.* Recently also, during one winter when other food was scarce, they had nothing but furze, and throve upon it. In 1750, oxen as well as horses were used for ploughing.†

Cattle are the chief live stock. Fifty years ago a small black breed was kept, and fed, on some of the islands, with seaweed. Cattle from Jersey were afterwards introduced, and have been subsequently crossed with Devons and Shorthorns. There are also a few Irish cattle on some of the islands.

Cows are usually kept upon the pastures at all seasons, except on wet days and at night in winter. They are frequently tethered.

Some farmers house their cows during two or three of the winter months, feeding them upon hay and straw, mangolds, and, in plentiful seasons, potatoes.

The statements concerning the yield of milk and butter were remarkably various. The truth probably is, that the better class of cows give, when in full milk, from ten to twelve quarts daily, and from eight to ten pounds of butter in the week.

On the Home farm, where the cattle are better fed, one cow gave sixteen quarts of milk in the day, for six months in succession, and thirteen pounds of butter in the week. The cream is scalded according to the Devonshire system. Cheese is seldom made.

Autumn calves are fed upon hay, mangolds, and cabbages. Spring calves are pastured.

Cows are worth from 10*l.* to 12*l.*, yearlings from 3*l.* to 3*l.* 10*s.*, and calves of a few days old 10*s.* each. Bullocks are chiefly fed upon the islands of Tresco and St. Mary's, the farmers of the other islands contenting themselves with rearing calves and making butter. In winter the food of fatting cattle consists of mangolds, turnips, hay, and unthreshed barley or oats. Very little cake is given. Many are fattened upon the grass land in summer.

At Holyvale, St. Mary's, the mangolds are sliced, and the unthreshed barley or oats passed through the chaff-cutter; but this practice is exceptional.

Fat cattle are killed when from two to three years old. Their dead weight varies from 3 to 5 cwt. Butchers come over from Penzance to buy beef, and outward-bound vessels often take in a supply.

The islanders feel the want of a veterinary surgeon.

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* Woodley on the Scilly Isles (1822).
† Heath on the Scilly Isles (1750).

Sheep.—An interesting and picturesque, but far from useful, breed of sheep runs half-wild upon the downs, where it has existed, we were told, since "the beginning of the world." Woodley says they resemble a breed in the Western Isles of Scotland.

Their white heads, straight thin noses, short ears, and small bright eyes give them an appearance of vivacity and self-satisfaction quite the reverse of sheepish. Their low shoulders and narrow chests are only surpassed in shapelessness by their scraggy necks. Their other features are crooked backs, weak loins, high pelvis, small abdomens, long tendinous legs, ragged tails, and loose shining wool. Altogether, such qualifications admirably adapt them for a goat-like existence among their native rocks.

It is not surprising that, with such an unimproved breed, farmers should find sheep more troublesome and less profitable than cattle. They are, nevertheless, a prolific breed; but a large number of the lambs die through neglect.

To prevent them straying or jumping over walls, it is the practice to tie one of their fore legs to the corresponding hind one—a barbarous custom which gives the animals much unnecessary pain and inconvenience.

A few South Downs are also kept.

Sheep intended for the butcher are put upon the better pastures and have a few roots thrown to them. They are not folded on turnips, nor do they receive hay or artificial food.

A common dead weight is 8 to 10 lbs. per quarter. When more than ordinary care has been used in feeding it may be as much as 12 or 15 lbs. per quarter.

Sheep are not washed before being shorn. Their fleeces weigh from 4 to 5 lbs. each. In 1859 this unwashed sandy wool was sold at the rate of 7½*d.* to 8*d.* per lb. Much of it is, however, retained for home use, being woven into clothes by the women.

Pigs, &c.—A sufficient number of pigs, of no particular breed, are kept for home consumption.

In 1822 there were "hogs in great number, fed on sea-weed, limpets, &c., which gave the flesh a disagreeable redness and a fishy taste."* Latterly their food has improved. They now get mangolds, soaked barley, and at times a few potatoes.

A good many geese are reared on St. Mary's. There are a few rabbits on most of the islands.

The proprietor uses Sampson as a deer park; he has also stocked it with partridges.

The farmers of Scilly are not troubled with rooks.

* Woodley on the Scilly Isles (1822).

Example Farm.

A farm near Old Town may be taken as an example of the larger holdings on St. Mary's. It is situated on the south side of the road which connects Hugh Town with Old Town. The most fertile fields lie in the valley, near the road. On the slope of the hill facing north-east, is some good land, the value of which is increased by its being well sheltered from southerly and south-westerly gales.

As one approaches the brow of the hill, the soil becomes thin and broken up by large blocks of granite. One or two fields on the south-western slope are of better quality, but much exposed.

The farm is divided by stone walls into eighteen fields, which vary in size from $\frac{1}{3}$ to $1\frac{3}{4}$ acres, making a total area of $17\frac{1}{2}$ acres.

On leaving the road, we entered a field of $1\frac{3}{4}$ acres, covered with a plentiful pasture of excellent quality. Three oxen in the year have been fattened on this field alone.

Thence we passed into a field of mangolds, which promised well in spite of dry weather and late sowing. Here the soil was a deep sandy loam, containing so much organic matter that, in some of the darkest places, it appeared to be mixed with pure black peat.

The percentage of organic matter has doubtless been increased by the yearly application of large quantities of seaweed. This field and others near it, of a rather lighter texture, have been for many years cropped with early potatoes, followed in the same season by mangolds.

As we ascended the hill we passed over land unsuitable for the cultivation of potatoes every year, some of it being simply a micaceous sand. Here a four or five years' course is adopted. Some of the fields on the top of the hill were ploughed. Others, on which granite boulders lay thinly scattered, were either in natural pasture or sown with artificial grasses.

Descending the south-western slope of the hill for a short distance, we found that the land slightly improved in quality, but on account of its exposed situation is always kept down in grass or seeds.

The farm contains $10\frac{1}{2}$ acres of arable land and 7 acres of grass.

The former was cropped as follows:—

	Acres.
Seeds (kept down from four to seven years) ..	$4\frac{1}{2}$
Potatoes, followed by mangolds	2
Wheat	$\frac{1}{2}$
Barley	$3\frac{1}{2}$
	$10\frac{1}{2}$

No general rotation is adopted, but the course of cropping is varied according to the situation of the fields. The live stock kept are one horse, ten or eleven head of cattle, and three pigs. There are no sheep.

The land on the whole is clean and thoroughly cultivated, and the cattle looked healthy and well cared for, as is generally the case on the Scilly farms.

The Home Farm.

This farm is on the island of Tresco, of which it includes the greater part of the cultivated land. On the southern slope stands the residence of the proprietor, in a pleasant and picturesque situation.

The garden, with its living walls of aloes and geraniums, its orange-trees and its myrtles, presents more the appearance of a Spanish than of an English pleasure ground. The road to the house is sheltered on the one side by a plantation of firs and pines, on the other by various kinds of ornamental shrubs. At a little distance are two large ponds, stocked with swans and Egyptian geese.

The area of the farm is between 300 and 400 acres. We state it thus loosely because we could not ascertain the exact size. This ignorance of areas prevailed on all the islands, and it was generally difficult to obtain even an approximate estimate.

The fields are much larger than on any of the other farms. The roads are good, numerous, and easily repaired.

The farm buildings are constructed of granite, and have slated roofs; they are in two distinct blocks, one recently erected, and the other built some years ago. The old block consists of engine house (with engine of 8-horse power), barn, granary and lofts (with two pairs of millstones), stables, chaff-house, cart-shed, carpenters' and blacksmiths' shops, and bailiff's house.

The chaff-cutter is driven by horse power. The cart-shed is small and distant from the stables.

The stack-yard is near the shore, and very much exposed.

The new block of buildings, which is on the other side of the road, is altogether better.

Here we have slaughter-house, house with copper for steaming food, piggeries, covered manure-pit, bull's house, cattle stalls, calves' shed, and root and hay house.

The root and hay house has a floor above, where is another chaffcutter, driven by horse power.

Provision is made for laying on water to each of the cattle. Thorough ventilation is obtained by means of sliding panels in the doors, and hinged shutters to the windows.

We heard that it is the intention of the proprietor to dispense with the old block of buildings by erecting others in proximity to the new block. Certainly the present arrangement is neither conducive to economy nor to convenience. For example, with a steam-engine of 8-horse power there should be no necessity for two horse-gears; all the chaff should be cut by steam.[1]

Implements are numerous and of good construction. There are some good cottages, near the farm buildings, for the labourers.

Punctuality on the part of the labourers is strictly exacted, those being fined who are late in coming to their work. The men receive from 12*s.* to 16*s.* a week, with extra wages in harvest time. They are paid during illness, and a fat ox is killed for them at Christmas. A good deal of work is done by the piece.

Crops.—Few potatoes are grown, because the labour cannot be spared. Red and white wheat is drilled in February, at the rate of 7 to 8 pecks per acre. If sown in autumn it grows too luxuriantly. It is rolled when well up, but not hoed. The wire-worm is often destructive. The harvest is in August, and the wheat is mown. Mangolds are drilled at the end of April, or the beginning of May, in rows 2 feet apart, and at the rate of 7 or 8 lbs. of seed per acre. The orange globe is the favourite variety. The plants are thinned by the horse-hoe, travelling at right angles to the rows. In the three years previous to 1869 notice was taken of the weight of the mangolds, and five roots were found, in many places, to weigh 118 lbs.

The plan of storing on this farm is to throw the roots into a heap with their tops on, and to leave them without further covering.

Kohl rabi is sometimes grown, but does not attain a profitable size, nor does it keep so well as mangolds.

The turnip-fly is very troublesome on all the islands.

Parsnips are grown for the cattle.

In regard to clover, alsike succeeds as well as any kind. White Dutch does not stand, and grass will not last more than two or three years on the light sandy land.

The downs are being rapidly improved—the surface rocks removed by blasting, the furze uprooted, and grass seeds sown.

Besides the crops above mentioned, barley, beans, peas, vetches, turnips, and carrots are grown as often, and in as large quantities, as their respective importance suggests.

The following rotation is used for part of the farm:—

1. Wheat, laid down with seeds.
2. Seeds, mown twice.
3. Vetches, followed by turnips.

4. Corn, or, if grass is wanted, mangolds, laid down with seeds at the last hoeing.

Barley is sometimes grown after wheat.

Live Stock.—In addition to the working horses, two mules are kept, and are found to be quite equal in value to the horses for certain kinds of work.

In winter the food of the horses consists of the following mixture:—

Indian corn, 20 bushels; barley, 10 bushels; peas, 20 bushels; these are roughly ground together, and a liberal allowance given to each horse.

There were about 80 head of cross-bred cattle on the farm at the time of our visit.

Fatting bullocks are fed on pulped mangolds and swedes, hay and straw chaff, and a little oilcake. A common dead weight is from 6 to 7 cwt. Calves are tied up for the first three or four months of their lives. This was, doubtless, the cause in part of their poor appearance. All the other cattle looked well.

The sheep are not confined to one breed, but South Down, Shropshire, Dartmoor, and Scillonian sheep are all kept. The ram is turned among the ewes on the 15th of September. Lambs are weaned in July, put on clover, and given a little cake for a short time. From the clover they go to turnips. In the winter they are on the grass land. Ewes are chiefly kept on the pastures and downs, getting chaff, pulped mangolds, and oilcake when in poor condition.

Fatting sheep are fed on the grass land, and have hay and straw chaff, with one pound each of oilcake per diem.

On St. Helen's the sheep are allowed to run wild, being only visited for clipping. Their number has long ceased to increase.

The sheep at Tresco suffer from the rot; and, as the diseased livers are thrown to the dogs, it is likely to continue.

A considerable number of breeding pigs are kept, and their progeny sold to farmers on the other islands. They are fed upon steamed mangolds and swedes, together with some of the same mixed meal which is given to the horses.

Much interest is taken in poultry, of which all the principal varieties may be seen on the farm.

There are several poultry houses, with walls made of dried ferns, near the farm buildings.

Rural Economy.

Rents are higher on St. Mary's than on the other islands. On

St. Mary's the rent of good land is 30*s.* to 40*s.* per acre. Poorer soils, and those in exposed situations, let for considerably less.

All the islanders hold their land under one proprietor, who resides at Tresco. They have no leases.

The entry on farms takes place on the 11th of October. The incomer has no payment to make for tillages or unexhausted improvements.

From 6*l.* to 7*l.* per annum is, in some cases, paid for a cottage with four good rooms, including, perhaps, a little garden ground; but there are many who, favoured by circumstances, pay a much lower rent. Rates are low, including only the poor and the road rates. Together these consist of from six to eight rates per annum, each of 3*d.* to 4*d.* in the pound.

There are but few paupers, and these are sent to a union in another part of Cornwall on the main land.

Native labourers are not numerous. The small farmers work for those who have larger holdings; and, in busy times, labourers come over from Penzance.

On St. Mary's labourers get 2*s.* 6*d.* per diem, with beer and supper in addition during harvest. On the other islands wages are lower. On St. Martin's 10*s.* a week is given.

The working day is from 6 A.M. to 6 P.M. in summer, half an hour being allowed for breakfast, and one hour for dinner. In winter it is from 8 A.M. till dark.

Piece-work is contracted for by the field, not by the acre. We heard that high prices were given.

The farmers on the islands appear to be prosperous. Few complained of high rents, and it is said that five acres suffice for the support of a family.

In the houses we visited there was no sign of poverty or straitened circumstances, but all the internal arrangements betokened the possession of plenty and abundance.

The prices of provisions are much the same as in other parts of Cornwall. In the following Table are given the prices of various kinds of food at three different periods:—

	1750.	1822.	1850.
	Per lb.	Per lb.	Per lb.
Beef	2½*d.*	4*d.*	5½*d.*
Mutton	2½*d.* to 3*d.*	4*d.* to 4½*d.*	6*d.*
Lamb	2½*d.*	4*d.*	7*d.*
Pork	2½*d.* to 3*d.*	3½*d.*	.. ..
Butter	"Scarce."	1s. 3*d.* to 1s. 4*d.*	10*d.* to 1*s.*
Eggs	2½*d.* per doz.	3*d.* to 4*d.* per doz.	4*d.* to 6*d.* per doz.

Barley bread is still eaten on St. Martin's.

There are two days in the week on which meat is offered for sale in the little market house at Hugh Town. Each farmer is his own salesman, and, as the joints are generally bespoken, the business is quickly despatched. Beef, mutton, and geese are sold at the same price per pound.

Shops are numerous in Hugh Town. The proprietors find it unprofitable to restrict themselves to a special branch of trade, so they keep a miscellaneous stock.

They will not always give money for farm produce, especially roots and butter, but oblige farmers to take their goods in exchange.

With respect to the state of agriculture on the Scilly Isles, we need scarcely say that there is much room for improvement. It certainly suffers from the smallness of the farms, and from the ignorance of the farmers on many points connected with good systems of husbandry. The latter defect might be remedied if the proprietor of the islands employed as his steward and as his bailiff, men well acquainted with the best methods of British farming. The one, in his personal intercourse with the tenantry, would have many opportunities of influencing their practice. The other, in his management of the home farm, might show to the islanders the style of farming best suited to their peculiar circumstances.

XXI.—*Field Experiments on Potatoes.* By Dr. Augustus Voelcker, F.R.S.

In 1867 I published the results of some experiments on potatoes, which I instituted in 1866, with the special object of ascertaining how far the artificial supply of potash-salts, either alone or in conjunction with phosphatic manures, favours the production of a crop of potatoes. Since then similar experiments have been carried out, under my direction, from year to year, in various parts of England, by several of my agricultural friends. The present report embraces experiments which were made in 1867 by my former pupils, Mr. S. Raillow Hetherington, Carleton, Carlisle, and Mr. George Maw, of Benthall Hall, Broseley, the author of a Prize Essay on 'Results of Experiments on the Potato Crop,' with reference to the most profitable size of the sets, &c., in the years 1864 and 1865, at Benthall, which will be found in Part II. of the volume of this Journal for 1867.

Unfortunately the potato crop in 1867 suffered much from disease, and many parts of the country turned out very badly.

Nevertheless the subjoined experimental results obtained in 1867 are not altogether void of interest, and therefore deserve to be placed on record.

Potato Experiments with Dung and various Artificial Manures made in 1867 *by Mr. Hetherington, at Carleton, Carlisle.*

The following manuring scheme was adopted in these experiments :—

TABLE I.

Plots.	Name of Manure.	Quantities used per Plot of $\frac{1}{20}$ of an Acre.	Manure per Acre.
1	No Manure	..	..
2	Mineral Superphosphate	22 lbs.	4 cwts.
3	Good Dung	1 ton.	20 tons.
4	Mineral Superphosphate	22 lbs.	4 cwts.
	and		
	Crude Potash-salts	22 ,,	4 ,,
5	No Manure	..	..
6	Crude Potash-salts	22 ,,	4 ,,
7	Common Salt	22 ,,	4 ,,
	and		
	Mineral Superphosphate	22 ,,	4 ,,
8	Common Salt	22 ,,	4 ,,
9	Good Dung	1 ton.	20 tons.
10	No Manure	..	..

The land upon which the experiments were tried was a very sandy light soil, in a poor agricultural condition, and of a uniform character throughout.

The potatoes were planted on the 23rd of April, and the manures were mixed with twice their weight of finely-powdered soil, and sown by hand during showery weather.

The potatoes on the plots manured with dung made a rapid start and grew luxuriantly, whilst the unmanured plots, and all those dressed with artificial manures, came up sluggishly, and throughout the abnormally dry season of 1867 looked stinted, and evidently not doing well. The potatoes on plot 7, manured at the rate of 4 cwts. of common salt, more especially had an unhealthy, shrivelled appearance, which I have noticed several times before as the result of a dressing of salt on potatoes in a dry season. The roots were taken up in October in dry weather and carefully weighed. The produce of each plot is shown in the following table :—

TABLE II.—Showing the Amount in lbs. of Large, Second, Small, and Diseased Potatoes obtained from each Plot of $\frac{1}{25}$ of an Acre.

Plots.	Name of Manure.	Large.	Second.	Small.	Diseased.	Total.
1	No Manure	81	33	67½	12	193½
2	Superphosphate	113	75	59	19½	266½
3	Dung..	384	115	43½	93½	636
4	Mineral Superphosphate and Crude Potash-salts..	269	50	27	80	426
5	No Manure	102	54	67	21	246
6	Crude Potash-salts	269	50	27	80	426
7	Common Salt	99	49½	47	26	221½
8	Mineral Superphosphate and Common Salt	211	68	55½	58½	393
9	Dung	478	90	62	140	770
10	No Manure	104½	53	42	26	225½

In Table V. (p. 396), the preceding results have been calculated per acre.

The produce on the three unmanured plots, as might have been expected, varied to some extent, as did also that on the two plots to which dung was applied.

The greatest variation in the unmanured plots amounts to 9 cwts. 1 qr. 14 lbs., and to 1 ton 3 cwts. 1 qr. and 20 lbs. in the dunged plots, as will be seen more clearly in the following table:—

TABLE III.—Showing the Averages of the Plots manured with Dung and unmanured, and the Differences between them.

	No. 1.	No 5.	No. 10.	AVERAGE.
	Tons. cwts. qrs. lbs.	Tons. cwts. qrs. lbs.	Tons. cwts. qrs.	Tons. cwts. qrs. lbs.
Unmanured ..	1 14 2 6	2 3 3 20	2 0 1	1 19 2 8⅔
	No. 3.	No. 9.		
Manured with Dung	5 13 2 8	6 17 2 0	.. ..	6 5 2 4
Increase by Dung .	.. ..	.. ..	.. ..	4 5 3 23⅓

The variations in the weight of the produce from both the unmanured and, especially from the dunged plots, are rather larger than it is desirable they should be, but not greater than they are usually found to be in unpropitious seasons in similar experiments.

Taking the average produce of the unmanured plots as a basis for calculation, we obtain the following increase or decrease in each experiment:—

TABLE IV.—Showing the Increase in Potatoes on each Plot, calculated to the Acre, and Average of Increase.

Plots.	MANURE.	Increase. Tons.	cwts.	qrs.	lbs.	Increase per Cent. on each Plot.
2	Mineral Superphosphate	0	8	0	$1\frac{1}{3}$	20
3	Dung	3	13	3	$27\frac{1}{3}$	187
4	Mineral Superphosphate .. .. .. and Crude Potash-salts	1	16	1	$27\frac{1}{3}$	91
6	Crude Potash-salts	0	4	3	$25\frac{1}{3}$	12
7	Common Salt	0	0	0	$2\frac{1}{3}$ (Decrease)	..
8	Mineral Superphosphate .. .. .. and Common Salt	1	10	2	$11\frac{1}{3}$	77
9	Dung	4	17	3	$19\frac{1}{3}$	247
	Average produce of Unmanured Plots	1	19	2	$8\frac{2}{3}$	..

It will be seen that the unmanured plots on an average produced barely 2 tons in round numbers, showing that the land was in a poor condition. On this account it was well adapted for manuring experiments; and it is, therefore, greatly to be regretted that the dry season of 1867 interfered, in a measure, with the characteristic effects which the various fertilising agents employed in the experiments unquestionably would have produced in a more favourable season on land of that description. Land in a high agricultural condition, as a rule, is altogether unfit for the trial of manuring experiments, for soils rich in all the elements of fertility, and containing more plant-food than is requisite for the luxuriant growth of our farm crops, is not benefited by the application of the most valuable fertilising matters, which, under these circumstances, often do harm instead of good. On the other hand, the poorer the soil, the more grateful it will be for manure, and the more striking will be the effect which a mixture of some of the more important fertilising constituents is capable of producing.

Common dung had by far the best effect on these experiments, for, on one of the dunged plots, the produce was increased 187 per cent., and, on the other, 247 per cent., whilst the highest increase on the plots dressed with artificial manures amounted only to 91 per cent.

On light land, and in a dry season, rotten dung produces a beneficial effect upon vegetation which cannot be expected to follow from the use of artificial manures.

Apart from the direct supply of fertilising matters, a fair dressing of dung per acre incorporates with the land a large

TABLE V.—Showing the Weight per Acre of Large, Second, Small, and Diseased Potatoes.

Plots.	Names of Manures used.	Large.				Second.				Small.				Diseased.				Total.			
		Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.
1	No manure	0	14	1	24	0	5	3	16	0	12	0	6	0	2	0	16	1	14	2	6
2	Superphosphate	1	0	0	20	0	13	1	16	0	10	2	4	0	3	1	26	2	7	2	10
3	Rotten Dung	3	8	2	8	1	0	2	4	0	7	3	2	0	16	2	22	5	13	2	8
4	Mineral Superphosphate and Crude Potash-salt	2	8	0	4	0	8	3	20	0	4	3	12	0	14	1	4	3	16	0	8
5	No Manure	0	18	0	24	0	9	2	16	0	11	3	24	0	3	3	0	2	3	3	20
6	Crude Potash-salt	1	3	3	20	0	8	1	16	0	4	3	8	0	7	1	18	2	4	2	6
7	Common Salt	0	17	2	20	0	8	3	8	0	8	1	16	0	4	2	16	1	19	2	6
8	Superphosphate .. .. and Common Salt	1	17	2	20	0	12	0	16	0	9	3	18	0	10	1	22	3	10	0	20
9	Rotten Dung	4	5	1	12	0	16	0	8	0	11	0	8	1	5	0	0	6	17	2	0
10	No manure	0	18	2	18	0	9	1	24	0	7	2	0	0	4	2	16	2	0	1	0

amount of decomposed organic matter, which possesses in an eminent degree the power of absorbing and retaining moisture in the land. For this reason dung is particularly useful on land which, like many poor sands, suffers much in a dry season.

It is worthy of special notice that common salt did no good whatever to the potato-crop. If anything, it had an injurious effect, which is the more remarkable as the soil upon which the salt was put was a light sand, or land which is generally supposed to be benefited by common salt. As far, however, as my experience goes, I am more and more constrained to look upon all very soluble saline manures as rather dangerous agents; for I have noticed over and over again the injury which these kinds of fertilisers produce in dry seasons, especially if they are applied rather late in spring. Unless common salt or potash-salts can be applied to the land quite early in spring, or, at all events, not later than the beginning of March, I believe it would be better in nine seasons out of ten not to make any use of these very soluble matters, which require to be thoroughly washed into the soil, if they are to benefit the crops for which they are used.

Potash-salts applied alone had a better effect than common salt in the preceding experiments, but the increase by the use of these salts was disappointing, as was also that obtained on plot 2, on which mineral superphosphate alone was employed.

The mixture of superphosphate and crude potash-salts, it will be noticed, had a much greater effect than either substance applied alone. Thus whilst 4 cwts. of mineral superphosphate gave an increase of 8 cwts. and $1\frac{1}{3}$ lbs. per acre, and 4 cwts. of crude potash-salts an increase of 4 cwts. 3 qrs. and 25 lbs., the mixture of the two produced an increase of 1 ton, 16 cwts. 1 qr. and 27 lbs., or whilst potash-salts increased the produce 12 per cent., and mineral superphosphate 20 per cent., the two mixed together gave an increase amounting to 91 per cent.

Potato Experiments made in 1867 *by Mr. George Maw, at Benthall Hall, near Broseley.*

An elaborate series of experiments with crude potash-salts, mineral superphosphate, farmyard-manure, common salt, and mixtures of superphosphate and potash-salts, and superphosphate and common salt, was carried out in 1867, by my friend and former pupil, Mr. G. Maw, of Benthall.

Potato sets of the King of Fluke Potato, of similar weight (each set separately weighed), were used within each of the twelve series of seven experiments which were tried in different parts of the garden of Benthall Hall, and uniform conditions insured as far as possible.

Mr. Maw carefully noted down the detailed results of his laborious experiments, which he incorporated in the following tables:—

TABLE VI.—Results of Experiments with Manures on the Potato Crop, made at Benthall in 1867. All King of Fluke, planted 1 foot in the rows, 2 feet apart.

A.—BRUSSEL SPROUT GROUND (the outer row not in the Experiment), rows 70 feet (Sets) in length.

Experiment.	Plot.	When Planted.	Number of Sets per Acre.	Weight of Set.	Weight of Sets per Acre.				Produce per Set in Ounces.	Gross Produce per Acre.				Net Produce per Acre after deducting Weight of Sets.				Rate of Increase.	Weight of Manure per Acre and Remarks.
				Ozs.	Tons.	cwts.	qrs.	lbs.		Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.		
1	1	April 6	21,780	8	4	17	0	26	23·03	14	3	0	21	9	5	3	23	2·91	No manure.
	2	,,	21,780	6	3	12	3	19½	22·45	13	12	3	12	9	19	3	20½	3·74	
	3	,,	21,780	4	2	8	2	13	20·28	12	6	1	26	9	17	3	13	5·07	
	4	,,	21,780	2	1	4	1	6	14·10	8	11	2	11	7	7	1	5	7·05	
2	5	,,	21,780	8	4	17	0	26	20·85	12	13	1	18	7	16	0	20	2·06	4 cwts. mineral superphosphate.
	6	,,	21,780	6	3	12	3	19½	18·08	11	8	1	27½	7	15	2	8	3·13	
	7	,,	21,780	4	2	8	2	13	19·34	11	15	0	6	9	6	1	21	4·83	
	8	,,	21,780	2	1	4	1	6	14·09	9	1	0	9	7	16	3	3	7·45	
3	9	April 8	21,780	8	4	17	0	26	16·00	9	14	1	24	4	17	0	26	2·00	20 tons of rotten dung. A.
	10	,,	21,780	6	3	12	3	19½	18·25	11	1	3	6½	7	8	3	15	3·04	
	11	,,	21,780	4	2	8	2	13	23·88	14	10	0	26	12	1	2	13	5·97	
	12	,,	21,780	2	1	4	1	6	16·01	9	15	2	20	8	11	1	14	8·05	
4	13	,,	21,780	8	4	17	0	26	26·05	16	2	0	9	11	4	3	11	3·31	4 cwts. mineral superphosphate. 4 cwts. per acre of crude potash-salts.
	14	,,	21,780	6	3	12	3	19½	27·02	16	10	2	10	12	17	2	18½	4·53	
	15	,,	21,780	4	2	8	2	13	26·34	16	0	0	14	13	11	2	1	6·58	
	16	,,	21,780	2	1	4	1	6	19·06	11	11	2	18	10	7	1	12	9·53	
6	17	,,	21,780	8	4	17	0	26	21·85	13	5	2	7	8	8	1	9	2·73	4 cwts. per acre of crude potash-salts.
	18	,,	21,780	6	3	12	3	19½	22·00	13	7	1	15½	9	14	1	24	3·66	
	19	,,	21,780	4	2	8	2	13	23·12	14	1	0	1	11	12	1	16	5·78	
	20	,,	21,780	2	1	4	1	6	16·86	10	4	3	18	9	0	2	12	8·43	

7	21	,,	21,780	8	4	17	0	26	17·03	10	10	1	1½	5	13	0	3½	2·16	4 cwts. per acre of common salt.
	22	,,	21,780	6	3	12	3	19½	24·05	14	17	3	2½	11	4	3	11	4·08	
	23	,,	21,780	4	2	8	2	13	23·52	14	5	3	12½	11	17	0	27½	5·88	
	24	,,	21,780	2	1	4	1	6	17·72	10	15	1	13	9	11	0	7	8·86	
5	25	,,	21,780	8	4	17	0	26	19·02	11	13	1	12	6	16	0	14	2·40	4 cwts. per acre of mineral superphosphate. 4 cwts. per acre of common salt.
	26	,,	21,780	6	3	12	3	19½	22·06	13	14	2	20	10	1	3	0½	3·76	
	27	,,	21,780	4	2	8	2	13	23·76	14	8	3	3	12	0	0	18	5·94	
	28	,,	21,780	2	1	4	1	6	16·92	10	5	2	16	9	1	1	10	8·46	
1	29	,,	21,780	8	4	17	0	26	18·08	11	8	1	27½	6	11	1	1½	2·35	No manure.
	30	,,	21,780	6	3	12	3	19½	29·35	17	19	0	17	14	6	0	25½	4·92	
	31	,,	21,780	4	2	8	2	13	25·84	15	14	0	6½	13	5	1	21½	6·46	
	32	,,	21,780	2	1	4	1	6	18·82	11	8	2	26½	10	4	1	20½	9·41	
2	33	April 9	21,780	8	4	17	0	26	25·05	15	9	3	19½	10	12	2	21½	3·18	4 cwts. mineral superphosphate. A.
	34	,,	21,780	6	3	12	3	19½	21·45	13	0	2	22½	9	7	3	3	3·57	
	35	,,	21,780	4	2	8	2	13	25·44	15	9	0	22	13	0	2	9	6·36	
	36	,,	21,780	2	1	4	1	6	16·12	9	15	3	19	8	11	2	13	8·06	
3	37	,,	21,780	8	4	17	0	26	15·03	9	5	3	23	4	8	2	25	1·91	20 tons of rotten dung.
	38	,,	21,780	6	3	12	3	19½	32·00	19	8	3	20	15	16	0	0½	5·33	
	39	,,	21,780	4	2	8	2	13	20·78	12	12	2	6½	10	3	3	21½	5·19	
	40	,,	21,780	2	1	4	1	6	18·92	11	9	3	23	10	5	2	17	9·46	
4	41	,,	21,780	8	4	17	0	26	36·25	22	0	2	9	17	3	1	11	4·53	4 cwts. mineral superphosphate. 4 cwts. crude potash-salts.
	42	,,	21,780	6	3	12	3	19½	20·07	12	11	2	9	8	18	2	17½	3·45	
	43	,,	21,780	4	2	8	2	13	25·52	15	10	0	19	13	1	2	6	6·38	
	44	,,	21,780	2	1	4	1	6	21·56	13	2	0	4½	11	17	2	26½	10·78	
6	45	,,	21,780	8	4	17	0	26	21·75	13	4	1	11	8	7	0	13	2·71	4 cwts. crude potash-salts.
	46	,,	21,780	6	3	12	3	19½	20·08	12	12	3	6	8	19	3	14½	3·46	
	47	,,	21,780	4	2	8	2	13	22·08	13	17	0	12½	11	8	1	27½	5·70	
	48	,,	21,780	2	1	4	1	6	18·68	11	7	0	4	10	2	2	26	9·34	

TABLE VI. (*continued*).—Results of Experiments with Manures on the Potato Crop, made at Benthall in 1867. All King of Fluke, planted 1 foot in the rows, 2 feet apart.

A.—BRUSSEL SPROUT GROUND (the outer row not in the Experiment) rows 70 feet (Sets) in length.

Experi-ment.	Plot.	When Planted.	Number of Sets per Acre.	Weight of Set.	Weight of Sets per Acre.				Produce per Set in Ounces.	Gross Produce per Acre.				Net Produce per Acre after deducting Weight of Sets.				Rate of Increase.	Weight of Manure per Acre and Remarks.	
				Ozs.	Tons.	cwts.	qrs.	lbs.		Tons.	cwts.	qrs.	lbs.	Tons.	cwts.	qrs.	lbs.			
7	49	April 9	21,780	8	4	17	0	26	21·05	13	1	1	6½	8	4	0	8½	2·68	4 cwts. common salt.	A.
	50	,,	21,780	6	3	12	3	19½	22·07	13	15	3	16	10	2	3	24½	3·78		
	51	,,	21,780	4	2	8	2	13	24·56	14	18	2	0	12	9	3	15	6·14		
	52	,,	21,780	2	1	4	1	6	20·52	12	9	1	17	11	5	0	11	10·26		
8	53	April 10	21,780	8	4	17	0	26	19·35	11	15	0	20	6	17	3	22	2·41	4 cwts. mineral superphosphate. 4 cwts. common salt.	
	54	,,	21,780	6	3	12	3	19½	14·03	8	13	3	5½	5	0	3	14	2·38		
	55	,,	21,780	4	2	8	2	13	21·02	12	17	2	18½	10	9	0	5½	5·30		
	56	,,	21,780	2	1	4	1	6	16·44	9	19	3	7	8	15	2	1	8·22		

B.—BORDER UNDER WALL. Rows 16 feet (Sets) long, outer row not in the Experiment.

Experi-ment.	Plot.	When Planted.	Number of Sets per Acre.	Weight of Set.	Weight of Sets per Acre.				Produce per Set in Ounces.	Gross Produce per Acre.				Net Produce per Acre after deducting Weight of Sets.				Rate of Increase.	Weight of Manure per Acre and Remarks.	
1	57	March 28	21,780	2	1	4	1	6	13·53	8	4	1	23	7	0	0	17	6·76	No manure.	B.
2	58	,,	21,780	2	1	4	1	6	15·21	9	4	3	24½	8	0	2	18½	7·60	4 cwts. mineral superphosphate.	
3	59	,,	21,780	2	1	4	1	6	8·78	5	6	2	25	4	2	1	19	4·39	20 tons rotten dung.	
4	60	,,	21,780	2	1	4	1	6	14·46	8	15	3	11½	7	11	2	5½	7·23	4 cwts. mineral superphosphate, and 4 cwts. crude potash-salts.	
6	61	,,	21,780	2	1	4	1	6	13·46	8	3	2	22	6	19	1	16	6·73	4 cwts. crude potash-salts.	
7	62	,,	21,780	2	1	4	1	6	16·21	9	17	0	13½	8	12	3	7½	8·10	4 cwts. common salt.	
8	63	,,	21,780	2	1	4	1	6	11·06	6	14	1	22½	5	10	0	16½	5·53	4 cwts. mineral superphosphate, and 4 cwts. common salt.	
1	64	March 29	21,780	4	2	8	2	13	12·31	7	9	2	16	5	1	0	3	3·07	No manure.	

2	65	,,	21,780	4	2	8	2	13	8·09	4	18	1	13½	2	9	3	0½	2·02	4 cwts. mineral superphosphate.	B.
3	66	,,	21,780	4	2	8	2	13	10.78	6	11	0	4½	4	2	1	19½	2·69	20 tons of rotten dung.	
4	67	,,	21,780	4	2	8	2	13	14·34	8	14	1	9	6	5	2	24	3·58	4 cwts. mineral superphosphate, and 4 cwts. crude potash-salts.	
6	68	,,	21,780	4	2	8	2	13	16·43	9	19	3	3½	7	11	0	18½	4·10	4 cwts. crude potash-salts.	
7	69	,,	21,780	4	2	8	2	13	11·03	6	14	0	8	4	5	1	23	2·75	4 cwts. common salt.	
8	70	,,	21,780	4	2	8	2	13	14·96	9	1	3	20	6	13	1	7	3·74	4 cwts. mineral superphosphate, and 4 cwts. common salt.	

C.—Turnip Ground 6 feet wide, rows 6 feet (Sets) long each, "Plot" 48 square feet.

1	71	March 4	21,780	4	2	8	2	13	20·25	12	6	0	13	9	17	2	0	5·06	No manure.	C.
	72	,,	21,780	6	3	12	3	19½	29·70	18	1	0	8	14	8	0	16½	4·95		
2	73	,,	21,780	4	2	8	2	13	26·95	16	7	2	17	13	19	0	4	6·73	4 cwts. mineral superphosphate.	
	74	,,	21,780	6	3	12	3	19½	26·41	16	1	0	7½	12	8	0	16	4·40		
3	75	,,	21,780	4	2	8	2	13	24·33	14	15	2	27½	12	7	0	14½	6·08	20 tons of rotten dung.	
	76	,,	21,780	6	3	12	3	19½	26·45	16	1	2	8	12	8	2	16½	4·40		
4	77	,,	21,780	4	2	8	2	13	22·91	13	18	2	3	11	9	3	18	5·72	4 cwts. mineral superphosphate, and 4 cwts. crude potash-salts.	
	78	,,	21,780	6	3	12	3	19½	29·04	17	12	3	25	14	0	0	5½	4·84		
5	79	,,	21,780	4	2	8	2	13	17·37	10	11	0	19½	8	2	2	6½	4·34	No manure.	
	80	,,	21,780	6	3	12	3	19½	27·25	16	11	0	22	12	18	1	2½	4·54		
6	81	,,	21,780	4	2	8	2	13	21·20	12	17	3	1½	9	19	0	16½	5·30	4 cwts. crude potash-salts.	
	82	,,	21,780	6	3	12	3	19½	25·70	15	12	1	23	11	19	2	3½	4·28		
7	83	,,	21,780	4	2	8	2	13	22·20	13	9	3	19	11	1	1	6	2·05	4 cwts. common salt.	
	84	,,	21,780	6	3	12	3	19½	23·62	14	7	0	15½	10	14	0	24	3·93		
8	85	,,	21,780	4	2	8	2	13	22·83	13	7	2	1½	11	8	3	16½	5·70	4 cwts. mineral superphosphate, and 4 cwts. common salt.	
	86	,,	21,780	6	3	12	3	19½	23·95	14	11	0	21	10	18	1	1½	3·99		

The average produce of the crops of 1867 were considerably less than those of the two preceding years, partly resulting from a late frost in the end of May having somewhat injured the tops just appearing above ground, and it is probable that the experiments may not be as reliable as under more favourable circumstances.

It will be observed that the produce of the individual experiments in the several twelve sets of trials vary considerably. With a view to ascertain their general bearing, the following comparisons are made, and the average result of the 12 trial plots of each of the seven experiments placed in their relative order of productiveness.

Two of the 12 trial plots were carried out with			8	oz. sets.
Three	,,	,,	6	,,
Four	,,	,,	4	,,
Three	,,	,,	2	,,

Average Produce per Acre.

		Tons	cwts.	qrs.	lbs.
12 Plots of	No. 4.—4 cwts. mineral superphosphate and 4 cwts. crude potash-salts	14	7	1	24½
,,	No. 1.—No manure	12	12	0	7½
,,	No. 6.—4 cwts. crude potash-salts	12	10	1	7½
,,	No. 7.—4 cwts. common salt	12	8	2	5½
,,	No. 2.—4 cwts. mineral superphosphate ..	12	2	1	8
,,	No. 3.—20 tons rotten dung	11	14	3	15½
,,	No. 8.—4 cwts. mineral superphosphate and 4 cwts. of common salt	11	9	2	0

It will be noticed that the unmanured plots produced a heavy crop of potatoes, which was only exceeded by the produce of the plots manured with mineral superphosphate and potash-salts.

It is worthy of remark that the produce of the ground enriched with 20 tons per acre of rotten dung falls somewhat short of that in which no manure was used. Furthermore, attention deserves to be directed to the slight variations in the average produce of all the plots except those manured with mixed mineral superphosphate and crude potash-salts.

The whole tenor of these experiments appears clearly to indicate that the trials were made in too rich a soil, and the details of these experiments, which are not altogether void of interest, are reported as a striking example, showing how much careful labour is thrown away in a great measure when manuring experiments are carried out on land in too high a condition of agricultural productiveness.

Potato Experiments made in 1868 *by Messrs. Coleman and Hull, Escrick Park, York.*

Early in 1868 I issued a circular, in which amongst other experiments I recommended the following :—

Field Experiments on Potatoes.

The following Experiments are specially recommended on light soils: —
Each Plot to be One-twentieth of an Acre.

Plot.				
1.	No manure.			
2.	Mineral superphosphate ..	22 lbs.,	or at the rate of	4 cwt. per acre.
	Crude potash-salts	11 lbs.	,,	2 ,,
	Sulphate of ammonia	11 lbs.	,,	2 ,,
3.	Good rotten dung	1 ton	,,	20 tons per acre.
4.	Mineral superphosphate ..	22 lbs.	,,	4 cwt. per acre.
	Crude potash-salts	22 lbs.	,,	4 ,,
5.	No manure.			
6.	Mineral superphosphate ..	22 lbs.	,,	4 ,,
	Crude potash-salts	11 lbs.	,,	2 ,,
	Nitrate of soda	11 lbs.	,,	2 ,,
7.	Peruvian guano	22 lbs.	,,	4 ,,
8.	Mineral superphosphate ..	22 lbs.	,,	4 ,,
	Common salt	22 lbs.	,,	4 ,,
9.	Good rotten dung	1 ton	,,	20 tons per acre.
10.	No manure.			

The Artificials should be first mixed with ashes, burnt clay, or dry earth, and then dug in, or ploughed in, quite early in spring, when the dung is put on the land, and when the potatoes are planted.

Messrs. Coleman and Hull kindly undertook to carry out the preceding experiments on Lord Wenlock's Menagerie Farm, at Escrick, near York.

The soil of the experimental field was a sandy loam in good agricultural condition.

A variety of Regent Potatoes, known as Snowballs, a fine round mealy white potato, was planted on the 20th of March, 1868.

Two drills were appropriated for each experimental plot of $\frac{1}{20}$ of an acre, and in each drill 460 sets were planted. The drills were 7 chains long, the sets 1 foot apart, and the distance between the drills 28 inches.

The drills were opened by a bouting plough in the usual manner, and the various manures then sown by hand and carefully spread, and the sets placed in the manure.

On the 15th of May the experimental plots presented the following appearance:—

Plot 1.—No manure. Sets regular and of a good colour.

Plot 2.—Mineral superphosphate, crude potash, and sulphate of ammonia. Very strong tops of a dark green colour.

Plot 3.—Rotten dung. Regular, but pale green.

Plot 4.—Mineral superphosphate and crude potash-salts. Sets irregular and tops pale green, apparently injured by the potash-salts.

Plot 5.—No manure. Sets regular, and colour the same as in Plot 1.

Plot 6.—Mineral superphosphate, erude potash-salts, and nitrate of soda. Sets irregular, but of a good colour.

Plot 7.—Peruvian guano. Sets regular, the tops were the strongest, and had a darker green colour than any of the other plots.

Plot. 8.—Mineral superphosphate and eommon salt. Sets irregular, weak tops, and general unpromising appearance.

Plot 9.—Rotten dung. Strong but pale green tops; sets regular.

Plot 10.—No manure. The same as Plot 1 and 5.

Judging from the appearance of the potatoes on the several plots, common salt, and to a minor but pereeptible extent erude potash-salts affected the sets injuriously at this early period. Subsequently the potatoes manured with superphosphate, erude potash, and sulphate of ammonia, and those planted with superphosphate, crude potash, and nitrate of soda, reeovered, and, as will be seen presently, produced good crops; whilst those manured with superphosphate and common salt throughout the experimental period looked weakly, and finally gave but a slight increase over the average yield of the unmanured plots.

Although the potatoes on Plot 7, dressed with Peruvian guano, at first looked very luxuriant and promising, the dry weather which set in subsequently sadly interfered with their progress. The guano plots evidently could not stand the injurious effeet of the dry weather.

On the other hand, the farmyard-manure plots were much less affected by the dry weather than any others. The produce of eaeh plot was carefully weighed, and the following results obtained:—

TABLE VII.—Showing the amount of Clean Potatoes from each Experimental Plot of $\frac{1}{20}$th of an Acre, and Weight calculated per Acre.

Plots.	Manures used per Acre.		Weight in Stones and lbs. per Plot.		Weight per Acre.			
			Stones	lbs.	Tons	cwts.	qrs.	lbs.
1	No Manure		27	1	3	7	2	20
2	Mineral Superphosphate .. Crude Potash-salts .. .. Sulphate of Ammonia ..	4 cwts. 2 ,, 2 ,,	65	7	8	3	3	0
3	Good Rotten Dung	20 tons.	60	10	7	11	3	4
4	Mineral Superphosphate .. Crude Potash-salts	4 cwts. 4 ,,	58	0	7	5	0	0
5	No Manure		22	11	2	16	3	24
6	Mineral Superphosphate .. Crude Potash-salts .. .. Nitrate of Soda	4 cwts. 2 ,, 2 ,,	58	12	7	7	0	16
7	Peruvian Guano	4 cwts.	36	0	4	10	0	0
8	Mineral Superphosphate .. Common Salt	4 ,, 4 ,,	30	0	3	15	0	0
9	Good Rotten Dung	20 tons.	72	0	9	0	0	0
10	No Manure		28	12	3	12	0	16

The produce on the 3 unmanured plots, it will be seen, varied to some extent, though not more than may be expected in a dry season.

On an average the crop on the unmanured plots weighed per acre, 3 tons 5 cwts. 2 qrs. and 11 lbs.

The small crop per acre shows that the land naturally was not too rich, and therefore well adapted for experimental purposes.

In the next table the increase on each plot over the average produce of clean potatoes from the unmanured plots is given.

TABLE VIII.—Showing the Increase per Acre on each Experimental Plot over the Average Produce from the Unmanured Land.

Plots.	Name of Manure.	Increase per Acre.			
		Tons	cwts.	qrs.	lbs.
2	Mineral Superphosphate .. .. Crude Potash-salts .. .. and Sulphate of Ammonia	4	18	0	17
3	Rotten Dung	4	6	0	21
4	Mineral Superphosphate .. .. and Crude Potash-salts	3	19	1	17
6	Mineral Superphosphate .. .. Crude Potash-salts .. .. and Nitrate of Soda	4	1	2	5
7	Peruvian Guano	1	4	1	17
8	Mineral Superphosphate .. .. and Common Salt	0	9	1	17
9	Rotten Dung	5	14	1	17

Average produce per acre of Plots 1, 5, 10 .. 3 tons 5 cwts. 2 qrs. 11 lbs.

A glance at the preceding tabular statement of results, amongst other particulars, shows:—

1. That the mixture of 4 cwts. of mineral superphosphate, 2 cwts. of crude potash-salts, and 2 cwts. of sulphate of ammonia is an excellent manure for potatoes on light soils.

This mixture yielded an increase of nearly 5 tons over the average yield of the unmanured land, and as the average produce of the two plots, manured with rotten dung at the rate of 20 tons to the acre, amounts to 5 tons 1 qr. and 5 lbs. calculated per acre, the artificial manure employed on Plot 2 had as great an effect on the potato-crop as a full dressing of rotten dung.

2. That the omission of sulphate of ammonia from the mixture used on Plot 1 caused a diminution in the increase of nearly 1 ton per acre.

3. That the addition of nitrate of soda to superphosphate and potash-salts did not answer quite so well as the addition of an

equal weight of sulphate of ammonia. The increase, however, both on Plot 4 and Plot 6 is considerable.

4. That Peruvian guano, used on light land at the rate of 4 cwts. per acre, in the dry season of 1867, did not produce as large an increase as in all probability it would have yielded in a more propitious season. Peruvian guano, it will be seen, gave an increase of only 1 ton 4 cwts. 1 qr. and 17 lbs., whilst the artificial manure, composed of superphosphate, potash-salts, and sulphate of ammonia, yielded an increase of 4 tons, 18 cwts., and 17 lbs., and produced 3 tons 14 cwts. and 3 qrs. more than Peruvian guano.

5. That 4 cwts. of common salt added to 4 cwts. of superphosphate per acre, was more than was good for the potato crop in a dry season. Practically speaking, the crop on Plot 8, manured with superphosphate and common salt, was the same as that of the unmanured land, for the apparent increase on Plot 8, amounting to only 9 cwts. 1 qr. and 17 lbs., falls within the range of the variations in the produce of the three unmanured Plots Nos. 1, 5, and 10.

Had 4 cwts. of superphosphate been applied alone, no doubt a better crop would have been produced than was obtained on Plot 8, where the addition of salt to superphosphate evidently did not exercise a beneficial effect upon the crop, but rather the reverse.

6. That on all plots on which potash-salts were used the increase in the crops was considerable, and that, therefore, potash-salts are useful and very desirable constituents in a potato-manure, especially if it is intended to be applied to light land.

Potato Experiments made in 1868 *by Mr. Charles Hunter, at Blennerhasset near Carlisle.*

A series of potato experiments, similar to the preceding, was carried out in 1868 by Mr. Charles Hunter, who conducts the laboratory and field-experiments on Mr. W. Lawson's farm at Blennerhasset, near Carlisle.

The potatoes, a variety of Regents known as Rough Whites, were planted rather late in the season, namely on the 4th of May, 1868, and the sets placed 8 inches apart in drills 30 inches wide. Each experimental plot comprised 4 stetches 36 yards long, equalling $\frac{1}{40}$ of an acre.

The manures, mixed with screened earth, were sown broadcast before planting the potatoes.

The soil of the experimental field was a friable deep sandy loam, and well suited for potatoes and root crops in general.

The crop was taken up on the 5th and 6th of October, sorted, and each lot carefully weighed by Mr. Hunter, who favoured me with the tabular statement of results (Table X., p. 408), showing the kind and amount of manure which was employed on each of the manured experimental plots, and giving the produce of the ten plots in small, seed, and large potatoes.

The small potatoes were only fit for pigs, and the others sound and of good quality.

The results of these experiments are in strict accordance with those obtained by Messrs. Coleman & Hull, at Escrick, near York, with the exception of the produce of the unmanured plots, which was higher at the farm at Blennerhasset than in the Escrick experiments.

The average produce of the three unmanured plots, calculated per acre, amounts to 5 tons 15 cwts., and the dung on an average produced 9 tons 1 cwt. and 2 lbs., or an increase of 3 tons, 6 cwts., and 2 lbs. over the unmanured plots.

Taking the average produce of the three unmanured plots as a basis for calculation, we obtain the following increase per acre in each experiment as due to the manures employed :—

Table IX.—Showing the Increase in Potatoes on each Manured Plot, calculated to the Acre.

Plots.	Manure employed.	Increase per Acre over Unmanured Produce. Tons	cwts.	qrs.	lbs.
2	Mineral Superphosphate .. .. Muriate of Potash .. .. and Sulphate of Ammonia	3	7	0	16
3	Rotten Dung	3	8	0	24
4	Mineral Superphosphate .. .. and Muriate of Potash	1	11	3	4
6	Mineral Superphosphate .. .. Muriate of Potash .. .. and Nitrate of Soda	1	16	0	8
7	Peruvian Guano	1	12	3	12
8	Mineral Superphosphate .. .. and Common Salt	0 (Decrease)	1	1	20
9	Rotten Dung	2	7	3	8

Here, as in the preceding trials at Escrick Park, the artificial manure, composed of 4 cwts. of mineral superphosphate, 2 cwts. of muriate of potash, and 2 cwts. of sulphate of ammonia per acre, gave fully as good a return as 20 tons of good rotten dung.

Superphosphate and muriate of potash, without sulphate of ammonia, produced much less, and the replacement of the

TABLE X.—Showing the Manures employed in Potato Experiments, made in 1867, at Blennerhasset, by Mr. Charles Hunter, and Produce calculated per Acre.

Plots.	MANURE PER ACRE.		PRODUCE PER ACRE. Small (Pig) Potatoes per Acre.				Seed Potatoes per Acre.				Large Potatoes per Acre.				Total Produce per Acre.			
			Tons	cwts.	qrs.	lbs.	Tons	cwts.	qrs.	lbs.	Tons	cwts.	qrs.	lbs.	Tons	cwts.	qrs.	lbs.
1	No Manure		0	13	2	8	1	18	0	24	3	12	3	12	6	4	2	16
2	Mineral Superphosphate .. .. .. Muriate of Potash .. .. and Sulphate of Ammonia	4 cwts. 2 ,, 2 ,,	1	5	0	0	2	15	1	12	5	1	3	4	9	2	0	16
3	Rotten Dung	20 tons.	1	5	0	0	3	2	3	12	4	15	0	12	9	3	0	24
4	Mineral Superphosphate .. .. .. and Muriate of Potash	4 cwts. 4 ,,	1	0	1	12	2	8	2	8	3	17	3	12	7	6	3	4
5	No Manure		0	12	0	16	1	18	0	24	3	3	0	24	5	13	2	8
6	Mineral Superphosphate .. .. .. Muriate of Potash .. .. and Nitrate of Soda	4 cwts. 2 ,, 2 ,,	1	3	2	8	2	10	1	12	3	17	0	16	7	11	0	8
7	Peruvian Guano	4 cwts.	0	18	3	20	2	11	3	4	2	17	0	16	6	7	3	12
8	Mineral Superphosphate .. .. .. and Common Salt	4 cwts. 4 ,,	0	15	2	24	2	0	0	0	2	17	3	12	5	13	2	8
9	Rotten Dung	20 tons.	0	18	0	24	2	11	1	20	4	13	0	20	8	2	3	8
10	No Manure..		0	11	1	20	1	10	0	0	3	5	1	12	5	6	3	4

sulphate of ammonia in the mixture used upon Plot 2 by nitrate of soda, as before, had a much less favourable effect upon the potato crop than the artificial manure employed on Plot 2.

Again, it is shown in these experiments, that in a dry season Peruvian guano in a great measure remains inactive in the soil, and does not produce so large an increase in the potato crop as it is known to yield in a season in which copious and repeated rains dissolve and distribute the guano more perfectly in the soil to which it is applied.

Relying on the experience gained at Escrick and Blennerhasset, it appears to be hazardous to apply in a dry season as much as 4 cwts. of common salt to the potato crop.

Plot 8, upon which superphosphate and salt were employed, actually gave a slight decrease in comparison with the average produce of the unmanured plots, and thus the salt appears to have affected the potato plants injuriously. Speaking in general terms, the Blennerhasset experiments furnish corroborating evidence that a good potato manure for light land ought to be composed mainly of a mixture of available phosphates with a fair proportion of sulphate of ammonia and salts of potash.

Potato Experiments in 1869.

The same manures which were employed in the preceding experiments were again tried in 1869, in two series of experiments. One series was carried out on a stiffish clay loam in the County of Durham, by my former pupil, Mr. G. Y. Wall, jun., and the other on light land, by Messrs. Coleman & Hull, of Escrick Park. The best thanks of the agricultural public are due to these gentlemen for the interest they showed at all times in my experimental enquiries, and the care and trouble which they took with these field trials.

Potato Experiments made in 1869 *by Mr. G. Y. Wall, jun., Exchequer Offices, Durham, at The Lizards, near Sedgfield, Ferryhill, in the County of Durham.*

The land on which the experiments were made is situated on the Carboniferous formation, and the soil of the experimental field was a rather stiffish clay loam.

Before planting out the potatoes, the manures, mixed with screened earth, were sown broadcast, and the ground planted, on the 13th of April, 1869, with Regents in whole sets, 78 lbs. of potato sets being appropriated to each experimental plot of $\frac{1}{20}$ of an acre.

The crop was harvested on the 8th of November, 1869, wet weather having prevented its being done earlier. The potatoes were sorted and weighed in three lots, and each lot carefully

Table XI.—Showing the Manures employed, and the Produce per Acre in Potatoes, obtained by Mr. G. Y. Wall in 1869. Experiments tried at the Lizards, near Sedgfield, Ferryhill, County of Durham.

Plots.	Description of Manure.	Quantity per Acre.	Produce per Acre.											
			Large Potatoes.			Seed Potatoes.			Small (Pig) Potatoes.			Total.		
			Tons	cwts.	lbs.	Tons	cwts.	lbs.	Tons	cwts.	lbs.	Tons	cwts.	lbs.
1	No Manure	cwts. ..	4	19	100	0	12	71	0	19	4	6	7	4
2	Mineral Superphosphate .. .. .. Crude Potash-salts .. .. and Sulphate of Ammonia	4 2 2	5	19	68	1	1	93	1	2	10	8	3	59
3	Good Rotten Dung	tons. 20	7	1	32	1	5	96	1	2	6	9	9	22
4	Mineral Superphosphate .. .. .. and Crude Potash-salts	cwts. 4 4	6	3	71	0	19	0	0	18	33	8	0	104
5	No Manure	..	4	19	67	0	18	14	1	0	100	6	18	69
6	Mineral Superphosphate .. .. .. Crude Potash-salts .. .. and Nitrate of Soda	4 2 2	6	10	75	0	19	62	0	18	84	8	8	109
7	Peruvian Guano	4	5	12	93	1	0	10	1	2	29	7	15	20
8	Mineral Superphosphate .. .. .. and Common Salt	4 4	4	8	104	0	16	65	0	18	82	6	4	27
9	Good Rotten Dung	tons. 20	7	8	32	1	7	46	1	9	54	10	5	20
10	No Manure	..	4	14	39	0	14	86	0	18	100	6	8	1

weighed. There were no diseased potatoes in the produce of the different plots, and the few frosted potatoes found in the various lots were weighed with the pig-potatoes.

The preceding tabular statement (Table XI.) embodies the details of Mr. Wall's potato experiments.

It will be noticed that three plots were left unmanured—1 at each end of the 10 experimental plots, and the third occupying a more central position.

The crop on the three unmanured plots differed but little in weight, showing that the field on which the experiments were tried was uniform in character and productive powers. The average produce of the three unmanured plots, calculated per acre, amounts to 6 tons 11 cwts. and 44 lbs.

The unmanured crop thus weighed more in "the Lizards" potato experiments than the natural produce of any of the preceding field-trials.

6½ tons to the acre is not a bad crop of potatoes. The land appears to have been in a better agricultural condition than the soils on which the preceding experiments were tried; and this, no doubt, was the reason that on the clay-loam the various manures produced comparatively much less increase than they did on the light sandy soils of the preceding experimental fields.

The following table shows the increase and decrease of the produce of each plot over the average yield of the unmanured plots, and the increase or decrease percentage of each plot :—

TABLE XII.—Showing the Increase and Decrease of the Produce of each Manured Plot over the average yield of the Unmanured Plots, calculated per Acre, and Increase or Decrease per Cent.

Plots.	Name of Manure.	Increase.			Decrease.		Increase.	Decrease.
		Tons	cwts.	lbs.	cwts.	lbs.	Per Cent.	Per Cent.
2	Mineral Superphosphate .. Crude Potash-salts .. .. and Sulphate of Ammonia ..	1	12	15	..		24·45	..
3	Rotten Dung	2	17	90	..		44·12	..
4	Mineral Superphosphate .. and Crude Potash-salts	1	9	60	..		22·47	..
6	Mineral Superphosphate .. Crude Potash-salts .. .. and Nitrate of Soda	1	17	65	..		28·60	..
7	Peruvian Guano	1	3	88	..		18·10	..
8	Mineral Superphosphate .. and Common Salt		..		7	17	..	5·44
9	Rotten Dung	3	13	88	..		56·15	..

On comparing the effects which the different manures produced on the stiffer clay-loam with those which the same manures exhibited on the lighter sandy soils in the preceding experiments, several striking differences will at once be noticed.

1. On the light sandy soils the mixture of mineral superphosphate with potash-salts and sulphate of ammonia had a much more beneficial effect upon the potato crop than on the stiffer clay-loam. On the former this mixture was equal in its results to the application of a heavy dressing of rotten dung, whilst on the latter dung on an average produced more than double the increase which was obtained on plot 2, on which the artificial manure, composed of superphosphate, potash-salts, and sulphate of ammonia, was used.

2. Nitrogenous or ammoniacal constituents appear to be far less useful in a potato manure intended for stiffish soils containing a fair proportion of clay than in fertilisers intended to be applied to potatoes on light sandy soils.

Neither the addition of sulphate of ammonia, nor that of nitrate of soda, to superphosphate and potash-salts, materially augmented the increase which was obtained on the clay-loam by superphosphate and potash-salts on plot 4.

Practically speaking the yield of potatoes was as large on plot 4 without sulphate of ammonia as on plot 2 manured with the same compound, and the addition of 2 cwts. of sulphate of ammonia.

3. Farmyard manure, it will be noticed, gave by far the best result, which no doubt was due — at least in part — to the mechanical effect which dung is well known to exert on retentive soils.

4. Common salt had a more decidedly prejudicial effect on the clay-loam than on the lighter soils.

5. On the whole we learn from the preceding field-trials that compound artificial manures tell far more favourably on potatoes when grown on light soils than upon heavier land, into the composition of which clay enters more largely than is the case with sandy soils.

In future experiments upon clay soils it is very desirable to try the efficacy upon potatoes of a purely mineral superphosphate by itself, as well as in conjunction with potash-salts, and also that of potash-salts alone.

Potato Experiments made in 1869 *by Messrs. Coleman and Hull at Escrick Park Home Farm, near York.*

In conclusion I have the pleasure of reporting on some extremely interesting and successful experiments on potatoes which my friends Messrs. Coleman and Hull undertook for me in 1869.

They were tried on light land, which, however, was in a good agricultural condition.

Each plot, measuring $\frac{1}{20}$ of an acre, was planted with Victoria potatoes on the 19th of April, 1869, and the crop harvested on the 15th of October and weighed on the same day, when the following results were obtained :—

TABLE XIII.—Showing the kind and quantity of Manure used in Potato Experiments, made in 1869, at Escrick Park Home-farm, near York, by Messrs. COLEMAN and HULL, and Produce of each Experimental Plot, and Produce calculated to the Acre.

Plots.	Description of Manure.	Quantity of Manure per Acre.	Produce of each Plot of $\frac{1}{20}$.		Produce per Acre.		
		cwts.	Stones	lbs.	Tons	cwts.	lbs.
1	Mineral Superphosphate .. .. Crude Potash-salts .. .. .. Sulphate of Ammonia	4 2 2	98	2	12	5	40
2	Rotten Dung	tons. 20	90	2	11	5	40
3	Mineral Superphosphate .. .. Potash Salts	cwts. 4 4	67	9	8	9	12
4	No Manure	..	54	4	6	15	80
5	Mineral Superphosphate .. .. Potash-salts .. .. Nitrate of Soda	4 2 2	86	0	10	15	0
6	Peruvian Guano	4	75	12	9	9	72
	Mineral Superphosphate .. .. Common Salt	4 4	58	10	7	6	88
	Rotten Dung	tons. 20	89	0	11	2	56
9	No Manure	..	51	0	6	7	56

The two unmanured plots yielded on an average 6 tons 11 cwts. and 68 lbs. per acre ; and the two plots to which rotten dung was applied on an average 11 tons 3 cwts. and 104 lbs.

On the 14th of July the potato field presented the following appearance :—

1. Strong luxuriant plants ; colour of tops dark green ; to all appearance the best of the experimental plots.

2. Good healthy plants ; colour of tops good ; nearly equal to Plot 1.

3. Weak tops, of a pale sickly colour.

4. Nearly equal to Plot 3, but tops a better colour.

5. Strong healthy plants ; dark green tops ; nearly equal to plot 1.

6. Strong healthy-looking plants ; colour of tops darker green than on any of the other plots.

7. Very small weak tops, and of a pale yellow colour; apparently the poorest plot of all.

8. Good strong healthy plants, and very regular in the rows.

9. Plants very regular, and appearance about the same as Plot 4.

A casual observer could readily distinguish the plots upon which nitrogenous manures had been used from the others, by the dark green colour which the potato-tops on these plots presented. On the other hand, he would at once recognise the parts of the field to which potash-salts, and especially common salt, had been applied, by the pale green colour of the tops.

The plots manured with potash-salts did not look very promising at first, but they subsequently recovered and yielded a good increase, although the tops throughout the whole period of growth were paler in colour than on the unmanured portions of the field. On the plot which had received 4 cwts. of salt, in addition to 4 cwts. of superphosphate, the potatoes made no way, looked pale and sickly, and yielded only an inconsiderable increase over the unmanured plots.

For the sake of better comparison the increase of each plot over the average yield of the unmanured portions of the field has been calculated in the following tabular statement:—

Table XIV.—Showing the Increase of each Manured Plot per Acre over the average yield of the Unmanured portions of the Potato-field at Escrick Park Home-farm, 1869.

Plots.	Name of Manure.	Increase of Produce per Acre.		
		Tons	cwts.	lbs.
1	Mineral Superphosphate .. .. Crude Potash-salts .. .. and Sulphate of Ammonia..	5	13	84
2	Rotten Dung	4	13	84
3	Mineral Superphosphate .. .. and Potash-salts	1	17	54
5	Mineral Superphosphate .. .. Potash-salts .. .. and Nitrate of Soda	4	3	44
6	Peruvian Guano	2	18	4
7	Mineral Superphosphate .. .. and Common Salt	0	15	20
8	Rotten Dung	4	10	100

Average produce of unmanured plots, 6 tons 11 cwts. 68 lbs.

A glance at the preceding table shows:—

1. That the greatest increase was obtained by applying to the

potato crop per acre a manure composed of 4 cwts. of mineral superphosphate, 2 cwts. of potash-salts and 2 cwts. of sulphate of ammonia.

This application produced the large crop of 12 tons 5 cwts. and 40 lbs. per acre, and gave an increase of over 5½ tons of potatoes over the yield of the unmanured plots.

2. That next to the compound artificial manure used on Plot 1 dung had the most beneficial effect upon the potato crop.

3. That mineral superphosphate and potash-salts, without sulphate of ammonia, yielded much less increase than the same mixture with sulphate of ammonia.

4. That the addition of nitrate of soda to superphosphate and potash-salts had a less beneficial effect than the addition of sulphate of ammonia to the same fertilising agents.

5. That a compound artificial manure, suited to the requirements of the crop intended to be raised, and to the character of the soil to which it is to be applied, frequently has a better effect than Peruvian guano.

6. That common salt, applied to potatoes in considerable quantities, rather injures than benefits the crop.

A general review of all the recorded experiments on the potato crop, if I am not mistaken, warrants the conclusion that on light land excellent crops of potatoes may be grown at a comparatively small expense by means of artificial manures, consisting of superphosphate, potash-salts, and sulphate of ammonia, and that on heavy land, in a good agricultural condition, sulphate of ammonia may be omitted from a potato manure, either altogether or in part, and that on such land a small quantity of nitrate of soda, added to superphosphate, generally has a better effect than sulphate of ammonia.

Laboratory, 11, *Salisbury Square, Fleet Street, E.C.*
July, 1870.

XXII.—*On the Composition and Practical Value of Several Samples of Native Guano prepared by the A B C Sewage Process of the Native Guano Company.* By Dr Augustus Voelcker, F.R.S.

Of the various plans which have of late been recommended for the purpose of effecting the purification of town sewage, and of extracting from it a dry and portable manure of sufficient fertilizing value to pay the manufacturing expenses, and by the sale of the manure to realise an income leaving a margin for profit, none has attracted so much public attention as the process which for some time past has been carried out at Leamington, and quite recently at Hastings, by the Native Guano Company.

This Company has adopted Sillar's Patent A B C process in the treatment of town sewage, and professes to extract from it a valuable dry artificial manure, and at the same time to render sewage bright and clear as water, and to remove the impurities from it so efficiently that the clarified sewage, after treatment by the A B C process, may be discharged into a river or water-course without causing any nuisance in the immediate neighbourhood or locality through which the effluent and purified sewage flows. Messrs. W. C. and R. G. Sillar and W. G. Wagner, in the specification of their patent, describe the A B C process as follows:—

"We add to the sewage to be purified a mixture consisting of the following ingredients—alum, blood, clay, magnesia or one of its compounds, by preference the carbonate or the sulphate, manganate of potash, or other compound of manganese, burnt clay, otherwise known as ballast, chloride of sodium, animal charcoal, vegetable charcoal, and magnesian limestone. Of these substances the manganese compounds, the burnt clay, chloride of sodium, and magnesian limestone may be omitted, and it is not essential that both animal and vegetable charcoal should be used. If any of the ingredients named should from any cause be present in sufficient quantity in the sewage, it may, of course, be omitted from the mixture. The proportions in which the ingredients are to be used vary according to the nature of the sewage to be purified, as, for instance, if a large proportion of urine is present, we increase the proportion of clay; if the sewage is much diluted, we slightly increase the proportion of alum and blood; if it contains a large proportion of street refuse we decrease the proportion of clay.

"For ordinary sewage the following preparations have answered well:—

Alum	600	parts.
Blood	1	,,
Clay	1·900	,,
Magnesia	5	,,
Manganate of potash	10	,,
Burnt clay	25	,,
Chloride of sodium	10	,,
Animal charcoal	15	,,
Vegetable charcoal	20	,,
Magnesian limestone	2	,,

"These substances are mixed together and added to the sewage to be purified, until a further addition produces no further precipitate. The quantity required will be about 4 pounds of the mixture for 1000 gallons of sewage. The sewage must then be thoroughly mixed with the compound and allowed to flow into the settling tanks. The greater part of the organic and other impurities will be immediately separated in the form of large flakes, which rapidly fall to the bottom, leaving the supernatant water clear and inodorous, or nearly so. The matter may then be allowed to accumulate at the bottom of the tank. In some cases it is preferable to add the compound of manganese to the water after the sediment produced by the other ingredients has been allowed to subside. The sediment will be found to possess the power of precipitating a further quantity of sewage; it must therefore be pumped or otherwise taken from the tank and mixed with fresh sewage, the sediment being allowed to subside in the same way as before. The sediment may be used 5 or 6 times in this way. When the sediment no longer possesses the power of precipitating the impurities of sewage, it must be removed from the tank and allowed to dry; when partially dry a small quantity of acid, by preference sulphuric acid, may be mixed with it, which will retain all the ammonia in a soluble form. When dried, the sediment will be a valuable manure."

It will be noticed that besides alum (A), blood (B), and clay (C)—ingredients suggestive of the name of the A B C process—a large number of other substances are included in the preceding list of chemical agents, which may be employed in the treatment of sewage by the process. The use of alum for the purpose of clarifying foul water has been known from time immemorial, and found efficacious in precipitating more or less perfectly the nitrogenous or albumenoid compounds which are present in sewage and similar refuse liquids. Town sewage has always an alkaline reaction, and yields with a weak solution of alum an abundant flocculent precipitate. There is therefore no need to introduce into sewage nitrogenous or albuminous matters in the the shape of blood, with a view of causing a flaky precipitate, which, like coagulated white of eggs, will carry down with it suspended impurities, and thereby effect the clarification of the muddy liquid. The patentees, therefore, are wise in giving only the faintest sprinkling of blood to their precipitating mixture. If they omitted the blood altogether, the manure which they abstract from sewage, other conditions being equal, practically would be neither the worse nor the better for this omission, nor would the purification of the effluent sewage be less complete. Why 10 parts of chloride of sodium should be mentioned as one of the ingredients in the preceding mixture is difficult to comprehend, for, being a very soluble salt it will, of course, pass off with the effluent water, and in the proportion in which it is employed in the purifying mixture the salt cannot possibly act beneficially upon sewage in virtue of its antiseptic properties.

It is, however, not my purpose in the present communication to make any further remarks on the merits or demerits of the chemical agents recommended by the patentees of the A B C process, nor do I intend to discuss at length how far this process fulfils the high expectations of its originators, and meets the sanitary difficulties which have to be overcome in the disposal of town sewage. Ample information, referring specially to the sanitary aspect of the great sewage question, will be found in the able reports for 1870 of the Rivers Pollution Commission (1868). Suffice it to state here that the Commission, on the strength of numerous experiments, have come to the conclusion that the A B C process fails in purifying sewage to such an extent as to render it admissible into running water.

As far as my own experience entitles me to express an opinion of the efficacy of the A B C process for purifying sewage, I would observe that I agree in the main with, but do not fully concur in, the view of the Rivers Pollution Commissioners. Sewage clarified by the A B C process, or by the plan recommended by Mr. Leek, or Dr. Anderson of Coventry (who both rely mainly on the efficacy of sulphate of alumina as a precipitating and disinfectant agent), or purified by any other equally efficacious process, I am of opinion cannot be rendered sufficiently pure to be admissible into running water when the sewage of a large town and populous district has to be disposed of, and the available running water, comparatively speaking, is too inconsiderable in proportion to the sewage which is poured into it, clear though it may be. But if the sewage of a small town has to be disposed of, and suitable land for irrigation cannot be procured, or only at an immoderate sacrifice of money; and, on the other hand, a good sized river or abundance of running water is near, into which the effluent and clarified sewage may be run, I believe the discharge of such sewage under these circumstances would not create a nuisance.

It is quite true that sewage, however well purified it may be by any known process of precipitation, always contains a good deal of saline mineral matter and obnoxious organic matter in solution, and for these reasons ought not to be poured in large quantities into a shallow watercourse; but if the disinfected and clear sewage of a small town be poured into a large bulk of running water, it will not materially augment the saline and earthy matters naturally present in the water, and the small amount of organic impurities, when brought into contact with the dissolved air of a large bulk of running water, will rapidly become oxydised, and rendered perfectly inodorous and harmless.

The examination of sewage purified by the A B C and other precipitating processes has shown me that, with the exercise of a moderate amount of care, the whole of the suspended matter may be removed, and the most filthy looking and disagreable smelling sewage be rendered clear as water, and so far deodorized as to possess but a faint sewage smell. Left in contact with air for a short period, the faint sewage smell of the clarified sewage entirely disappears, nor does it return, however long the liquid may be kept. But if the purified sewage is placed in a stoppered bottle, the original foul smell of raw sewage soon returns, showing that clarified sewage contains soluble organic matters which enter into putrefaction unless they are brought into contact with atmospheric oxygen, and thereby converted into inodorous and harmless soluble compounds.

Whilst it appears to me decidedly objectionable to pour large quantities of even the most perfectly purified sewage into a watercourse running very sluggishly, and containing but little water, and consequently an insufficient supply of air to effect the oxydation of the soluble organic impurities present in such sewage, no fear need, I think, be entertained that the discharge of the moderate amount of clarified sewage of a small town into a large bulk of quick running water will poison the water, or create the least nuisance.

It is well, however, to bear in mind that neither the A B C process, nor any other known precipitating plan, removes in any appreciable degree the ammoniacal salts and other soluble saline compounds upon which the fertilising value of sewage mainly depends, and that, speaking generally, only one-eighth of the fertilising value of sewage resides in the suspended impurities which are removed by precipitation, and seven-eighths of its value is due to the matters held in solution.

All who are practically acquainted with sewage irrigation are fully aware of the obstacles which the suspended matter in raw sewage interposes to successful irrigation. Clarification by any good precipitating plan, whilst it only removes a small portion of fertilising matter from sewage, greatly improves its suitability for irrigating purposes. Experienced sewage farmers, I believe, will bear me out in maintaining that sewage perfectly clarified has a greater practical value than it has in a raw state with all the suspended filth in it.

Although sewage purified by the A B C process, or any other equally efficacious or better plan, under some conditions, may be poured into running water without risk of creating a nuisance or spoiling the water for the purposes for which it is adapted, it appears to me a great pity to waste this liquid, which is more valuable, because better adapted for irrigation purposes, than raw sewage. Wherever practicable, therefore, clarified and disinfected sewage should not be wasted, but employed for irrigating our fields.

The matters held in suspension in sewage, as stated already, have comparatively but little value. Still, taking into consideration the enormous quantities of sewage, at present for the greater part wasted in this country, and the fact that purified sewage is better adapted for irrigation than it is in a raw state, it might be worth while to precipitate the suspended matter if it could be obtained at a moderate expense in a sufficiently concentrated and dry form.

Works for the extraction of manure, and the defœcation of sewage, have been established at Leamington and Hastings by the proprietors of the patent A B C process. The native guano prepared by the A B C sewage process of the Native Guano Company, Limited, professes to be a valuable fertiliser which, having commanded a ready sale at 3*l.* 10*s.*, is now offered at 5*l.* per ton, delivered at any railway station in England or Wales.

In the preparation of this manure, the sewage deposit, in a semi-solid state, is pumped into centrifugal drying machines, in which it loses about 50 per cent. of water. The comparatively dry mud is then taken out of the revolving cages, spread out in thin layers and exposed to the air and sun until it becomes sufficiently dry and powdery to be bagged and sent out.

In the printed circular issued by the Native Guano Company, on which the price of the manure is quoted at 5*l.* per ton, the subjoined statement occurs:—

"The following analysis of the manure as sold to the farmers gives an idea of its composition—

Water	14·1
*Organic matter	22·4
Phosphate of lime	9·6
Earthy and alkaline salts	11·2
Silicates	42·7
	100·00
*Nitrogen = ammonia	4·2"

In the second report of the Commissioners appointed in 1868 to inquire into the best means of preventing the pollution of rivers, Dr. Frankland gives the following analysis of the precipitated mud which, under the guidance of the Messrs. Sillar, the patentees of the A B C process, was extracted by the Commissioners from one of the subsidence tanks at Leamington on the 10th of last May.

This mud, acidified with dilute sulphuric acid to prevent loss of ammonia, and dried in the air, contained the following ingredients:—

*Organic matter	34·27
Ammonia	·16
†Phosphoric acid	1·98
Clay and other useless mineral matters	56·13
Water	7·46
	100·00
*Containing nitrogen	1·55
Equal to ammonia	1·88
†Equal to tribasic phosphate of lime (bone-phosphate .. ..)	4·32

Adding the small amount of ready formed ammonia (·16) to the ammonia which will be finally yielded by the nitrogenous matter of this sewage manure we obtain 2·04 per cent., or just about one-half of the amount of ammonia which the Native Guano, as sold to the farmers, is represented to contain in the analysis printed in the Company's circular. Dr. Frankland found an amount of phosphoric acid in the dried Leamington sewage mud which is equal to 4·32 per cent. of phosphate of lime.

The printed analysis of the Native Guano Company represents the manure as sold to the farmer to contain 9·6, or more than twice as much phosphate of lime as found by Dr. Frankland in the dried Leamington sewage mud.

The differences in the composition of the two analyses just quoted are too great to be ascribed to mere accidental circumstances. Sewage deposits, as shown by the Leamington manure in a dried state, unless fortified by guano, sulphate of ammonia, dry blood, or other substances rich in nitrogen, rarely yield more than $1\frac{3}{4}$ to 2 per cent. of ammonia on decomposition. Presuming the analysis which is put forward by the Native Guano Company to be correct, it would appear that before the dried sewage mud obtained from the subsidence tank at Leamington is sold to the farmers it is fortified by some kind of nitrogenous or ammoniacal compound or the other. Considering that the native guano is sold at 5*l.* per ton the managers of the Native Guano Company can well afford to give to their customers a little more fertilising matter than they are likely to get in the genuine or unmixed dried sewage mud which is obtained by the A B C process.

During the last few months five different samples of native guano have been sent to me by as many different parties, who, before buying any more of the Leamington A B C Manure, wished to have an opinion of its value.

Having had a good opportunity of becoming acquainted with the composition and value of some of the manure which actually found its way into the hands of the consumers, I deem it my duty, in the interest of the agricultural public, to lay these analyses before the readers of the 'Journal of the Royal Agricultural Society.'

The analytical results are embodied in the subjoined Table:—

COMPOSITION of Five Samples of Native Guano, prepared by the A B C Sewage process of the Native Guano Company.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Water	7·91	6·12	12·14	8·84	6·30
*Organic matter	19·40	22·45	9·04	12·63	14·55
Tribasic phosphate of lime (bone-earth)	2·40	2·81	2·57	4·27	2·48
Carbonate and a little sulphate of lime	20·93	6·37	4·71	4·91	3·53
Magnesia and alkaline salts ..	2·92	3·56	3·32	4·06	5·59
Oxide of iron and alumina ..	9·78	6·59	7·80	9·01	7·30
Insoluble siliceous matter (clay and sand	37·66	52·10	60·42	56·28	60·25
	100·00	100·00	100·00	100·00	100·00
*Containing nitrogen	·96	1·92	·60	·70	·67
Equal to ammonia	1·16	2·33	·73	·85	·81

A comparison of the preceding analyses with each other, and with the published analysis of the Native Guano Company, shows:—

1. That the native guano prepared by the A B C process has a very variable composition.

2. That especially the proportion of nitrogen varies greatly in different samples. The first sample analysed by me, in round numbers, contained 1 per cent. of nitrogen, the second 2 per cent., and the third, fourth, and fifth from $\frac{6}{10}$ to $\frac{7}{10}$ of 1 per cent.

3. That three out of the five samples contained, in round numbers, $2\frac{1}{2}$ per cent. of phosphate of lime, one not quite 3 per cent., and the fifth a little over $4\frac{1}{2}$ per cent.

4. That the proportions of useless insoluble siliceous matter (clay and sand, chiefly the latter) in the five samples analysed by me varied from $37\frac{1}{2}$ per cent. to $60\frac{1}{2}$ per cent.

5. That the analysis published in the Company's circular represents the manure as sold to the farmers to contain rather more than twice as much phosphate of lime as the best of the five samples, and nearly 4 times as much as the average amount in the four remaining samples, and gives the per centage of nitrogen about twice as high as I found it to be in the best of the five samples, and about 5 times as high as I found it in three out of five samples.

6. That the analysis published by the Native Guano Company represents the manure as having a much greater fertilising value than any of the five samples which were sent to me for examination.

The intrinsic fertilising value of artificial manures of the nature of sewage deposits is mainly regulated by the amount of phosphate of lime and of nitrogen which they contain.

The manure prepared at Leamington contains no appreciable amount of ready formed ammonia; its nitrogenous constituents, however, when applied to the land, soon enter into decomposition and readily yield ammonia.

Phosphate of lime in the shape of bone can at present be bought at about 10*l.* a ton; and animal matters, which readily yield ammonia on decomposition, can be purchased by paying 60*l.* for each ton of ammonia, which they are capable of producing. Allowing thus 10*l.* per ton for phosphate of lime, and 60*l.* for ammonia, the samples of Native guano, according to the preceding analytical data would have the following value:—

		£.	*s.*	*d.*	
No. 1 would be worth	.. ..	0	18	6	per ton.
No. 2 ,, ,,	.. ..	1	13	6	,,
No. 3 ,, ,,	.. ..	0	14	0	,,
No. 4 ,, ,,	.. ..	0	18	6	,,
No. 5 ,, ,,	.. ..	0	14	6	,,

At these prices all the really valuable fertilizing constituents in a ton of this manure may be purchased in a concentrated form, and be easily carried by a lad on the field in a very small bag. Thus a few pounds of bone-dust and dried blood will embody the whole of the intrinsically valuable fertilizing constituents of a ton of Native guano. The bulk of this manure, in fact, consists of matters which occur in abundance in almost all soils, and for this reason are practically without value, or, rather, have a negative value, inasmuch as carriage has to be paid for them, and the application of bulky manures necessarily is more expensive than that of concentrated manures, such as guano or superphosphate. It is, therefore, manifestly practically wrong to estimate the money value of such bulky and poor manures by the same standard of prices at which the commercial value of guano, superphosphate, bone-dust, and similar concentrated artificial manures is ascertained. The value of such sewage manures may probably be determined more correctly by comparing them with the intrinsic fertilizing value of common dung, and the price which is paid for the latter.

Ordinary farmyard manure, composed of mixed horse, cow, and pig dung, and plenty of straw used as litter, according to my analyses, on an average yields about $\frac{3}{4}$ to $\frac{8}{10}$ per cent. of ammonia, or just about the same amount which I found in three of the five samples of native-guano. Farmyard manure on an average contains nearly 1 per cent. of phosphate of lime, or about $1\frac{1}{2}$ less than four of the five samples of native guano. A couple of shillings' worth of bone-dust, however, would supply the deficiency of phosphate of lime in a ton of farmyard manure. Bearing in mind, however, that common dung contains an appreciable amount of salts of potash, which in the preparation of the A B C mud passes into the clarified sewage, and that in virtue of the rotten straw, dung exercises a beneficial mechanical effect upon the land to which it is applied, both of which give it a certain value that is not possessed by the Native guano, I believe I am not overstraining a point by stating it as my deliberate opinion that a ton of four of the five samples of Native A B C guano analysed by me, is barely worth as much as a ton of common farmyard manure.

Unless dung can be bought at about 5*s.* per ton when it has to be carted some miles, it is unavailable for practical purposes. It consequently follows that the above mentioned estimated values of the different samples of Native Guano are stated about three times as high as their respective real practical values; and that, at any rate, four of the five samples are practically worthless, if the manure has to be carted a distance beyond 10 miles from the place where it is manufactured.

11, *Salisbury-square, Fleet-street, E.C.*
July, 1870.

XXXIII.—*Quarterly Reports of the Chemical Committee on Adulterated Manures and Feeding Stuffs.*

March.

The Committee recommend that the following report by Dr. Voelcker be published in the minutes of the Council meeting.

I. Composition of a sample of so-called bone manure, sent by Mr. S. Bacon, jun., Ratcliff Culey, Atherstone.

Water	20·19
*Organic matter	21·61
†Monobasic phosphate of lime	·74
Free sulphuric acid	3·78
Oxide of iron and alumina	·69
Sulphate of lime (gypsum)	47·67
Magnesia and alkaline salts	·78
Insoluble siliceous matter	4·54
	100·00
* Containing nitrogen	1·11
Equal to ammonia	1·34
† Equal to bone-phosphate rendered soluble	1·17

It will be noticed that this example of so-called bone manure contained only 1 per cent. of phosphate of lime, and 1 per cent. of nitrogen. It contained 20 per cent. of water, and consisted mainly of gypsum and some cheap organic refuse, impregnated with sulphuric acid, and is not worth more than 30*s.* to 35*s.* per ton as a manure.

Mr. Bacon informs me that he bought the manure from a Mr. Ralph Potts at 4*l.* 10*s.* per ton, and invoiced at 4*l.*, and that it was guaranteed to be bone manure, prepared by Mr. George Birch, manufacturer of all kinds of bone and special manures for every crop, Woodcock Street Works, No. 1, Heneage Street, Birmingham.

II. A second sample of bone-dust was sent for analysis by Mr. J. Borlase Tibbets, Barton Seagrave, Kettering, who bought it at 7*l.* 7*s.* from Messrs. Ellis and Everard, Leicester, as ½ inch bones.

The following is the composition of this bone-dust:—

Moisture	9·94
*Organic matter	7·74
Tribasic phosphate of lime	40·12
Carbonate of lime	17·66
Oxide of iron and alumina, magnesia, &c.	6·25
Insoluble siliceous matter (sand)	18·22
	100·00
* Containing nitrogen	·66
Equal to ammonia	·80

It will be observed that these bones were very poor in nitrogenous organic matter, and contaminated with a good deal of carbonate of lime and fine sand. Their real value does not exceed 5*l.* per ton.

III. The following is the analysis of another sample of bone-dust sent to me by Mr. E. D. Broughton, Wislaston Hall, Nantwich, who bought it from Messrs. Bradburn and Co., of Wednesfield, near Wolverhampton, through Mr. Thomas Whittingham, their agent at Nantwich, at 7*l.* per ton:—

Moisture	13·52
Organic matter	22·03
Phosphate of lime	41·49
Sulphate of lime	13·75
Carbonate of lime	2·42
Alkaline salts and magnesia	3·47
Sand	3·32
	100·00
* Containing nitrogen	2·71
Equal to ammonia	3·29

Genuine bone-dust contains about 48 per cent. of phosphate of lime, and yields about 4½ per cent. of ammonia, and no appreciable amount of sulphate of lime. Good bone-dust at present, I believe, cannot be bought for less than 8*l.* 8*s.* per ton. The bone-dust sent to me by Mr. Broughton was mixed with boiled bones, to which frequently sulphuric acid is added for the purpose of arresting decomposition.

June.

There is at the present time need of very great caution in the purchase of Peruvian guano. Samples have been forwarded to Professor Voelcker from all parts of England; for instance, from Devonshire, Staffordshire, Nottinghamshire, and Surrey; in each of which the guano, although in some cases coming direct from the importers, and being genuine Peruvian guano, was damaged by sea-water, contained a considerable proportion of sand and rock, and was inferior in value to the best samples by 50*s.* to 60*s.* per ton. The great number of these guanos that have been forwarded for analysis, prove the truth of the warning given earlier in the year, that the qualities of guano now arriving are so variable and uncertain, that great caution is necessary in making purchases of this manure. The following are examples of such inferior guanos:—

Moisture	16·10
*Organic matter and ammoniacal salts	43·98
Phosphate of lime	20·73
Alkaline salts	10·01
Sand	9·18
	100·00
* Containing nitrogen	10·65
Equal to ammonia	12·21

This guano was sold as "best Peruvian guano," at 14*l.* 2*s.* 6*d.* per ton. It is, however, not best Peruvian guano, for it is damaged by sea-water, contains too much sand (rock), and yields only 12 per cent. of ammonia, and is worth about 2*l.* less per ton than Peruvian of average quality.

Moisture	17·79
*Organic matter and ammoniacal salts	46·24
Phosphates	20·21
Alkaline salts	10·75
Sand	5·01
	100·00
* Containing nitrogen	11·49
Equal to ammonia	13·95

This guano was bought at the full market price of 14*l.* 5*s.* cash. It is genuine, but damaged by water, and worth about 25*s.* to 30*s.* less per ton than good Peruvian guano.

Moisture	16·04
*Organic matter and salts of ammonia	41·38
Phosphate of lime	20·81
Alkaline salts	9·32
Insoluble siliceous matter	12·45
	1·000
* Containing nitrogen	9·65
Equal to ammonia	11·71

The bulk of this guano was delivered in a very damp state, and with a quantity of stone. The quality was guaranteed first-class Peruvian guano, and the price charged 14*l.* per ton. It is genuine Peruvian guano damaged by water, and, apart from the larger stones, contains 12½ per cent. of fine siliceous matter (rock), and yields only 11¾ per cent. of ammonia, instead of 14½ to 15 per cent., which Peruvian guano of good quality at present contains, on an average.

The Committee next direct attention to the following analysis, showing the composition of a sample of British guano, sent to Dr. Voelcker by Mr. H. Robbins, Northfield Farm, Witney :—

Moisture	26·80
*Organic matter	11·09
Phosphate of lime	·65
Oxide of iron and alumina	2·94
Carbonate and sulphate of lime	47·26
Alkaline salts and magnesia	1·72
Insoluble siliceous matter	9·54
	100·00
* Containing nitrogen	·53
Equal to ammonia	·64

This so-called guano is sold as Pound's British Guano, at High Street Bromley, Bow, E., at 3*l.* 10*s.* per ton, and is described by the maker as "an extraordinary scientific combination of night-soil, sulphate of lime, and bones, possessing immense body, which gives it great durability and feeding power, whilst no known manure can compare with it in quantity of fixed ammonia." The preceding analysis, however, shows that the sample sent to Mr. Robbins contains merely a fraction of 1 per cent. of ammonia and phosphate of lime, and is all but worthless as an artificial manure. Its strong smell is chiefly due to animal or bone-oil.

As an instance of the caution that is requisite on the part of agents for the sale of manures, the Committee wish to call attention to the following case, in which the son of a farmer was about to become agent for a manure known as the British Economical Manure. Before undertaking this agency he was requested by a friend, who had formerly purchased the manure, to have an analysis of the article, and accordingly Mr. H. Allen, Stephen of Eastover, Andover, forwarded a sample to Dr. Voelcker, which was analysed with the following results:—

Composition of a sample of British Economical Manure, sent by Mr. Stephen H. Allen, Eastover, near Andover, sold at 12*l. per ton by B. Coveney*, 17, *Devonshire Square, Bishopsgate Street, E.C.*:—

Moisture	9·86
Crystallised sulphate of iron (green vitriol)	28·81
Sulphate of lime	2·05
Chloride of sodium (common salt)	13·39
Bisulphate of soda	30·69
Insoluble siliceous matter (sand)	15·20
	100·00
Nitrogen	·06
Equal to ammonia	·07

The proprietor of the British Economical Manures states in his prospectus that $1\frac{1}{4}$ to $1\frac{1}{2}$ cwt. per acre has been found in results equal to 3 cwt. of the best Peruvian guano, and cautions farmers not to apply more than $1\frac{1}{4}$ to $1\frac{1}{2}$ cwt. to the acre. This caution is very appropriate, for a compound like the Economical Manure, which contains no intrinsically valuable fertilising matter, and which is a mixture of cheap saline matter with green vitriol—a constituent inimical to vegetation—is certain to do injury if it be used in quantities in which Peruvian guano and other concentrated artificial manures are usually employed.

In corroboration of the above, the following analysis of another sample of the same manure, which was sent by M. G. W. Hicks, Hillgrove, Wells, Somerset, may be quoted:—

Moisture	11·84
Crystallised sulphate of iron	20·92
Sulphate of lime	2·81
Chloride of sodium	13·77
Sulphate of soda	37·30
Sand	13·36
	100·00
Nitrogen	traces

Both samples are worthless as manure.

Many samples of superphosphate, which contain either no bone whatever, or but very little, are sold this season professing to be made from bone. The following case is an illustration of this fact:—

Composition of a sample of Superphosphate advertised as made from bone, sent by Mr. S. Browne, Brockton, near Shifnal, Salop, bought from Mr. George Dawler, Plume Works, Aston, Birmingham, at 7l. per ton:—

Moisture	11·76
Water of combination and *Organic matter	25·33
Biphosphate of lime (monobasic phosphate of lime)	1·69
Equal to bone phosphate (tribasic phosphate of lime), rendered soluble by acid, 2·56	
Insoluble phosphates (coprolite powder)	17·91
Sulphate of lime	28·27
Alkaline salts and magnesia (common salt)	5·18
Insoluble siliceous matter	9·86
	100·00
* Containing nitrogen	·56
Equal to ammonia	·68

Practically this bone-superphosphate contained no bone, but was a badly made coprolite superphosphate, containing only $2\frac{1}{2}$ per cent. of soluble phosphate. It would be dear at *3l.* 3*s.* per ton.

Cake is often sold as genuine linseed-cake, which is either made from inferior and undressed seed, or it is mixed with other articles. The following is a good example of one of these cases. Mr. Dudfield, of Catsley, Bewdley, forwarded a sample of cake branded "B genuine," bought from Mr. Firmston, Stourbridge, price 10*l.* 15*s.* per ton, and manufactured by Walker and Smith, of Hull. The analysis is as follows:—

Moisture	12·30
Oil	9·69
*Albuminous compounds (flesh-forming matters) ..	32·50
Mucilage, sugar, starch, and digestible fibre	26·16
Woody fibre	12·03
Mineral mattter (ash)	7·32
	100·00
*Containing nitrogen	5·20

This cake was found to be made of dirty linseed, and to be mixed with earth-nut cake. A correspondence on the subject with Mr. Dudfield ensued, and the Committee think it right to that gentleman and the manufacturers to publish the last letter received from him:—

"Catsley, Bewdley, April 15, 1870.

"DR. VOELCKER, DEAR SIR.—I have to thank you for yours of the 13th inst., and also for other communications, but I have *not* to thank you for any information tending to lead me as to the relative value of the cake you analysed for me; and I beg to say that it is not my wish that any publicity should be given in this matter; or if it is, it must be on your own, or the Council of the Royal Agricultural Society's account—the parties I bought the cake from having amicably settled the matter with me, and the makers, Messrs. Walker and Smith, having accounted for the error and shown every courtesy in the matter.—I am, &c.,

"BENJ. DUDFIELD."

Another sample was forwarded by Mr. Hudson, of Castleacre, bought of Messrs. Marston, of King's Lynn, as genuine linseed-cake, at 10*l.* 15*s.*, of which the analysis is as follows:—

Moisture	13·78
Oil	10·31
*Albuminous compounds (flesh-forming matters) ..	30·93
Mucilage, sugar, starch, and digestible fibre	22·44
Woody fibre	15·53
Mineral matter (ash)	7·01
	100·00
*Containing nitrogen	4·95

This cake was found to be mixed with earth-nut cake, and although it was by no means a bad feeding cake, it should not have been sold as genuine linseed-cake.

Other cases of adulteration have occurred, in some of which the Professor has been able to prevent loss to the purchasers; but the Committee regret to find that many farmers are unwilling to give up the names of the dealers, resting satisfied with the settlement made in their individual cases.

XXIV.—*Report of the Governors of the Royal Veterinary College to the Council of the Royal Agricultural Society.*

THE Governors of the Royal Veterinary College would have transmitted their Report to the Council of the Royal Agricultural Society at an earlier period, but for several unforeseen circumstances, among which was the receipt by them of a communication from the Council calling attention to the terms of the alliance which has so long, and to the public so advantageously, existed between the two institutions. The governors have replied by endeavouring to meet the views of the Council in a manner which they trust will prove satisfactory to the members of both institutions.

The Governors have received a very able report from Professor Simonds. Almost the whole of the very valuable information which the Professor has furnished will be found incorporated in this communication.

During the past year, 1869, events have occurred which tend to prove the increasing importance to the members of the veterinary profession of a complete and practical acquaintance with the diseases of farm stock, and especially with those which, normally existing in a mitigated form, are likely to assume an *epizootic* character, and occasion serious loss to the farmer, although they may not be essentially malignant in their nature or destructive to life. Such, for example, is the malady commonly known as "Mouth and Foot Disease."

In accordance with the agreemeut between the Royal Agricultural Society and the College, the inculcation of correct principles in the science of veterinary medicine has been steadily adhered to. It is not possible that the most complete system of tuition in collegiate establishments should afford to the rising members of the profession the general exemplification in detail which can be obtained only through an extended practice in the country; but every facility for imparting as much knowledge of this kind as is possible, during the limited period devoted to study in the college, has been afforded to the students.

The essential sciences of anatomy, physiology, and therapeutics, as a basis of practical knowledge, have received all the attention which their importance demands; and the painstaking student, who has made himself acquainted with these principles and with the practical duties of his profession as far as the opportunities afforded him in the College will permit, leaves the institution well prepared to commence the arduous duties of his profession.

The course of lectures on the science and practice of veterinary medicine, in relation to the animals of the farm, was begun at the end of the Christmas vacation, 1868-9, and continued to the end of April, when the summer vacation ensued. In October the lectures were recommenced, and uninterruptedly delivered up to Christmas. Four lectures a week were given during the whole educational term for the year.

Advantage has also been taken of the receipt at the College of specimens of morbid anatomy during the course of instruction. The specimens principally were illustrative of the changes produced in the lungs by cancerous deposit, scrofula, contagious pleuro-pneumonia and ordinary pneumonia, pyæmia, and the existence of entozoa (*filaria bronchialis*); in the liver by inflammation, softening, and partial rupture; in the uterus and its appendages by ovarian dropsy and vaginal tumours; in the spleen and other organs by that remarkable and fatal affection, designated splenic apoplexy, and also by cancerous deposits; in the kidneys by calculi; in the tongue and the throat by scrofula; in the mammary glands by abscesses, as effects of the "foot and mouth disease," and in the feet by extensive ulceration, as another sequel to this disease. Besides these specimens of morbid anatomy some very remarkable illustrations of disease of the ribs of young lambs were supplied by a veterinary surgeon in Essex. In these cases large osseous tumours existed in different parts of the ribs, mostly, however, at the upper part or near the middle. Occasionally two tumours were present, although usually one only; sometimes the ribs of both sides of the chest were affected. It was supposed at first that the enlargements had arisen from constitutional causes, and were probably the effect of scrofula; a minute examination, however, completely disproved this idea, and showed that these tumours were produced by the reparative process, in excess, after fractures which had occurred *in utero*, probably through some injury received by the ewes.

Some interesting cases of disease of the skin of lambs were likewise brought to the notice of the students. The disease possessed all the characteristics of the affection known as *crusta lactea* in the human infant.

The parts principally affected by morbid action were the face, eyelids, and ears. In some cases the sides of the neck, and even the shoulders of the animal, were ultimately attacked. Thick crusts of a dark colour covered the skin, which was also much inflamed and cracked. The young animals suffered much from local irritation and symptomatic fever, under which some of them sunk. The cases, however, were not numerous in the several flocks in which the disease appeared—not more than six or eight among 150 to 200 animals. Applications of the oxide of zinc ointment proved beneficial, but careful nursing and protection, from both hot and wet weather, were needed as adjuncts to the treatment.

Some other novel cases occurred in lambs, in which death resulted from parasites existing on the skin. The parasites in question were those commonly known as ticks (*Ixodes ricimus.*) These epizoa abound in most countries, and are met with both on wild and domesticated animals, firmly attached to the skin, from which they draw blood as their food. Until now they have not been found on animals in Great Britain to an extent injurious to health, much less as a cause of death. In hot countries, however, and particularly in many parts of South America, ticks attack animals in such vast numbers that even oxen often succumb to the continued irritating and exhaustive effects of their attacks. Specimens of the skin of lambs, thickly covered with these epizoa were sent from Kent by a veterinary surgeon who had been consulted on the case. In his communication he writes that "they"—the ticks—"had attacked the sheep and lambs both on uplands and marshes, and one farmer found a large quantity of them on some colts which were at pasture near to the sheep." There are few parasites more tenacious of life than ticks; but experiments having shown that they could easily be destroyed by carbolic acid, it was recommended that a trial should be given to dipping the sheep and lambs in a diluted mixture of this agent. This treatment proved most effective in the destruction of the ticks, and thereby prevented a further loss of lambs.

Another circumstance may be mentioned in connection with these cases. Some of the fully matured or old ticks were placed in a box, chiefly for the purpose of determining the length of time they would survive without a supply of food, it being known that the young parasites will often live for many weeks under such conditions.

On examining the box shortly afterwards it was found that the ticks had deposited many brown coloured masses of a size equal to themselves, which proved to be an enormous quantity of ova, held together by a glutinous substance. The ova were subjected to artificial warmth, and in about three weeks a batch of young ticks was obtained. The young ticks were next placed on different animals, and although the greater part of them wandered from the places on which they had been deposited, and could not be found, others were seen to attach themselves to the skin and begin to feed upon its fluids. It is not improbable that these further investigations of the natural history of the tick are without a parallel in this country.

The chief event of the year in connection with cattle diseases has been the remarkable outbreak of the malady known as the "mouth and foot disease." Few parts of Great Britain have escaped, and in one instance, at least, the disease was ascertained to have been introduced into Ireland by cattle exported from England. In Ireland, however, the malady has been kept far more in check than elsewhere by sanitary regulations, as the Executive of the Government in that country was enabled to enforce the orders of Council through the medium of the constabulary.

During the first part of the year little was heard of this disease beyond the existence of it in its ordinary form in a few places in England and Scotland. At the beginning of the summer, however, a somewhat sudden augmentation of the disease occurred; and as this circumstance was coincident with the malady assuming an epizootic form on the Continent, it was believed by many persons that its increase here depended on the importation of diseased animals from abroad. An official inquiry, however, did not confirm this opinion. The experience of the last thirty years has shown that periodical outbreaks of the disease in its epizootic form have occasionally occurred. At no time was the disease more rife than in 1839-40, or nearly three years previously to foreign cattle being allowed to be imported. In that outbreak, cattle, sheep, and pigs, and also the gallinaceous tribe of fowls, suffered equally from the disease as during its recent occurrence.

The late outbreak on the Continent has been as remarkable as that which has taken place in Great Britain. Countries which had been free from the disease for many years have been visited; and it may be said that, from the shores of the German Ocean and the Baltic to those of the Black Sea, scarcely a single country has escaped. Under such circumstances, it could not be expected that foreign animals could be landed here without some of them being found affected with the malady; and although it cannot be said that no augmentation of the attacks was thereby produced, yet it may be affirmed that the manner in which the Government dealt with imported cattle, sheep, and pigs, materially reduced the evil.

Another contagious disease of cattle has excited a good deal of attention—Pleuro-pneumonia; and in addition to the legislative provisions for its suppression, a revival of the system of inoculation, by way of prevention, has been resorted to. Experiments for this purpose have been had recourse to in several parts of the country, but chiefly in Norfolk and Cheshire. Some of the results have been published; but in the present state of the inquiry, no correct deductions can be arrived at from the data obtained. It may, however, be reasonably doubted whether the results will so far differ from those which were obtained in 1852-3 as to justify the adoption of the system. At that time, numerous experiments were carried out by the joint exertions of the College and the Royal Agricultural Society, which clearly showed that the system could not be recommended, and that it was not based on any known principles of science. Full reports of the inquiry were made to the Society, and published in its Journal for 1853.

It is a subject of sincere congratulation that no fresh introduction of the cattle plague has occurred within the year.

The disease has, however, been more than usually rife in many parts of Eastern Europe, and early in the year it spread from Hungary into Lower Austria, showing itself in several places, and among these in some villages near Vienna. At that time reports were current that the plague had broken out in some of the states of the North German Confederation. These rumours were, however, traced as having their origin in the precautionary measures adopted by Prussia against the introduction of the disease from Poland and Galicia. The Dutch government was quickly on the alert, and at once despatched a veterinary surgeon to Emmerich to inspect all the cattle which were about to enter Holland from the Prussian States. The continuance of the plague, however, in Poland, notwithstanding the vigilance displayed by Prussia, led to its crossing the frontier, and gaining a footing in the province of East Prussia; and, contrary to what would have been thought possible, the disease established itself in several distant places in that province before the government was aware of its existence. The outbreak was fraught with much danger to Western Europe, and even to England, as some cattle came direct from East Prussia to London, travelling by rail to Berlin only the day before the government closed the railway against cattle traffic as a precautionary measure. It was subsequently ascertained that the plague had been conveyed into Prussia by some cattle-dealers, who had bought infected cattle in Poland and sent them to a fair at Mühlhausen, where they were sold to different persons, and thus distributed the disease over the province.

The latest intelligence which has been received is far from reassuring, as, according to official reports, the plague had entered Silesia from the south-western districts of Poland; and although it was quickly stamped out, the state of things was so threatening that both the Prussian and Austrian frontiers were being strictly guarded by the military. It may be hoped that Western Europe will be thus protected from further loss through this most malignant and infectious disease; but that Poland, Galicia, Hungary, Transylvania, and Buckowina will suffer severely from the outbreak cannot be questioned.

With reference to another foreign disease, the small-pox of sheep, it may be mentioned, that the Government measures, which required that all foreign sheep should undergo a quarantine of fourteen days, or be slaughtered within four days at the port of landing, proved most effective in securing the country against the reintroduction of the malady. It will be remembered that these regulations were in full operation at the commencement of the year, and that no relaxation of their stringency was allowed until the danger had passed. This disease is always to be found in some of the countries of Europe. The ordinary measures of precaution adopted here may, however, be regarded as being sufficiently protective, except when the disease is very widely spread.

Passing from foreign to home diseases of a contagious nature it has to be stated that scab in sheep has been exceedingly prevalent during the year. This disease is essentially parasitic in its nature, the analogue, in fact, of itch in the human subject. It is not difficult of cure, and many of the popular remedies are often sufficient for the purpose. These, however, often fail of effecting a cure, as will even the best-chosen remedies, for want of sufficient care in their application. Each sheep in turn should be well examined, and the agent applied to every spot where the disease is found to exist. In all places, indeed, where "scabs" are met with, they must be well broken up by the fingers before the agent is used, otherwise neither the acari nor their ova will be destroyed.

Many seizures of sheep affected with scab have been made by inspectors acting under the provisions of the Contagious Diseases (Animals) Act, the provisions of which seem well adapted to keep in check all contagious diseases of cattle, sheep, and pigs. Much, however, depends on the practical application of the measure by the Local Authority; and hitherto there has not been that uniformity of action which is necessary to secure success. Persons totally unfit to act as inspectors have been appointed in numerous instances. This is a subject well worth the attention of the Council of the Royal Agricultural Society, upon national grounds. None but thoroughly educated veterinary surgeons should hold office as inspectors, and even with respect to such persons their acquirements with regard to the laws which govern the spread of each infectious or contagious malady should be ascertained prior to their receiving the appointment. With a view to limit the number of inspectors, each county should also be divided into districts or departments, and an approved inspector appointed for each.

The number of pupils who entered the college during the past year was seventy-one, being an increase of six on the number admitted in the previous year. Seventy candidates presented themselves for examination by the Court of the Royal College of Veterinary Surgeons, and of these fifty were admitted members of the incorporated profession. All the candidates for admission as pupils of the Royal Veterinary College were, according to the regulations of the Institution, submitted to a matriculation examination as to their educational acquirements before being admitted to the curriculum of the College. This preliminary test, which was established five years since, has been so fruitful of good results that it cannot but be satisfactory to the Council to know that the Governors of the Royal College of Veterinary Surgeons are using their utmost efforts to secure the extension of the system, which this Institution initiated, to the Colleges of Edinburgh and Glasgow. Should this object be attained, an important step will have been taken towards the country being supplied with veterinary surgeons whose knowledge of scientific principles gives system to their practice, and great progress will have been made towards the permanent elevation of the veterinary profession.

Before they conclude this report, the Governors desire to assure the Council, although they trust that experience must have rendered the renewal of this assurance almost unnecessary, that they have anxiously sought and will continue to seek to render the means at their disposal thoroughly available for the object which is mutual to the two institutions, "the advancement of science in the practical treatment of the diseases of cattle, sheep and pigs."

The Governors would, however, venture to remind the Council that there are limits to their means. The primary object of the Royal Veterinary College is the special education of young men who intend to devote their energies to the veterinary profession ; and it must be obvious that the Governors cannot consistently with this duty undertake to provide general or public instruction to an extent that would be injurious to the profession which the students at the College are about to enter. Another limit is presented by the known impossibility of collecting in the metropolis an aggregation of disease among cattle, sheep, and pigs, such as is exhibited to the students of medicine and surgery as applied to mankind in the various London hospitals. The sanitary regulations of the metropolis, the absence of space and of the large funds which would be requisite for the establishment of an extended hospital for diseased cattle, and other circumstances, forbid the idea of such an undertaking. The Governors, while encouraged by the general progress in veterinary science which the profession has of late years manifested, are convinced that they must be content with persevering in the development of the course which their Institution has hitherto pursued in the inculcation of those branches of science which are essential to the due organization and direction of the practice of future veterinary surgeons throughout the country.

The Governors are nevertheless fully aware of the value of demonstrations in surgical and medicinal education. Indeed it cannot be denied that explanations of the kind give point and life to instruction which would otherwise be felt by many students to be cold, abstract, and uninteresting. The Governors will therefore be grateful for any help which the Council may think fit to afford them in procuring specimens of disease in cattle, sheep, &c., and on their part they will provide all the means at their command for turning them to practical use, without losing sight of the fact that the greater part of the knowledge and skill which are essential to the success of veterinary surgeons, such as aptitude in the detection of the premonitory symptoms of disease, promptitude in forming an early diagnosis of its primary stages, and facility in devising methods for the effectual application of remedies, can only be developed by continued observation and extended practice in the country.

(Signed) C. N. Newdegate,
March, 1870. *Chairman.*

XXV.—*Report on the Trials of Implements at Oxford.* By John Coleman.

In our report on the Bury Show in 1867, where much the same classes of machines were tried as at Oxford this year, the unusually large entry of nearly 5000 articles is commented upon 'as without parallel in the annals of the Royal Agricultural Society.' At Oxford the Catalogue describes 7851 entries, shown by 359 exhibitors, and occupying many miles of shedding. Such a collection looks well on paper; but it is, in reality, overgrown, and defies the most energetic and indefatigable student who desires information. The evil, which is as yet small, will grow unless checked, and the Society is therefore giving this subject serious consideration. One simple way whereby the Show would at once be materially reduced, would be a stringent rule as to the exclusion of duplicates: that is to say, a maker must bring only one machine of precisely similar construction, and the same make of machines must only be shown by one firm. This would effectually shut out agents as exhibitors. The first stand in the Catalogue—that of Mr. Phillips, of Banbury—numbered 180 articles; and we can say that not more than a dozen emanated from the exhibitor, all the rest were implements shown by the makers themselves. One maker contributed a long row of winnowing machines, which appeared precisely alike, looked very neat, but occupied a most unnecessary area.

At present the agricultural implements—*pur et simple*—constitute only a portion of the collection. It is quite evident that the miscellaneous department, comprising as it does so much that cannot be included as strictly pertaining to agriculture, admits of considerable reduction. The extent of this is a question requiring careful consideration. It would add very much to the convenience of the visitor if the miscellaneous implements could be collected together, and not mixed up as now. Something has been done in bringing the carriage department together with manifest advantage, and we hope that further alteration in this direction may be attempted another year. The Show-ground was unavoidably laid out less consecutively than usual in consequence of a brick-field interfering. The absence from the Catalogue of a plan of the ground giving the shedding was an omission that should be rectified. Such a plan was issued with the Implement awards on the Monday, but it would have been more convenient if bound up with the Catalogue.

Owing to increased competition, consequent on the growth of the implement trade, the Society have thought it desirable to alter the Prize-sheet, by omitting the Class of Portable Engines and Threshing-machines, the trials of which are deferred for another year. The following list, with the names of the Judges in each department, may assist the reader in following the Reports :—

Judges.—E. J. Bramwell, C.E., 37, Great George Street, London.
E. A. Cowper, C.E., 6, Great George Street, London.

Section I.—*Fixed Steam-Engines.*

Class 1.—For the class of Fixed Steam-Engines of 4-horse power, with boiler combined £23

Class 2.—For the class of Fixed Steam-Engines of above 4-horse power, and not exceeding 10-horse power, to be worked by an independent boiler 30

Section II.—*Horse-Gears.*

Class 1.—For the class of Gears for one horse 10

Class 2.—For the class of Gears for two horses 10

Section VIII.—*Steaming Apparatus.*

Class 1.—For the class of Steaming Apparatus for the preparation of food for Stock 20

Judges.—H. B. Caldwell, Monkton Farleigh, Bradford-on-Avon.
H. Stephenson, Throckley House, Newcastle-on-Tyne.
John Ogilvie, Mardon, Coldstream, N.B.

Section III.—*Mills.*

Class 1.—For the class of Mills, with Stone Grinders, for grinding agricultural produce into meal, by steam or horse power 20

Class 2.—For the class of Mills, with Metal Grinders, for grinding agricultural produce for feeding purposes, by steam or horse power 20

Class III.—For the class of Mills, with Metal Grinders, for grinding agricultural produce for feeding purposes, by hand power .. 10

Section IV.—*Crushers.*

Class 1.—For the class of Corn Crushers by steam or horse power	£15
Class 2.—For the class of Corn Crushers by hand power	10
Class 3.—For the class of Linseed Crushers by steam or horse power	10
Class 4.—For the class of Linseed Crushers by hand power	10

Judges.—J. Helmsley, Shelton, Newark.
M. Savidge, Chipping Norton.
H. Cantrell, Baylis Court, Slough.

Section V.—*Chaffcutters.*

Class 1.—For the class of Chaffcutters to be worked by steam or horse power	20
Class 2.—For the class of Chaffcutters to be worked by hand power	10

Section VI.—*Oilcake-Breakers.*

Class 1.—For the class of Oilcake-Breakers, for large and small cake, to be worked by steam or horse power	15
Class 2.—For the class of Oilcake-Breakers, for large and small cake, to be worked by hand power	10

Section VII.—*Turnip-Cutters.*

Class 1.—For the class of Turnip and Root Cutters	15
Class 2.—For the class of Root-Pulpers	15

Judges.—J. K. Fowler, Aylesbury.
George Jackson, Tattenhall Hall, Chester.
G. Murray, Elvaston, Derby.

Section IX.—*Dairy Implements.*

Class 1.—For the class of Churns worked by hand power	10
Class 2.—For the class of Churns worked by any other power ..	10
Class 3.—For the class of Cheese-Tubs	10
Class 4.—For the class of Cheese-Presses	10
Class 5.—For the class of other Dairy Utensils	10

Judges.—J. Thompson, Badminton, Chippenham.
J. W. Kimber, Tubney Warren, Abingdon.
G M. Hipwell, Elmore Lodge, Sutton, Surrey.

Section X.—*Bone Mills.*

Class 1.—For the class of Bone Mills to be worked by steam or other power	20

Section XI.—*Guano-Breakers.*

Class 1.—For the class of Guano-Breakers worked by hand power	10

Section XII.—*Coprolite Mills.*

Class 1.—For the class of Coprolite Mills	10

Section XIII.—*Flax-breaking Machines.*

Class 1.—For the class of Flax-breaking Machines	10

SECTION XIV.—*Tile Machinery.*

CLASS 1.—For the class of Machines for the manufacture of Draining Tiles £15

Judges.—F. SHERBORN, Bedfont, Middlesex.
JOHN HICKEN, Dunchurch, Rugby.
JOHN WHEATLEY, Newmarch, Driffield.

SECTION XV.—*Draining Tools.*

CLASS I.—For the class of Draining Tools 10

MISCELLANEOUS AWARDS to Agricultural Articles and essential improvements therein .. .. 10 Silver Medals.

Alterations were made in some particulars, as will be seen by the reports. The steaming apparatus put down for the Judges of steam-engines were undertaken by Messrs. Kimber, Hipwell, and Thompson, whilst guano-breakers and coprolite-mills were adjudicated upon by Messrs. Caldwell, Stephenson, and Ogilvie. Mr. Amos and Mr. Amos, jun., with four active assistants, looked after the engineering arrangements, and worked the various dynamometers, used to register the power used by the implements during the trials. In many of the divisions, especially the mills, chaff-cutters, &c., the entries were very numerous, and the work consequently heavy; but, thanks to more complete preparations, and the activity displayed by officials and exhibitors, the start was good, and the running well maintained throughout. We cannot say as much of the engine-trials. Naturally certain preparatory work has to be done, which makes no show; calculations to be made; machinery to be inspected; but vexatious delays arose from accidents and obstructions which certainly were preventible. Instructions were issued as to the plan of trial, and, to prevent mistakes, a plan and section was prepared. Yet in Class 2, in more than one instance, the engine was so fixed that the strap from the friction-break would not work, and an alteration either of the engine or break was necessary. The pipe to connect the Society's boiler with the engines was so faulty, that the pressure of steam burst it, and much time was consumed before a satisfactory junction was effected. The three friction-breaks were of different diameters, and in two of them the bearings heated, causing delay. Thus, in one way or another, very little progress was made during the first two days; and, had the entries been as numerous as at Bury, we doubt if the work, even with such undaunted and energetic Judges as Messrs. Bramwell and Cooper, could have been accomplished; as it was, the stars were shining brightly and lanterns were in use on two or three evenings before they would cry "hold, enough!"

It is worth consideration whether it would not be desirable to have the breaks of similar size, and drive off a pulley of equal dimensions. This would simplify matters, and save much calculation. The admirable report, which is, we venture to say, quite unique, goes so thoroughly into the subject, that we feel comment on our part would be superfluous. Nevertheless, we must call particular attention to the importance of ascertaining the evaporation of water in each experiment, and making the same a material element in the calculation. The object of the Society is to find out the best engine; and, to do this, we must eliminate all sources of error. The comparative skill of the driver is a point that must be ascertained. All that is necessary is to have a graduated water-tank, and note the quantity consumed. It will be seen in the report that a difference of from 10 to 11 per cent. of effective force from a given quantity of fuel resulted from driving. This being so, it would be interesting to the public, and encouraging to the men, if the Society were to offer prizes for the best driving. In the case of engines worked from the Society's boiler, the quantity of water consumed would be the test, but if separate trials were considered necessary, there would be no great difficulty in carrying them out, the materials required being an engine and boiler, a friction-break, and a given quantity of fuel. At Oxford, vertical engines and boilers combined competed with horizontals. The former are somewhat new; they can be built considerably cheaper than horizontal engines, or engines with separate boilers; they occupy much less area, which may be an advantage in some cases, but they burn considerably more fuel, and do less work. We gather from the trials that a good horizontal engine, *i. e.* a portable engine, deprived of its wheels and put on a bed-frame, will consume 4 lbs. of coal per horse-power. A good vertical engine took 6 lbs. of coal for the same results, whilst others varied from 8 to 27 lbs.

The question of cost is of minor importance as compared with durability and efficiency; hence we think the vertical engines and boiler, though suited to particular situations, are not so worthy of recommendation as the horizontal engine. Should, however, the public continue to support the manufacture of vertical engines, it will be well to give them a separate class, as, except on the score of price, they cannot compete with good horizontal engines. At Oxford the restrictions were few, and great latitude was allowed in details. This is, to a certain extent, wise, but an opportunity is thereby afforded—which, in one or two instances, was taken advantage of—to run with parts admirably adapted for racing, but not of sufficient substance for ordinary wear and tear. Thus we think that tubes, firebars, &c., cylinders, water-space over fire-box, &c., should be of specific dimensions. Only a limited quantity of oil should be allowed during an experiment. Formerly it was much more the case than now to prepare an engine specially for trial, and thus deceive the public as to the real merits of the make. That it has not been done lately, has been due, in a great measure, to the adoption of certain restrictions, and we think that they should be maintained.

The following Report on Steam Engines and Horse Gears has been furnished by the Judges:—

Section I.—Steam Engines.

These were divided into two classes:—

Class I. Fixed Steam Engines of Four-Horse Power with Boiler combined.

Class II. Fixed Steam Engines of above Four-Horse Power and not exceeding Ten-Horse Power, to be worked by an independent Boiler.

The primary consideration in the purchase of a steam-engine in former days was, too commonly, "What will be its first cost?" But now the users of engines have grown wiser, and they endeavour to find out, not so much what will be its first cost, as what will be the daily expense in fuel, and what the annual expenditure in repairs, for keeping the engine at work. This Society has, therefore, as the great object in its trials of engines, to ascertain first—Is the engine, if with a boiler, safe? Is it well proportioned, and is it well made, so as to be likely to last with few repairs? And, if it have all these good qualities, what are its capabilities of giving out power compared with the fuel consumed in developing that power? And, last of all—instead of first of all—What is the price the purchaser must pay for this engine?

The last trial of steam engines took place three years since at the Bury Show (1867). On that occasion, as on former occasions, the engines tried were divided into the two great classes of Portable and Fixed; the Fixed being then, as now in the case of Class 2, worked from an independent boiler. At that show, also, the Society issued regulations by which 9 circular inches of area were required in each double-cylinder engine, and 10 inches in each single-cylinder engine, to represent a horse power; and, further, each engine having its own boiler was to be tried twice, once at a duty equal to its nominal power, and at 50 lbs. pressure per square inch, and once at one-and-a-half times that duty, and at 80 lbs. pressure per square inch.

A reference to the regulations in respect of steam engines issued for this Oxford meeting will show that the Royal Agricultural Society of England this year departed from its practice at the Bury Show, by not offering any prize for that important class of engines used in agriculture—the Portable *—and by dividing the fixed steam engines into two classes, one of them being reserved for those of 4 horse-power, the other for those above 4 and not above 10 horse-power.

At this Oxford Show the Exhibitor was also left at perfect liberty to give any number of circular inches he pleased to represent a horse power, so long as the cylinder of the 4 horse-power engines were not above $7\frac{1}{4}$ inches diameter (13·14 circular inches per horse-power), nor the cylinders of the 10 horse-power above $11\frac{1}{2}$ inches diameter (13·22 circular inches per horse-power). No restriction whatever was placed on the Exhibitor as to the nature or (except the above limitation) as to the proportions of his engines, nor in respect of the boiler was the rule of the Bury Show as to the size of tubes and amount of water space repeated.

Like most other things, the leaving this latitude as to dimensions to the engine builders, as compared with the fixed rules for the proportions of the engines for

* These will come into competition in 1872.

a nominal horse-power laid down for the Bury meeting, has both its advantage and its disadvantage. The advantage is, that full play is given to the talent and ingenuity of the Exhibitor to so proportion his engine as to develope on the Society's break, in the most economic manner as regards fuel, and with the least costly engine, the stipulated or nominal power. The disadvantage is, that it leaves to the intending purchaser the task of ascertaining whether, when he purchases the engine nominally of 10 horse-power of A, he is getting as large and powerful a machine for his money as when he purchases the nominal 10 horse-power engine of B. It may be said by those readers of this Report who are neither engine makers nor engine purchasers that, as the engine of each Exhibitor is at its trial made to exert the nominal power, the purchaser may be certain, whatever the dimensions of any engine may be, that engine has been shown to be capable of working up to its nominal power, and thus the purchaser is relieved of all further consideration of the dimensions of the engine, because he has got that which he bargained for, viz. an engine capable of working up to its stated power.

Unfortunately, however, this simple and logical rule has long been broken through, and no purchaser would now-a-days be content unless his engine were competent to develop a power largely in excess of the nominal for which it was sold; he would certainly look for double the power; he would not be at all surprised to find treble; and he would be only too glad were he to find quadruple the power. Indeed, if the purchaser resided in the neighbourhood of a seaport, and got his notions from those acquainted with the horse-power developed by marine steam engines, nothing short of six times the nominal power would satisfy him.

It is a great pity that purchasers as well as manufacturers do not describe engines exactly according to their actual horse-power, viz., 33,000 *lbs. lifted one foot* high per minute; as this is the only real standard, we have thought it absolutely necessary to give, in the tables which accompany this report, the dimensions of the cylinders of all the engines which competed, the lengths of their strokes, and the number of revolutions at which the Exhibitors elected they should run while under trial; so that those of our readers who are acquainted with engineering matters might have the necessary data to form an approximate opinion as to what the purchaser who bought the particular article against which the dimensions are written, would get for his money.

These dimensions are sufficient in respect to Class 2 (the fixed engines without boilers), but for Class 1, where the Exhibitor supplies the boiler with the engine, then the purchaser should also know what amount of heating surface each boiler contains, as the extent of heating surface in the boiler is (within reasonable limits) the true index of the power of doing work.

Not unfrequently, and, in fact, on several occasions during the Oxford Show, some very distinguished members of Agricultural Societies other than the Royal expressed their doubts as to whether there is any practical utility in the trials to which engines (and other machinery) are subjected by this Society; and these doubters point to the circumstance that other societies, notably the Bath and West of England, do not put machinery to any test, but are content with the opinion that can be formed upon inspection.

We, however, can by no means go with the doubts of these persons: doubts which we cannot help thinking are somewhat suggested by the idea in the minds of the doubters that if, from the appearance and the evidence afforded by touch, "stock" judges are enabled to assess the merits of a shorthorn, a pig, or a sheep, engineering judges, if equally competent, ought to be able to arrive by the eye alone at a true estimate of the economic value of a steam-engine.

Assuming an engineering judge to be a man of the very highest ability in his profession, and to have so large an amount of time afforded him for his inspection that he might be able to have the whole of the engines and boilers of each Exhibitor opened and taken apart, so as to obtain accurate drawings and to base calculations on those drawings, then, indeed, the engineering judge should be competent to form an opinion as to whether the machine was one constructed according to the best known rules of engineering science, but time does not admit of such a process as this being pursued, and happy indeed it is for the judges, or rather for the stewards, that the judges are not driven to arrive at their awards by the mode suggested; for were they, the stewards would be the recipients of endless protests from the Exhibitors, protests embodying also all the most recondite principles of engineering at present received, and, looking at some of the curious things which are constantly brought to trial, of new and startling principles of engineering not yet to be found in any of the text-books.

The Royal Society, however, still pursues, and, if we may be allowed to say so, wisely pursues, the ready but by no means rough test of ascertaining the merits of an engine by trying what is the actual work it can perform for a given weight of fuel. As an illustration of the information conveyed by such trials to intending purchasers, we refer our readers to the Table of Results appended to the Report on Class 1, which shows that, with equal weights of fuel, Messrs. Clayton and Shuttleworth's engine ran 3 hours 45 minutes 24 seconds, while Mr. Eagle's ran only 30 minutes 30 seconds, so that the purchaser of Messrs. Clayton's engine would get 7½ times as much work from the consumption of a given weight of coals as the purchaser of Mr. Eagle's would get. In the case of Mr. Eagle's engine, it is true, there was a general air of bad design and of equally bad workmanship about the machine, which was enough to make the purchaser wary, however unscientific he might be; but in the case of Mr. Nicholson's engine, which only ran 55 minutes 24 seconds, and which therefore was not quite of one-fourth the economic value to a purchaser that the engine of Messrs. Clayton and Shuttleworth would be, there was nothing to shock the eye; on the contrary, the parts of the engine appeared to be harmoniously proportioned, and the workmanship and materials to be very good. The intending purchaser might perhaps be struck with the fact that the boiler was without clothing, and that the ash-pit was without a damper, but with these exceptions, such a purchaser, in the absence of trials, might just as readily have bought Mr. Nicholson's engine as that of Messrs. Clayton and Shuttleworth, and thus might have found himself possessed of a machine which would require four times the coals required by that of Messrs. Clayton and Shuttleworth's to keep it going.

It may, perhaps, be interesting to give some account of the method followed by the Society, for the purpose of ascertaining what is the economic value in fuel of any engine which is offered for trial. No doubt most of the old members know thoroughly well what this method is; but there are many new ones who may not know it, and perhaps some old members who may have forgotten it, and to whom therefore, an explanation of the course pursued may not be without interest, although such an explanation is wholly unnecessary in the case of those who have some years' experience in these trials. The object is to ascertain what amount of coal per real horse-power—not *nominal* horse-power (for these are two most different things)—each engine offered for trial will consume. A horse-power, as everybody now knows, was settled by Watt to be equivalent to about 15 tons (actually 33,000 lbs.) raised through one foot in a minute of time. If, therefore, an exhibitor declares his engine to be 10-horse-power, he ought to be able to raise 150 tons through a foot in a minute of time,—or, what is precisely an equivalent thing, one ton through 150 feet, or 1 cwt. through 20 times that distance, or 3000 feet. Now, obviously, the most satisfactory mode of ascertaining whether any particular engine could do this would be to have that engine tried in the neighbourhood of some tremendously deep coal-pit, so that a rope could be let down the pit, the rope having a given weight at the end of it, and could be wound up round a pulley in a given time. Then one should be able to say, such a weight has been raised through such a distance in a minute of time, and that represents so many horse-power. But as deep coal-pits are luxuries not to be found in the neighbourhood of all trial-yards, it becomes necessary to devise an apparatus which shall have the same effect in putting work upon the engine as if it were lifting a weight, but without ever lifting a weight at all. That which is called a "Friction Break" is an apparatus of this description.

As an elementary illustration of the principles and construction of a "Friction Break," imagine a smooth wheel inside a smooth ring (a break-riug), capable of being tightened, round about which ring was wound a rope with the required weight at the end of it. If on turning this wheel, say by an engine, the break-baud were tightened sufficiently, it is clear it could notwithstanding the weight be made to revolve with the wheel. It would then wind up the rope and draw up the weight, just as we have supposed might be done by drawing the weight up the coal-pit; on the other hand, the band might be left so slack, that notwithstanding the wheel continues to revolve, the weight might as a sailor would say, overhaul the band and cause it to turn in the direction opposite to that of the wheel, aud thus let the weight run down. But assume that the band could be slackened to just such an extent that it would neither run round with the wheel, to wind up the weight, nor allow it to descend contrary to the action of the wheel, then it is clear that although the baud and the weight would remain stationary, the friction put by that band upon the wheel revolving within it must be precisely the same as if the wheel were really winding the weight; because, although it is not winding it, it is holding it up, and thus it is in fact subjected to the whole weight. It is upon this principle that the breaks used by the Society are constructed. They have in addition to that which has been stated in this mere elementary description, an arrangement of levers invented by the late Mr. Appold, of such a nature that if the weight fall a little it immediately tightens the break, and if it rise a little it immediately slackens it.

Now, being provided with such an implement as this, one is able, by causing the wheel within the break to be turned round by the engine to be tried, to put upon that engine just such an amount of resistance as it is intended to overcome. Thus, if an engine be a 10-horse engine, it should lift 330,000 lbs. one foot high in a minute; or, if the break were running at the rate of 2000 feet per minute, it should lift, or, what is the same thing, uphold suspended 165 lbs. If this be done, then the eugine is really delivering to the break 10-horse-power; and if, instead of working this useless break, it were working a thrashing-machine or a corn-mill, it would under similar circumstances do work equal to ten-horses'-power. The break being thus adjusted, the next thing is to find what is the amount of coals that will be consumed to drive the engine during a given time. It might be thought that nothing was more easy than to give out a certain weight of coals, to allow them to be put upon the fire and burnt, to note the time during which they were burning, and then say that such a weight of coals worked the engine for so many hours, and that the weight of coals divided by the horse-power, multiplied into the number of hours would give the coal consumed per hour per horse; but a little reflection will show that this apparently simple and fair proceeding would not be a true test. The water in the boiler would be cold, the boiler itself would be cold, and a large amount of fuel would be consumed in the mere getting-up of steam, which would be a loss that would tell most seriously upon a short trial. To obviate these sources of error the Society pursues the following course:—There is issued to each exhibitor sufficient wood and coals to get up steam, and to run his engine for a short time, at the stipulated pace, and with the requisite weight held suspended by the break. When this fair running condition is reached, no more coals are put upon the fire; but it is suffered to burn down and the steam to lower, until the engine will no longer run at the proper pace, care being taken that every steam-valve or expansion-valve be open, so that the engine can take full advantage of the lowering pressure of steam in the boiler. Then, the fire being all but out, only just so much as will light the fresh coals, and the ashes being most carefully raked out of the ashpan, the exhibitor starts with a fresh supply of coals, being allowed 14 lbs. per nominal horse-power. With these coals he gets up steam to the working pressure—which this year was 50 lbs. to the square inch—and then he re-stokes his engine and works the break as long as he can possibly make his coals and ashes last.

So soon, again, as, with every valve wide open, the engine ceases to keep its speed, the Judge in charge of the experiment stops the engine and then reads the counter attached to the break (the counter being similar in principle to that attached to gas-meters), and from this reading ascertains how many revolutions the break has made during the time the coals have been burning. This time, divided by the calculated number of revolutions of the break per minute, gives the amount of *break*-time during which the engine has been running. "Break-time" is used because it is impossible to keep the engine running with absolute regularity; and thus an engine which has been running three hours of actual time, if it has been making a few more revolutions than it was arranged to make, may have run, say three hours, ten, twenty, or thirty minutes of break-time. Care is taken that the water should show at the same height in the water-gauge of the boiler at the termination of the experiment as at its commencement; as were this point neglected, the exhibitor might, on the one hand, have been getting power out of water which was heated in a previous experiment, or, on the other hand, he may have been heating water which he would never use. As the water ordinarily rises in the gauge immediately on starting the engine, it is well to take the height just before starting and just after. It is difficult to say whether it is more amusing or more provoking to witness, and to have to struggle with the ingenuity of some of the exhibitors' representatives, who do try their very hardest to make the engine stop in its preliminary trial with high steam, a large fire, and the valves not fully open; and then at the final trial to stop with all these conditions reversed; and the Judges have to be very careful indeed that the conditions at the final trial are precisely identical with the preliminary one.

We believe that trials thus conducted do truly give the results obtained by each exhibitor for a given weight of fuel burnt, but in the class of engines with boilers combined, it is impossible to say, with accuracy, whether the merit or demerit of any particular engine is due to the engine, or to the boiler, or to both, or to a third most important element—and that is the ability of the stoker. But a further investigation as to the quantity of the water evaporated would go far to enable the Judges to solve some of these problems; for instance, if one engine did half as well as another, and it were found that its boiler and stoker together evaporated only one half the water that the other boiler and stoker evaporated, it would then be clear that the engines, *quà* engines, were of equal merit, because the one that was supplied with half the steam did half the work done by the other that was supplied with the full volume of steam; but whether the suggested difference in evaporation was due to the boiler or to the stoking, it would be always all but impossible to ascertain. It is true experiments might be made by appointing one man to fire several boilers, but unless that were done the Judges see no means, in this class of engines, beyond their ability of expressing an opinion from *à priori* reasoning upon the boilers' merits, of determining whether the power of evaporating water economically is due to the boiler or to the stoking. But in the class of fixed engines without boilers the case is very different. Here each engine is worked off a boiler belonging to the Society. With equal diligence and ability, and similar quantities of coal, it is clear that equal quantities of water should be evaporated during the trial of each engine; and if this is not the case it is a fair assumption that the difference lies in the want of skill in the stoker. It is to be regretted that the Society did not deem it necessary to provide for the Oxford Show a very simple apparatus, which would have enabled us to readily ascertain the facts; as it was, one had to be improvised and carefully watched, which proved a difficult matter, as it is hard to persuade a man working a pump that there can be any harm in pumping water out of a vessel at any moment he wants to pump it. He does not understand the object, thinks it all nonsense, and is very apt to disregard orders. As the apparatus was not got ready for the first of these trials, and as we do not possess reliable records of all the evaporative results, we do not tabulate those we have; but call attention to two experiments, which show in a striking manner the difference due to skill in firing. A comparison was made between the stoking of the Reading Iron Works, No. 4010, and of Messrs. Marshall, Sons, and Co., No. 7082. The Reading Company's man evaporated as much as 9·37 lbs. of water for each 1 lb. of coal burnt. Messrs. Marshall's man evaporated only 8 lbs. of water for each 1 lb. of coal burnt. The boiler being the same, the difference represented solely the skill of the fireman. Now the Reading Company's engine ran for 3 hours 18 minutes and 54 seconds of "break time," and burned 4·22 lbs. of coal per horse-power per hour, while Messrs. Marshall's engine ran only for 2 hours 42 minutes 6 seconds, and burned 5·18 lbs. of coal per horse-power per hour. But while the Reading Company obtained 937 lbs. of water turned into steam for 100 lbs. of coal burnt, Messrs. Marshall obtained only 800 lbs., and therefore their engine never had the same chance of doing work as that of the Reading Company, for it never had the same steam wherewith to do it. If the fireman of the Reading Iron Company had also fired for Messrs. Marshall and Sons, and with equal ability, they would have had their 937 lbs. of water evaporated for the 100 lbs. of coals, and their engine, instead of having run only 2 hours 42 minutes 6 seconds, would have run 3 hours 9 minutes 51 seconds, and their consumption, instead of being 5·18 lbs., would have only been 4·22 lbs. of coal per horse-power, per hour.

When considering the consumption of fuel per horse per hour of the engines in Class 2, worked off the Society's boiler, it should be borne in mind that in almost all non-condensing engines of the present day the waste steam is made to heat the feed water, and most properly so, because the difference or saving between using feed water at 60 degrees, and at, say, 200 degrees, is about $13\frac{1}{3}$ per cent. of the coal required to turn it into steam; or a given weight of coal being used in both cases, about 15 per cent. more effect would be obtained from well heated feed water than from cold. Formerly it was commonly thought that if water were heated nearly boiling hot it would save nearly the whole coal, but now everybody knows that the principal absorption of heat in turning water into steam is not providing the sensible heat which goes to make water feel hot, but in imparting the latent heat required to convert the liquid into a vaporous condition. Unhappily, this Society has never provided any means for heating the water for its boiler from the waste steam of the engines under trial, and thus the whole of the fixed engines tried with the Society's boiler exhibit a consumption $13\frac{1}{3}$ per cent. higher than they would do were this simple provision made.* One very small advantage, however, that the engines had during the trial was, that they were not required to pump the feed water into the boiler, that operation being done by hand.

* This was a point referred to by the Bury report.

So far in explanation: now for details of trials at the Oxford Show of 1870:—

SECTION I.—CLASS 1.

Fixed Steam-engines of 4-horse-power with Boiler complete. £20.

AWARDS.

7171.	Clayton and Shuttleworth	£9 0
6891.	Brown and May	6 0
4009.	Reading Iron Works Company	£5 0
7081.	Marshall, Sons, and Co.	Highly commended.
7110.	Robey and Co.	Commended.
7100.	Davey, Paxman, and Davey ..	Commended.

Ordinal Number	NAME.	No. in Catalogue.
1.	Clayton and Shuttleworth	7171
2.	Robey and Co.	7110
3.	Riches and Watts	7136
5.	Ashby and Jeffrey	478
8.	Brown and May	6891
9.	Hancock and Foden	6966
10.	Marshall, Sons, and Co.	7081
12.	Reading Iron Works	4009
13.	C. D. Eagles	6793
14.	Davey, Paxman, and Davey	7100
16.	W. N. Nicholson	4314

SECTION 1. Class I. For Engines of 4-horse-power with boilers combined.—As already stated, except the condition that the bore of the cylinder should not exceed 7¼ inches in diameter, and also, as should have been remarked, that during the trial the pressure of steam should not exceed 50 lbs., no limitations as to form or as to arrangements were placed upon the exhibitors of these engines.

It resulted from this latitude that, among the following eleven exhibitors who came to trial, there were three engines, exhibited respectively by Messrs. Clayton and Shuttleworth, by Messrs. Brown and May, and by the Reading Iron Works Company, which were in all respects of the ordinary type of the portable engine, with the exception that they were placed upon stands and not upon wheels.

In one instance, at all events if not in more than one, this variance from a portable engine could be caused to disappear, for the stands were removable and the engine was supplied with arrangements for readily fixing the ordinary wheels and axles of a portable engine; and, indeed, one of the exhibitors brought his engine to trial mounted on its wheels and axles, being in every respect a 4-horse portable engine, a class excluded from trial at the Oxford Show. It is hardly necessary to remark that if we had allowed this engine to be thus tried, there was not a single one of the 4-horse portable engines in the Yard which might not have been entered for the prize. On the matter being laid before the Stewards, they at once decided that at the time the engines were being tried, they must be engines upon stands and not portable engines upon wheels. The other exhibitors who came to trial, eight in number, all brought forward engines with vertical boilers, and, with one exception, the engines themselves were vertical; this exception was that of No. 6793, exhibited by Mr. Eagles, but manufactured, as it appears from the Catalogue, by Messrs. Dennison and Sons, of Orchard Street Works, Newcastle-on-Tyne.

It will be seen by an examination of Table I. that the three engines which were provided with horizontal boilers gave the best results, and there is no doubt that had the Reading Iron Works not laboured under the disadvantage of being unable to use their loose feed-water heater, their engine would have exhibited the larger economy of about 15 per cent., due (as has been already explained) to the use of heated feed water, and thus the three engines provided with horizontal boilers would have been still farther ahead in point of economy of any of those provided with vertical boilers.

We consider there are points of merit about a horizontal boiler which it is difficult, if not impossible, to equal in a vertical boiler; and one, and a principal one, of these points is that in a horizontal boiler there is a very large surface of water from which the particles of steam can be disengaged, and thus there is far less danger of the steam carrying up particles of water with it.

This liability of carrying over water with the steam (*i.e.* of "priming") increases with the amount of steam delivered in a given time, and therefore the exhibitors of vertical boilers were placed during the trial under extremely favourable conditions as compared with those in which they would have been in ordinary working, because the engines were restricted to developing only their nominal power; while in actual work, as has already been stated, they would be urged to a far greater power than this. It is a fact, although a regrettable one, that in engines, as in other matters, there arise fashions, and there is no doubt that for the last few years vertical boilers (vulgarly called "coffee-pots") have come into fashion.

In certain cases, such as on swinging cranes, for which these boilers are very largely used, their form is convenient, and there may be other cases, such, for example, as those where floor-space is extremely limited, in which it may be desirable to use boilers and engines which occupy height rather than breadth and width; but these cases are more likely to arise in crowded printing-offices and in little manufactories in the City, where ground is very valuable, than on farm premises. For the agriculturist's purposes we see nothing beyond the saving of a very few pounds (from 10*l.* to 30*l.*) in the original cost of the 4-horse engine to tempt the farmer to purchase the vertical form in lieu of the horizontal—a dear first economy, looking at the perpetual extra cost of working, as shown by the trials.

With respect to the table which follows, and with respect to that which will be given for Class 2, it may be well to call the reader's attention to the fact, that column No. 9, which shows the total revolutions of the break, is not by itself any indication whatever of the merits of these engines, because these total revolutions depend not alone upon the time during which the engine is capable of running before it has consumed its allotted coal, but also upon the size of the pulleys; and in the same way the succeeding column, No. 10, which records the weight held suspended by the break in the case of each engine is by itself no guide of the power developed, inasmuch as that weight varies inversely as the speeds; but column 11, which represents the product obtained by multiplying the total number of revolutions of the break into the weight held suspended in each case, gives results which truly represent the relative performances of the different engines tried.

On mature consideration as to the most practical way of testing engines and boilers of this class, so that a purchaser might best be able to judge whether a particular engine would suit his requirements or not, we decided with the full concurrence of Mr. C. E. Amos, the Society's engineer, and with the sanction of the Stewards, that instead of a number of persons being allowed to assist, and, if we may use the expression, "nurse" the engine, by oiling various parts, breaking the coal for the stoker, and spending much time in attending to the heat of the feed water, &c., that one man only should drive the engine, stoke

SECTION I.—CLASS 1.

TABLE I.—RESULTS WITH FIXED STEAM ENGINES OF 4 HORSE-POWER WITH BOILERS COMBINED.

Name of Exhibitor.	Number of Stand.	Catalogue Number.	Nominal Horse Power.	Diameter of Cylinder.	Length of Stroke.	Revolution per Minute.	Feet run of Piston per Minute.	Total Revolutions of the Break.	Weight held suspended by the Break.	Total Revolutions of the Break Multiplied by the Weight suspended.	Time Running as shown by the Break.	Total Coal allowed at the Rate of 14 lbs. per Horse-Power.	Coal consumed per hour per Horse-Power.	Price.	Nature of Engine.	Judges' Award.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
				Inches.	feet. in.		feet. in.		lbs. ozs.		h. m. s.			£.		
Clayton and Shuttleworth	329	7171	4	7	1 0	110	220 0	26,397	65 0	1,715,805	3 45 24	56	3·72	145	Horizontal ..	Prize £9.
Robey	323	7110	..	7¼	1 0	120	240 0	15,027	72 7	1,088,518	2 22 6	..	5·91	100	Vertical	Commended.
Riches and Watts	326	7136	..	6½	0 10	150	250 0	15,238	55 0	838,090	2 7 24	..	6·60	105	Ditto	
Ashby, Jeffery, and Luke	9	478	..	6¾	0 10	150	250 0	18,366	56 2	1,030,792	2 15 18	..	6·22	102	Ditto	
Brown and May	302	6891	..	$7\frac{3}{16}$	1 0	120	240 0	24,690	58 3	1,436,649	3 8 54	..	4·44	125	Horizontal ..	Prize £6.
Hancock and Foden ..	312	6966	..	7	1 0	120	240 0	10,322	70 3	724,475	1 35 7	..	8·83	95	Vertical	
Marshall, Sons, and Co.	320	7081	..	7¼	1 0	110	220 0	14,581	76 11	1,118,180	2 28 0	..	5·67	115	Ditto	Highly Commended.
Reading Iron Works (Limited)	154	4009	..	5¾	1 2	140	326 8	23,799	57 12	1,374,392	3 0 48	..	4·65	145	Horizontal ..	Prize £5.
Eagles	292	6793	..	6½	0 10	100	166 8	1,386	167 6	231,982	0 30 30	..	27·61	100	Boiler Vertical Engine Horizontal	
Davey, Paxman, and Davey	322	7100	..	6¾	1 0	115	230 0	16,794	63 5	1,063,270	2 19 42	..	6·01	105	Vertical	Commended.
Nicholson	160	4314	..	6¾	1 0	100	200 0	4,354	96 14	421,794	0 55 28	..	15·18	100	Ditto	

SECTION I.—CLASS 2.

TABLE II.—RESULTS WITH FIXED STEAM ENGINES (WITHOUT BOILERS) ABOVE 4 HORSE-POWER AND NOT ABOVE 10 HORSE-POWER.

				Inches.	feet. in.		feet. in.					lbs.		£		
Ellis, G. H.	293	6801	8	10	0 10	125	208 4	None registered.	None	None	None	112	Not tried	70	Called a Lever Engine.	
									lbs. ozs.		h. m. s.		lbs.			
Turner, E. R. and F. ..	184	4831	10	11	1 6	105	315 0	21,451	120 15	2,594,230	2 17 50	140	6·69	142	Horizontal ..	
Clayton and Shuttleworth	329	7172	10	16	1 8	65	216 8	21,236	182 8	3,875,570	3 23 36	140	4·12	With Cornish boiler, £240.	Horizontal ..	Prize £11 5s.
Marshall, Sons, and Co. ..	320	7082	10	10¾	1 4	70	186 8	12,848	240 3	3,085,929	2 42 6	140	5·18	£ 130	Horizontal ..	Prize £7 10s.
Reading Iron Works (Limited)	154	4010	10	8½	1 8	105	350 0	25,411	149 0	3,786,239	3 18 54	140	4·22	With boiler, £262.	Horizontal ..	Prize £11 5s.
Underhill, W. S.	148	3828	10	10¾	1 2	97	226 4	20,549	132 8	2,722,742	2 23 0	140	5·87	£ 150	Horizontal ..	

the boiler, and attend to the whole; and it was evident that there could not be the slightest objection to such a course, as the whole attention of the man could be given to the work, inasmuch as he had nothing to do with any machinery driven by the engine, as is generally the case on a farm, where a man is expected to give as much attention as he can to all the machinery in motion.

Unfortunately the Reading Iron Works Company were compelled to dispense with their feed-water heater, as it formed no part of the engine, and required the aid of an extra hand.

This arrangement was therefore carried out with the 4-horse-power engines, with boilers combined, though with the 10-horse power engines, which were independent of the boiler, one man was allowed to the engine, and one man to the boiler, which was one belonging to the Society, and was used for all the 10-horse power engines one after the other.

The steam-pressure gauges of all the boilers were tested by the Society's officers, and a note made as to when the index stood at 50 lbs. pressure, and the boilers were all proved by the Judges to 100 lbs. pressure. (See Table, Section I., Class 1.)

No. 7171. Clayton and Shuttleworth. Fixed Steam Engine of 4-horse-power, with boiler combined. This boiler stands upon good supports, on a cast-iron bed-plate on the ground, which also forms a shallow tank for feed water, from which the feed-pump draws at all times, and into which it returns all surplus water that is not required by the boiler.

The boiler is of the form of an ordinary portable engine boiler, with horizontal tubes, fire-box, and smoke-box.

The engine is an horizontal one, very compactly fitted up on one saddle casting that lies on the top of the boiler, and carries cylinder, guides, and plummer-blocks for the crank-shaft, the fly-wheel overhanging on one side.

This saddle casting is hollow, and takes the eduction steam from the cylinder to the chimney, and at the same time has divisions in it that enable it to receive the feed water from the pump, and heat it on its passage to the boiler, so that the water is well heated after it has passed the pump; this is a material point, for when feed water is heated before the pump draws it, there is always a danger of the pump failing to draw well, and hence the water in such cases is generally kept rather cool, or in fact not heated much more than half as much as it may be, when it is heated after being pumped; thus if the cold water is at 60°, and it is heated 76° = 136°, it is pretty nearly as hot as it can be made if the feed-pump has to draw several feet perpendicular lift, and it is wished that it shall be certain to draw and fill well every stroke, whereas, if the water is heated another 76° = 212° considerable economy is thereby obtained; and as there is always plenty of eduction steam at 212° to heat it, there is good reason for so doing.

The fire-bars of this boiler were very thin, and the spaces narrow, and we think, in actual practice on a farm, it would be found advisable to use stouter bars; the finer bars undoubtedly enable greater perfection in firing to be carried out, and there was no limit laid down by the Society this year as to size of bars.

The space taken on plan by the engine and boiler is 8 ft. in length by 3 ft. 2 in. breath, with 2½ in. extra width for fly-wheel.

The engine worked very steadily, though there was at times a little tremor observable in the fly-wheel. The bearings can be readily oiled, as well as the oil caps to the cylinder, by the use of a step-ladder or tressel of 2 steps.

No. 2. Robey and Co. 7110.—This is an upright boiler with vertical engine attached to it; cylinder at top; 7¼ inches diameter; 120 revolutions per minute. This boiler has Field's patent tubes, 36 in number, and 2 feet 3 inches long. The tubes have smaller circulating pipes inside them. The steam is cut off by a slide worked by an eccentric capable of adjustment by means of the governor whilst running. The slide was set to cut off at about one-third of the stroke, and the governor allowed it to vary somewhat above and below this degree of expansion. This arrangement tended to uniform speed, even with a variation of from 50 to 33lbs. pressure per square inch. The governor is horizontal on the crank-shaft itself, and is provided with a large spiral spring around the shaft, to resist the centrifugal force of the governor-balls. It is a powerful governor, in order that it may be able to move the wedges which regulate the eccentric, so as to vary the expansion. We do not, however, consider there is any substantial advantage in this arrangement over an ordinary working slide and an expansion capable of adjustment in its eccentric before starting. The cast-iron brackets for carrying the crank-shaft plummer-blocks are fastened to the boiler. The heavy fly-wheel is provided with a balance-weight, and runs very steadily. No drum is attached, unless ordered. The engine stands in a space of 4 feet 1 inch by 3 feet 11 inches, and was remarkably steady in running, although merely placed on loose wooden packing (four thicknesses). The fly-wheel projects 5 inches in width, and 2 feet ½ inch beyond the end. The wheel is 6 inches wide. The cylinder is steam-jacketed, and the boiler covered with 1 inch lagging. The feed water has an adjustment, so that the pump always draws full. The pump may have to lift the water 18 inches. When the water is not required in the boiler, it is allowed to pass back by the cock being partially opened. There are four guide-bars to the piston-rod. The boiler is provided with proper mudhole doors, and gauges for showing the level of the water in the feed-water heater. The bed-plate being hollow, forms the feed-water heating tank, with a division, so that the centre plate forms the ashpan. This is all but universal with this character of upright boilers. There are close-fitting ashpit dampers, two guide surfaces, glass gauge, gauge-cocks, small blow-off cock, and other proper fittings. The steel crank-shaft is bent. The stoke-hole is at the opposite end to the fly-wheel. The fire-bars are ⅜ of an inch thick, with $\frac{5}{16}$ spaces. The diameter of the fire is 17 inches, with bricks round the inside of the fire-box. There is a 3-inch water-space around the fire-box. The height of the steam-space is 26 inches. The height outside the casing is 7 feet 6 inches; the diameter 3 feet 2½ inches. The height of the chimney above the top of the boiler is 8 feet—12 if required. The total weight is said to be about 53 cwts. The packing is one wood inside, with two outside.

No. 3. Riches and Watts. 7136.—Vertical boiler with upright engine, on cast-iron independent standards, fixed on the same cast-iron bed which bears the boiler; 3½-inch cylinder; 10-inch stroke; 150 revolutions per minute; steam cut off at 3¾. The fire-box has a horizontal ring tube-plate, cupped down 1 ft. 8½ in. in the centre, from which a circle of 14 vertical tubes extends to a flat tube plate on the top of the boiler. Thus the upper parts of the tubes pass through the steam-space, and, in addition to this superheating, the steam-pipe coils round the inside of the chimney-dome at the top of the boiler. The fire-box itself is conical. Small governor at upper part of boiler, driven by strap and bevilled gear, to act upon throttle-valve. Working slide and expansion eccentric. Eccentric capable of being set when the engine is standing, by bolt and nut and slot. Feed-pump driven off the same eccentric. Guide surfaces, in place of separate bars, on the insides of the standards, with ample surfaces, well got up. Adjustment on the block by very thin packing. Wrought-iron crank-shaft with bearings on each side of crank, and one at the fly-wheel. Balance-weight on light fly-wheel, and drum. Feed-water heater and feed-pump arrangement. Pump may have to lift water 8 inches. Two gauges to heating tank, which is within the bed-plate; ashpit. Wrought-iron fire-bars $\frac{3}{8}$ inches thick, by $1\frac{3}{8}$ deep, and from $\frac{3}{16}$ to $\frac{1}{4}$ inch spaces. Size of fire 1 ft. 5 inches; 2 feet 9 inches diameter outside the shell; 6 feet high. Packing of piston, with gauge, bottom ring. Boiler covered with one thickness of felt, and $1\frac{1}{4}$ wood and sheet iron. Cylinder covered in the same manner, but not steam-jacketed; weight about 33 cwts. Standing space, 4 feet $3\frac{1}{4}$ inches by 3 feet $\frac{1}{2}$ inch. The fly-wheel projects 6 inches in width and 1 ft. 4 inches in extra length. Stoke-hole at opposite end; two glass gauges; no gauge-cocks; blow-off cock. Chimney about 6 feet above top of dome. Engine tolerably steady in working.

No. 5. Ashby and Jeffrey. 478.—Upright boiler with upright engine attached to it. Cylinder at top; $6\frac{3}{4}$ inch double cylinder, 10-inch stroke, 150 revolutions per minute. Boiler has two horizontal tube-plates, provided with 37 tubes ($1\frac{3}{4}$ inches outside, and $1\frac{9}{16}$ inches outside), 5 feet 4 inches long, being 4 feet in water and 1 ft. 4 inches in steam. The lower tube-plates would probably require frequent cleaning, as it is commonly found that a horizontal tube-plate over the fire cannot get well supplied with water, especially if the latter is bad. Fire-box, $22\frac{1}{2}$ inches diameter. In centre of fire-bars there is a raised boss of clay, enclosed within cast-iron ring, slightly conical. This boss is $11\frac{3}{4}$ inches diameter at top. The radial rings of the bars outside of this boss are 5 inches and $3\frac{1}{8}$ inches. The bars are $\frac{3}{8}$ to $\frac{7}{16}$ths in thickness, having spaces between $\frac{3}{8}$ tapering to $\frac{1}{4}$ of an inch. The governor is attached to the side of the cylinder, driven by a strap and gear. There is a working slide and an expansion slide, driven by a separate eccentric, capable of adjustment when standing, by a bolt and nut and slot. The feed-pump is drawn by a separate eccentric. The steam is cut off at about 3 inches, but may be varied considerably. Guide to piston-rod is a single guide-bar of steel, having ample surfaces, capable of adjustment by packing behind the bars, contained within a sliding plate block. The crank end of connecting-rod has ample surfaces provided with good bars. There is no drum on crank-shaft, but a good fly-wheel, with proper balance-weight. The feed-water heater is formed in the foundation-bed, and is heated entirely from the ashpan. The feed is regulated by a cock in the suction. The ashpan has a damper, and the boiler a blow-off cock. The boiler is enclosed in $1\frac{1}{4}$ inch of non-conducting composition (lime material), and sheet-iron casing outside. Two gauge-cocks and glass gauge. A proper gauge and safety valve, like all the other engines tried; 4 feet chimney; base, 2 feet $9\frac{1}{2}$ inches square. Fly-wheel projects on the side $5\frac{1}{2}$ inches, and at end 2 feet 5 inches. The boiler has proper mudhole doors. Boiler, 2 feet $4\frac{1}{2}$ inches diameter; height 5 feet 11 inches. Five thicknesses of packing. The engine ran remarkably steadily, no doubt owing to the balance-weight being correctly adjusted. The pump may have to lift the water 18 inches; the water, therefore, cannot be allowed to become very hot. Total weight about 27 cwts.

No. 8. Brown and May. Horizontal tubular boiler; 21 tubes, $2\frac{1}{4}$ inches diameter inside, made of No. 10. Birmingham wire-gauge; 5 feet 7 inches long. Horizontal engine with cylinder placed on top of fire-box, $7\frac{3}{16}$ inches diameter, 12 inches stroke, 120 revolutions per minute. Steam cut off at about $2\frac{3}{4}$ inches; can be varied greatly, as there is separate expansion slide and eccentric, capable of adjustment, when the engine is standing, by bolt and nut and slot. The governor stands on the boiler, is driven by a strap and bevilled wheels. The cylinder is steam-jacketed and lagged. The valve-box is also lagged. The eduction steam passes the whole length of the boiler, through a feed-water heater, provided with an air vessel on the top to prevent its being affected by frost. The pump is worked by a separate eccentric, which pumps the cold water through the feed-water heater into the boiler, so that it is quite capable of drawing the water from the level of the ground, or even from a shallow well. The pump always works full. The feed is regulated by allowing some portion of the water pumped to pass back into the tank or well. There is an Argand blast-pipe, of $2\frac{1}{4}$ inches diameter, with cone inside, to adjust the opening, and used at a diameter of $1\frac{3}{8}$ inches, level with the top of the blast-pipe, equal therefore to $\frac{7}{16}$ width of opening all round. Fire-box 1 foot 6 inches fore-and-aft, 2 feet 1 inch wide. Bars running fore-and-aft, $4\frac{1}{2}$ inches wide; bars $\frac{3}{4}$ to 1 inch, spaces $\frac{1}{4}$ to $\frac{3}{8}$ths. Boiler provided with mud-hole doors, blow-off cock, glass gauge, two gauge cocks, and small blow-pipe to chimney. Large lubricator to cylinder. Total length over all, except cocks, 9 feet 5 inches. Width of fire-box outside, 2 feet 8 inches. Feed-water heater projects 6 inches. Fly-wheel projects 8 inches beyond the 2 feet 8 inches width, and about 4 inches beyond the end of the boiler. Good fly-wheel and balance weight. Total weight, with wheels, 3 tons. Fire-box stands in a space of $5\frac{1}{2}$ feet by 6 feet in width.

No. 9. Hancock and Foden, 6966. Upright boiler with engine attached. Cylinder at top. Working slide and expansion slide, not adjustable except by altering the key on wrought-iron crank shaft. Cylinder 7 inches diameter; 12 inches stroke; 120 revolutions per minute. Governor is fixed to cylinder with driving strap and bevilled wheels. Pump driven by separate eccentric. Four guide bars to piston-rod. No drum on crank shaft; and fly-wheel without balance weight, and engine somewhat unsteady in working in consequence. Feed-water heated by condensed water and steam from eduction steam-pipe. Water may have to be lifted 18 inches. The pump is kept full, as the excess feed-water pumped is allowed to pass back into the feed water heater. The cylinder not steam-jacketed. One cross tube through the fire-box, and a baffling plate just below the upright chimney flue, prevents the produce of combustion going straight up the chimney before it has come in contact with the crown of the box. Fire-box, 2 feet 3 inches diameter, 3 feet 7 inches high. Shell of boiler, 2 feet 10 inches diameter, 6 feet 6 inches high. Fire-bars, $\frac{7}{16}$ths thick, $\frac{5}{16}$ths spaces. A bar of brickwork, 9 inches wide, runs fore-and-aft from the fire-door. Boiler provided with mud-hole door. Mud-hole doors to feed-water heater. Boiler covered and lagged with sheet-iron. Base 3 feet 11 inches by 4 feet. Chimney 4 feet high. Fly-wheel projects sideways $4\frac{1}{2}$ inches, and at end about 2 feet 4 inches. Weight about 2 tons 12 cwt.

No. 10. Marshall, Sons, and Co. (Limited), 7081. Upright boiler with tubes hanging down towards fire, much like Robey's, described before, inclosed in strong boiler-plate casing. Engine nearly vertical; cylinder at top. Four guide-bars to piston. Working slide, and expansion slide driven by separate eccentric, capable of adjustment by bolt, nut, and slot. Steam cut off at 3 inches. Feed-pump placed low down in the tank, so that it can pump boiling water. Feed-water heater has copper tubes, with a particularly large amount of surface. Cylinder steam-jacketed, sides, top, and bottom, and lagged, and inclosed in sheet-iron case. Wrought-iron crank shaft. No drum. Fly-wheel without balance-weight. Boiler provided with 2 glass gauges, mud-hole doors, and small blow-off cock. The quantity of steam passing through feed-water heater can be adjusted by cock. The tank, of wrought iron, under the engine forms water-tank and ashpan. The governor, placed at top, is driven by strap and bevilled wheels. Both plummer-blocks and crank shaft carry large brasses, with wrought-iron plate riveted to boiler. Chimney, 7 feet high, $9\frac{1}{2}$ inches diameter. Boiler, 2 feet 7 inches diameter, by 7 feet. Base, 3 feet 10 inches by 6 feet. Fly-wheel projects about 6 inches at the side, and 6 at the end. Works very steadily.

No. 12. Reading Iron Works (Limited), 4009.—Horizontal boiler, 31 tubes, $2\frac{1}{4}$ in. in diameter outside, 5 feet 6 inches long, cylinder horizontal on top of fire-box, $5\frac{3}{4}$ inches diameter, 14 inches stroke, 140 revolutions per minute. Supplied with working slide and expansion slide, with separate eccentric, capable of adjustment by means of set screw on the shaft. Cuts off steam at $3\frac{1}{2}$ inches. Feed-pump driven by separate eccentric. There is no feed-water heater to this engine, but one would be supplied within the price. The feed is regulated by cock and suction, or cock to allow part of the water pumped to return. Lock-up safety-valve as well as usual safety-valve. Large lubricator to cylinder and crank end of connection-rod. Governor on top of boiler driven by strap and bevelled wheels. Balance-weight to fly-wheel; no drum to crank-shaft. Cylinder steam-jacketed, lagged with felt and wood and sheet-iron. Four guide-bars to piston. Boiler provided with two gauge-cocks and glass gauge. Jet-blast to chimney. Proper mudhole doors, and blow-off screw valve. Ash-pan, with close-fitting damper; chain adjustment. Barrel of boiler 2 feet 2 inches diameter. Outside dimensions 2 feet 10 inches wide by 8 feet 10 inches. Smoke-box 2 feet 8 inches diameter, 1 foot $\frac{1}{2}$ an inch long. Fly-wheel projects 1 foot $10\frac{1}{2}$ inches from centre line of engine, and is within the length of the boiler. Chimney 7 feet 4 inches high, $7\frac{1}{2}$ inches diameter. Fire-box, outside 1 foot $11\frac{1}{2}$ inches, inside 1 foot $5\frac{1}{2}$ inches fore and aft; width inside, 2 feet and $\frac{1}{2}$ an inch; three inches of brick on the side next fire-door, 3 inches against tube-plate, and $4\frac{1}{2}$ inches on right-hand side only, leaving the fire 1 foot 8 inches by 11 inches. Total weight, 2 tons 4 cwt., of which the wheels, which are provided and included in price, are from $3\frac{1}{2}$ to 4 cwt.

No. 13. C. D. Eagles, 6793.—Upright boiler with plain fire-box, having two cross tubes only. Large fire, wide bars. Horizontal engine, fixed on cast-iron tank, on which boiler stands. Cylinder $6\frac{1}{2}$ inches diameter; 10 inches stroke; 100 revolutions per minute. Single slide only, with eccentric bent in S form. Guide-block working in guide on bed-plate under overhanging guides, so that guide-block is T shaped. Feed-pump small, projects outside connecting-rod and guides, working upon small bearings. The governor stands over the crank-shaft, and is driven by friction only. The fly-wheel is not balanced, and the band-wheel outside is too small for its work (2 feet diameter, 6 inches wide). The engine is badly fitted. The brasses have plain plummer-blocks. Cylinder lagged with thin wood and not steam-jacketed. Glass gauge; no gauge-cock; no blow-off cock; no close ashpan or damper. Boiler provided with mudhole doors, and mudhole doors to water-tank in bed-plate. Fire-box 2 feet $4\frac{1}{2}$ inches diameter inside; bars $\frac{3}{4}$ inch wide, $\frac{5}{8}$ths spaces. Water-space and thickness of tube plates 3 inches. Diameter of shell of boiler 2 feet $10\frac{1}{2}$ inches. Base 4 feet 5 inches, by 4 feet 9 inches. Height 5 feet $7\frac{1}{2}$ inches. Fly-wheel projects sideways 7 inches, and 1 foot $6\frac{1}{2}$ inches beyond end.

N.B.—In working, the chimney was constantly red-hot; the ashes fired the timbers on which the engine stood, there being no close ash-pan or damper; and the bed-plate cracked right through, and the consumption of fuel was enormous.

No. 14. Davey, Paxman, and Davey, 7100. This was a 4-horse vertical engine, attached to its boiler, the cylinder acting invertedly upon the crank-shaft, which was close to the foundation plate upon which the boiler was fixed. The diameter of the cylinder was $6\frac{3}{4}$ inches, and its stroke 1 foot. The exhibitors elected to run at 115 revolutions. The boiler consisted of an outer cylindrical shell, 7 feet 3 inches high by 2 feet 7 inches diameter. It contained a cylindrical fire-box, 2 feet in diameter, and 4 feet 3 inches high above the fire-bars. From the centre of the top of this box a $7\frac{1}{2}$ inch tube went up through the top plate, forming the central chimney. From the crown of the box there depended sixteen $2\frac{1}{2}$ inch (external) diameter tubes, which hung down about three feet, and then, by means of a bend, turned, round so as to present their lower ends to the circumference of the fire-box, with which they were united. Thus these tubes were filled with water, having a connection with the water-spaces at their bottoms, with the sides of the fire-box, and at their tops at the crown of the fire-box. There was a concave diaphragm hanging a short distance below the lower orifice of the chimney, so as to prevent the products of combustion from going direct up it. The cylinder and its top and bottom cover were steam-jacketed. There was no expansion valve. The jacket being at all times open to the boiler, so that whenever the steam was up the jacket was filled. The water arising from the condensed steam flowed back into the boiler as it was formed. The cast-iron base-plate was hollow on three of its sides, and served as a tank for the feed water. This water was heated by the admission of a portion of the waste steam, and the result appeared to be to raise the temperature very nearly to the boiling-point. The feed-pump was worked off a special eccentric, and was fully sufficient to meet the requirements of the boiler. There was a governor with throttle-valve, and a hand regulator. This engine was fired and worked by Mr. Paxman, one of the exhibitors, who said it was the first time he had ever acted as stoker; but he certainly did himself very great credit, and attended to the Judges' directions most minutely. He succeeded in obtaining a run of 2 hours 19 minutes 42 seconds, computed off the break, equivalent to a consumption of 6·01 lbs. of coal per horse-power per hour. It should be observed that the boiler was thoroughly well cleaded The engine was not a showy engine by any means, but was well-designed and proportioned and well made.

No. 16. The last engine tried in this class was that of Mr. W. N. Nicholson, 4314. This had also a vertical boiler and the engine also was vertical, its cylinder was $6\frac{3}{4}$ inches diameter, by 1 foot stroke. The exhibitor elected to run 100 revolutions per minute. The engine was bolted to a cast-iron bed-plate, as was also the boiler, but otherwise they were not connected. The cylinder was below, and the piston worked an overhead crank-shaft. The boiler was cylindrical, 6 feet 8 inches high externally, by about 2 feet 9 inches diameter. It had an internal fire-box, slightly conical, with two transverse tubes placed on an incline, and, like Robey's and Marshall's boilers, had tubes 16 in number pendant from the crown of the fire-box, containing within them circulating tubes on a plan invented now upwards of thirty years ago by the late Jacob Perkins, of steam-gun notoriety; but the circulating tubes were flanged out at their upper ends on Field's plan. There was a central chimney to the fire-box. The boiler was without any cleading. There was only a single slide, and this was so set that the steam was admitted during very nearly the whole of the stroke, certainly $\frac{9}{10}$ths of it. From such a construction as this only one result could be expected, and that result was obtained. The engine ran for 55·39 minutes (break time), thus showing a consumption of upwards of 14 lbs. of coal per horse-power per hour. There was not any ash-pit damper, nor any means whatever of regulating the consumption of fuel. As a mere matter of workmanship the engine appeared to be well made, and the parts to be very fairly proportioned; but it showed a total want of ordinary scientific knowledge on the part of the constructors.

CLASS 2.—*Fixed Steam-Engines above 4-horse power and not exceeding 10-horse power, worked by an independent Boiler.* 30*l.*

AWARDS.

No.			£.	s.	*d.*
7172.	Clayton and Shuttleworth	equal	11	5	0
4010.	Reading Iron Works Company ..	equal	11	5	0
7082.	Marshall, Sons, and Co.		7	10	0

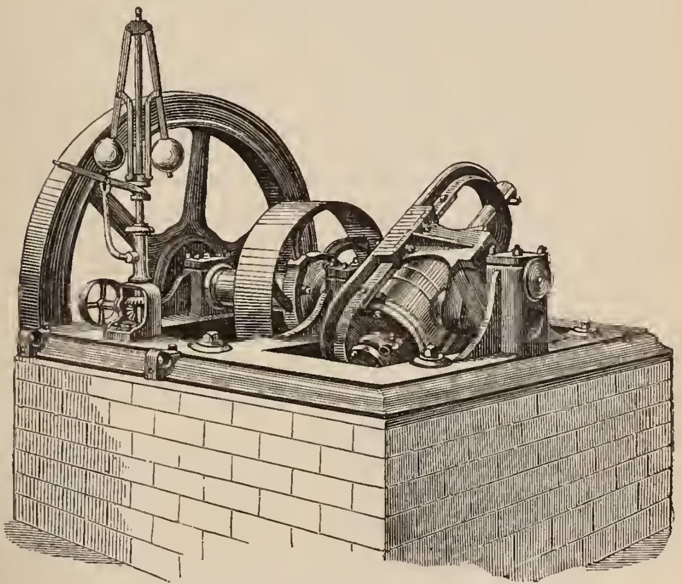
Seven engines of this class were entered for trial, but one did not make its appearance. The six that were tried were taken in the following order:—

Ordinal Number.	Name.	No. in Catalogue.
1.	G. H. Ellis	6801
2.	E. R. and F. Turner	4831
3.	Clayton and Shuttleworth	7172
4.	Marshall, Sons, and Co.	7082
5.	Reading Iron Works	4010
6.	W. S. Underhill	3828

The engines in this class are—as has already been stated, and as is well known to the *habitués* of the Royal Agricultural Society's Shows—always worked off a boiler the property of the Society, but fired by the exhibitors' men. —(See Table II., p. 450.)

No. 1. G. H. Ellis, 6801.—The nominal power of this engine was 8-horse, the diameter of the cylinder was 10 inches, and the length of stroke 10 inches. The exhibitor elected to run at 126 revolutions. This engine is called by the exhibitor a lever engine, and is stated to be manufactured by Ellis and Co. (Limited), 91, Gracechurch Street, London. It is all but impossible to give in words an intelligible description of this engine, but we will give the best we can, calling to our aid the annexed engraving, taken from a photograph by Guggenheim, of Oxford.

Fig. 1.—*Ellis's Lever Engine.* (6801.)



From this engraving it will be seen the cylinder is fastened at right angles to the end of the fly-wheel shaft, so that shaft and cylinder revolve together. The shaft is hollow and has a mid-diaphragm, separating it into steam side and eduction side. The steam-pipe and exhaust-pipe are connected with a stationary end plug, and round about a cone formed on this plug the hollow shaft revolves; and thus, passages formed in the end of the hollow shaft are made to pass other passages formed in the cone, and by this means the steam is admitted and exhausted alternately from each end of the cylinder. This arrangement is in lieu of the slide-valve or other apparatus for admitting and exhausting steam. At the cylinder end of the fly-wheel shaft, the end opposite to the plug, there is a fixed pin placed at 5 inches above the common centre of the cylinder and fly-wheel shaft. Upon this pin revolves a block which is contained within a slide formed in a cast-iron frame, which frame embraces the cylinder and is attached to the two ends of the piston-rod, which issues from both ends of the cylinder. By this arrangement it will, on consideration, be seen that when the steam is admitted to press upon the piston, it tends to drive the frame endways, and by this means a side pressure is put on which causes the revolution of the entire cylinder with the cast frame within which the cylinder is placed. To enable this revolution to take place, however, it is obvious that there must be a sliding motion between the cylinder and the frame before referred to. Thus, there are two sliding motions —one in the direction of the line of the cylinder, and another at right angles to that direction. It is obvious that this is a construction which must give very large friction—friction of the nature that occurs in those engines known as "dog-crank" engines, the term applied by mechanics to the slotted piston-rod commonly used in small engines where there is not any connecting rod. But the friction here is far worse than that of any ordinary dog-crank, for that friction, at all events, is put on in the centre line of the machine, whereas here it is put on at one side. As might have been expected, the results of the endeavours to work this engine were most unfavourable. Mr. Ellis elected to run at 125 revolutions. He called his engine 8-horse-power. The computed weight upon the break was 230 lbs. The fly-wheel of the engine was very small, and the break-revolutions consequently slow; but the engine was never able to lift this weight at 125 revolutions, nor indeed at any greater number of revolutions than 42. The load was reduced weight by weight to endeavour to see what the engine would lift when at the speed of 125; but it was found to be far below this speed even when only 36 lbs. weight remained. We then directed the strap to be thrown off and the engine to be run as fast as it would go. This turned out to be 126 revolutions, per minute, or one revolution more than it was intended to have kept up when the full load was on. A result so absurd that no further trial of the engine was attempted. We almost regret that we did not try the consumption of coal at the 42 revolutions, as we believe, from the immense amount of steam that went through the engine, it would have proved very large. Irrespective of fuel consumed, the utmost duty of this machine was one-third of its nominal power. It has been thought well to go at some length into a description of this engine, as it may probably cause persons of an inventive disposition, but without practical experience, to pause before they embark money in carrying out crude ideas.

No. 2. E. R. and F. Turner, 4831.—This was a horizontal engine on a framed cast-iron bed-plate, planed all over, having a wrought crank shaft proceeding out from one side of the engine; that is to say, not a shaft having bearings on both sides. In lieu of a crank there was a cast-iron disc into which the crank-pin was inserted. The engine was jacketed with steam both round the cylinder and at the ends. There was an expansion-slide at the back of the main slide, and the throw of this expansion-slide was regulated by the action of the governor, raising or lowering the slide-block in a link placed very near to the expansion eccentric and worked by it. The governor was driven entirely by gearing, and there was no throttle-valve or other mode of regulation than the varying of the expansion above mentioned. The feed-pump was worked off a third eccentric placed outside the governor. The main eccentric was situate in the middle of the plummer-block, which was separated into two portions to admit of the eccentric thus occupying such position. On trial this engine ran for

2 hours 17 minutes 15 seconds, showing a consumption of 6·09 lbs. of coal per horse-power per hour. Part of this comparatively poor result we believe to have been due to imperfect stoking.

No. 3. The third engine in this class was that of Clayton and Shuttleworth, 7172, nominally 10-horse power: diameter of cylinder, 10 inches; stroke 1 ft. 8 in. The exhibitors elected to run at 65 revolutions. This was a horizontal engine fixed on a complete bed-plate; that is to say, a frame placed on a solid panel. The crank-shaft was a bent wrought-iron shaft carried in plummer-blocks on each side of the engine—these plummer-blocks being fitted with sideway and vertical adjustments for the brasses. The cylinder was steam-jacketed round the body and about the ends, and took its jacket-steam from the boiler side of the stop-valve. There was an expansion-slide worked off a link in which was a sliding-block attached to the eccentric rod-end. This link was very near the cylinder. The block was caused to rise and fall by the governor, which thus gave a small variation of expansion. The governor also operated upon a throttle-valve of the ordinary construction for the purpose of further regulation. The feed-pump was worked off a separate eccentric. The design and proportion of this engine were excellent, as was also the work done. On trial this engine ran for 3 hours 23 minutes 36 seconds of break-time, the equivalent consumption of fuel being 4·12 lbs. per horse-power per hour. The price of this engine, with Cornish boiler and fittings complete, is stated in the catalogue to be 240*l.* We, for reasons which will be given when we come to speak of the Reading Iron Works Company's engine, awarded it a prize of 11*l.* 5*s.*, the same as the engine of that Company.

No. 5. The next engine in this class was that of Messrs. Marshall, Sons, and Co., 7082. This was a horizontal engine of 10-horse power (nominal), having a cylinder of 10¾ inches diameter; stroke 1 foot 4 inches. The exhibitors elected to run at 70 revolutions. The frame-work consisted of a most massive bed-plate, 2 feet 2 inches deep, and having a complete diaphragm across the bottom, serving not only as a stiffener but as a receptable for the waste oil. The cylinder was sunk down between the sides of this frame, in which frame were formed the plummer-blocks, so that the thrust and pull was entirely within the line of the framing. The crank-shaft was wrought-iron, supported on each side of the frame, and had counter-balances formed on it. Two loose discs were placed at the backs of the cranks and balances as a matter of ornamentation and neatness. The brasses were set up sideways, and on the fly-wheel side were also set up vertically. The cylinder and covers were steam-jacketed. The steam was obtained from the boiler side of the stop-valve. There was an expansion slide-valve working between the back of the main-slide and a fixed bridge-plate, which plate was for the purpose of relieving the pressure. The expansion was variable by hand whilst the engine was running. This was effected by means of double nuts and right and left hand screws on the slide-stalk. There was a governor, with an ordinary throttle-valve, for the purpose of regulation. The cylinder and jacket were well cleaded, and the ends of the cleading were covered by neat mahogany casing. On trial this engine ran 2 hours 42 minutes 6 seconds—equal to 5·18 lbs. of coal per horse-power per hour. The amount of water consumed was taken. The evaporation was low, showing that the stoker—who was using the same boiler as the other stokers—was not up to the exigencies of racing. Had he been, we are convinced, as we have already said, that the performance of the engine running would have been considerably higher. It should be stated that this engine has not any feed-pump included in its price, the exhibitors saying that they recommend an injector to be used, and do not, therefore, provide a feed-pump. The price (130*l.*) is therefore not that of a complete engine, as the cost of a feed-pump or that of an injector, must be added. It should also be noticed, that an injector will not work with hot water. It is difficult to speak in too favourable terms of the thoroughly substantial manner in which this engine was manufactured. There is no doubt that the strength of its parts was such that it could work with perfect safety very much in excess of its nominal power. The work also was exceedingly good. Taking all the circumstances into consideration, we awarded it the second prize (7*l.* 10*s.*); or rather, looking at the fact that there are two first prizes, it would be more correct to say that we put it in the third place of merit.

No. 6. The next exhibitors in the class were The Reading Iron Works Co., who exhibited a 10-horse Horizontal Engine (4010), having a cylinder $8\frac{5}{8}$ inches diameter only, and a length of stroke of 1 foot 8 inches. The exhibitors elected to run 105 revolutions per minute. This engine was carried upon a complete cast-iron bed-plate, planed all over, supporting two plummer-blocks with sideway and vertical adjustments for their brasses. The crank-shaft was of wrought iron, forged—not bent. The cylinder was steam-jacketed round the body, and derived its steam from the boiler side of the stop-valve. The cylinder covers have air spaces, but are without steam. There is an expansion valve, which could be adjusted when the engine was standing. A governor with an ordinary throttle-valve, and a feed-pump worked off an eccentric. There were no other special points to note in this engine, but the proportion and workmanship were admirable; and on trial the engine ran for 3 hours 18 minutes 54 seconds, and consumed 4·22 lbs. of coal per horse-power per hour. The price of this engine with the boiler is stated in the catalogue to be 202*l.*, or 38*l.* less than the price of Messrs. Clayton and Shuttleworth's; and, looking at the fact that the time during which this engine ran was only 4 minutes 42 seconds less than that of Messrs. Clayton and Shuttleworth's—that its consumption of coal was only $\frac{1}{10}$ lb. per horse-power per hour more; and setting this slight superiority against the benefit to the customer of the reduced price as compared with Messrs. Clayton and Shuttleworth's, we felt bound to divide the first prize into two, and to give one (as already stated) of 11*l.* 5*s.* to Clayton and Shuttleworth, and another, also of 11*l.* 5*s.*, to the Reading Iron Works Company Limited.

No. 7. 3828.—The sixth and last engine of this class was that exhibited by W. S. Underhill, Newport, Salop. This was a Horizontal Engine of 10-horse power, having a cylinder $10\frac{3}{4}$ inches diameter, and a stroke of 1 foot 2 inches. The exhibitor elected to run at 97 revolutions per minute. The engine was carried on a frame bed-plate, provided with two bearings having sideway adjustment, the cuts in the brass being at angles. The cylinder and covers were steam-jacketed, deriving their steam from the slide jacket. The expansion valve was of peculiar construction, as it contained within it the throttle-valve, which thus moved backwards and forwards with the expansion valve, the valve stalk being also the throttle-valve spindle, the spindle slid through the eye of the lever worked by the governor; and being (in the eye) of a D shape, vibrated as the lever rose and fell. The expansion slide was provided with an end pipe which worked telescopically over the steam-pipe internal to the jacket; and thus steam entered into the eccentric slide at the back of the throttle-valve. But the telescopic pipe not being tight, as the sliding joint, sufficient steam passed through that joint to fill the jackets. The variation of the expansion was made by hand when the engine was standing. There was no feed-pump worked by this engine, but a small donkey-engine was bolted to the side of the cylinder, to be worked by steam out of the jacket. The Exhibitor imagined that by placing the throttle-valve so close to the cylinder he would get a more efficient regulation. This, however, appears to us to be an extremely microscopic advantage, as the contents of steam between the throttle-valve, as ordinarily placed, and the cylinder would not, as a rule, suffice for a quarter of a revolution of the engine. On trial, Mr. Underhill's engine ran for 2 hours 23 minutes, and the equivalent consumption of coal was 5·87 lbs. It should be stated to the praise of this exhibitor that he provided a feed-water heater; which, however, he could not use during the trial for the reasons already stated.

Section II.—Horse Gears.

There is still, even in England, a very considerable use of Horse Gears, farmers alleging that there are times when horses, which must of necessity be kept on the farm, are not fully employed, and when their power can be exerted in propelling machinery by the agency of horse gear, without any appreciable extra cost over and above that which would be incurred if they were merely engaged in the profitless occupation of "eating their heads off;" and in foreign countries, where steam-engines have not yet been so commonly adopted as they have been in England, animal power is generally relied on. That the trade in these gears is very large, may also be gathered from the fact that no fewer than 70 were exhibited by 41 exhibitors, and a large proportion of these gears were entered for trial.

The Engineer-Judges found themselves directed to determine upon the merits of these animal power machines, and to try them (but how they were to try them did not appear). This direction for trial seems sufficiently simple in the case of steam-engines, for the well-known and time-honoured appliances for that purpose are, as has already been explained in the Report on that subject, provided by the Society, but no means existed for the trials of the Horse Gears, nor could the Judges learn that there had ever been any efficient trial of these machines.

Any person conversant with mechanics will know that in an apparatus the especial object of which is to convert a slow motion of some two or three revolutions per minute into a motion of from 100 to 150 revolutions per minute, it would be useless to endeavour to test the merits of such a machine by working from the quick-going shaft back to the slow-going one, and they would also know that any attempt to try the machine by less than the working load which would come upon it in practice would be likely to give fallacious indications; and he will thus understand why it became necessary to devise a means by which the gears might be worked for trial under similar circumstances to those in which they would be used in practice.

Fortunately for the trial, traction engines exist which can be employed in lieu of horses as a motive power for horse gears.

Taking advantage of this fact, an apparatus was arranged which consisted of a temporary wooden drum 8 feet in diameter. This drum was fixed to the poles of the two horse gears, and round about it was coiled a rope 100 yards in length, the end of this rope being attached to a dynamometer spring link, which was in its turn attached to the draught-hook of one of Aveling and Porter's traction engines. The description will be better understood by reference to the accompanying illustration (see next page) from a photograph by J. Guggenheim. There was thus provided a means by which the horse gear could be caused to rotate at a proper pace as the engine slowly drew away uncoiling the rope from the drum, and also by the link there was afforded a means of ascertaining what tractive force was being exerted to draw out this rope. This tractive force multiplied into the distance passed over by the engine represented the power consumed in working the horse gear.

For the purpose of finding out what useful effect the horse gear delivered, nothing more was needed than to cause it to work one of the dynamometer breaks which have already been described in the Report upon the engine trials.

By these means that percentage of the power employed, which was delivered as useful effect off the driving pulley of the horse gear was ascertained. As soon as the trial was finished with one-horse gear the drum was removed from it and placed upon another, which during the trial of the first had been fixed in its neighbourhood, and thus the experiments went on through three long days. That they were completed even in that time is due to the fact of Messrs. Aveling and Porter having afforded (in addition to the ordinary traction engine which drew the rope) the assistance of their valuable traction crane engine, the well-known "Little Tom". This engine, with its skilful juvenile driver, ran about the yard realising all the tales that one has ever heard of the power and of the intelligence of the elephant. It went in and out of places where there did not appear to be room for it. It turned in positions which seemed impossible—it lifted all sorts of pieces of machinery—carried them to their destination—set them down upon the ground; or even in the case of the millstone trials, (which must not be described here, as they fell to the lot of the other Judges,) placed the running stone upon the bed stone; and, in the case of these horse gears, Little Tom picked up the gears, put them down upon the ground, picked up the wooden drum from the gear that had been tried, placed it upon the gear that was to be tried, laid hold of the one the trial of which had just been completed, pulled it out of the ground, and ran away with it to the exhibitor's stand.

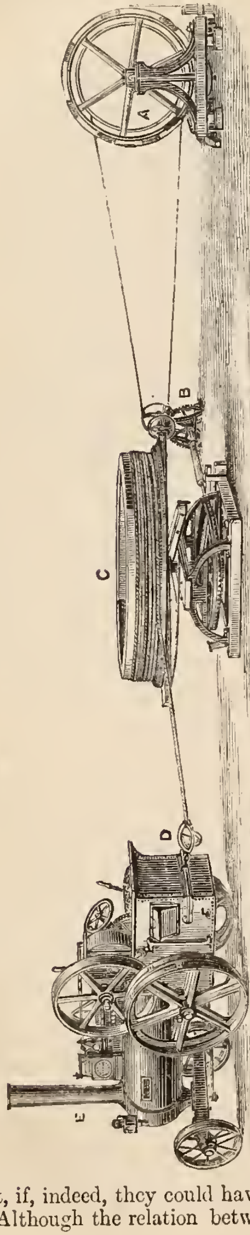


Fig. 2.—Mode of Testing Horse Gears.

A. The Break, with Load. B. Intermediate Frame. C. Drum on frame of Horse Gear.
D. Dynamometer Spring Link. E. Traction Engine.

It is really difficult to speak too highly in praise of the utility of this engine of Messrs. Aveling and Porter, and it is impossible to speak too highly of the unremitting exertions of Mr. Aveling, and of all those engaged under him, in aiding us in carrying out the horse gear trials.

In mere justice, we must also acknowledge most gratefully the valuable assistance we received from Mr. Amos, jun., who presided over the friction break with unflagging zeal, and worked out many of the results, and but for whose devotion these experiments could not have been so successfully carried out, if, indeed, they could have been completed at all.

Although the relation between the useful effect developed and the power

TABLE III.—RESULTS WITH HORSE GEARS FOR 2 HORSE-POWER.

Name of Exhibitor.	Number of Stand.	Catalogue Number.	Price. For Statement of what is included, see Catalogue.	Diameter of Horse Track.	1st Motion. Approximate Diameter of Wheel.	1st Motion. Approximate Diameter of Pinion.	1st Motion. Pitch.	1st Motion. Width on Face.	2nd Motion. Approximate Diameter of Wheel.	2nd Motion. Approximate Diameter of Pinion.	2nd Motion. Pitch.	2nd Motion. Width on Face.	Revolutions of the Spindle which drives Machinery for 1 Revolution of Horse Gear.	Useful Effect, i.e. Percentage of the Power left available for Driving Machinery as ascertained by Dynamometer and Break.	Remarks.	Judges' Award.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
			£ s.	feet. in.	feet. in.	Inches.	Inches.	Inches.	feet. in.	Inches.	Inches.	Inches.				
Baker	16	746	14 10	20 2	5 $0\frac{3}{16}$	$8\frac{3}{8}$	$1\frac{3}{4}$	$3\frac{1}{8}$	2 $3\frac{1}{4}$	$4\frac{11}{16}$	$1\frac{1}{8}$	2	34·0	69·8	Bevil and spur gear.	
Cambridge	21	984	12 10	22 0	2 $11\frac{1}{2}$	$6\frac{1}{8}$	$1\frac{3}{8}$	3	2 5	$4\frac{13}{16}$	1	$2\frac{1}{2}$	35·0	65·7	Horizontal spur and bevil gear.	
Hunt	23	1097	15 0	20 0	..	..	..	..	..	..	..	..	42·0	73·3	Bevil and intermediate motion.	Highly Commended.
Coleman and Morton	41	1698	15 0	19 8	3 $6\frac{7}{8}$	$5\frac{3}{4}$	$1\frac{3}{8}$	$2\frac{3}{4}$	1 $6\frac{7}{8}$	$4\frac{13}{16}$	$1\frac{1}{4}$	2	29·0	69·3	Bevil gear and intermediate motion.	Commended.
Hunt and Pickering ..	64	2025	15 10	22 0	3 $5\frac{3}{4}$	$6\frac{3}{4}$	$1\frac{3}{4}$	3	1 $11\frac{7}{8}$	$4\frac{3}{16}$	1	$2\frac{3}{8}$	36·0	62·3	Bevil and intermediate motion.	
Holmes and Sons ..	65	2142	13 0	20 2	4 $1\frac{7}{16}$	$6\frac{1}{8}$	$1\frac{1}{2}$	$2\frac{3}{4}$	2 $0\frac{13}{16}$	7	1	2	28·0	73·4	Bevil and intermediate motion.	
Carson and Toone ..	81	2665	12 12	22 0	3 $1\frac{5}{8}$	7	$1\frac{3}{8}$	$3\frac{1}{4}$	..	..	..	$2\frac{1}{2}$	32·0	65·6	Horizontal spur and bevil gear.	
Brown and Maude ..	105	3314	12 10	22 4	3 5	$5\frac{3}{4}$	$1\frac{1}{2}$	$3\frac{1}{2}$	2 $1\frac{1}{2}$	$4\frac{3}{8}$	$1\frac{1}{8}$	$2\frac{3}{4}$	41·5	67·2	Annular spur and bevil gear.	
Reading Iron Works (Limited).	154	4013	11 0	21 6	1 $10\frac{11}{16}$	$4\frac{9}{16}$	$1\frac{3}{16}$	$2\frac{3}{4}$	1 $8\frac{3}{8}$	$3\frac{13}{16}$	$1\frac{3}{16}$	2	32·0	66·8	Sun and Planet spur gear. N.B. The spur wheel is internal and fixed, the 3 carrier wheels have 24 teeth each: second motion has bevil gear.	
Woods, Cocksedge, and Warner.	155	4041	15 15	21 0	4 $1\frac{5}{8}$	$5\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{5}{8}$	1 $9\frac{3}{16}$	$4\frac{3}{4}$	$\frac{7}{8}$	$2\frac{1}{4}$	38·5	72·2	Bevil and intermediate motion.	Commended.
Woods, Cocksedge, and Warner.	155	4042	17 17	21 0	5 2	$6\frac{3}{4}$	$1\frac{5}{8}$	3	2 3	5	$\frac{7}{8}$	2	50·0	75·9	Bevil gear and intermediate motion.	1st Prize £5.
Binnie, Dayer, and Co.	181	4760	14 0	22 0	3 6	$6\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{5}{8}$	2 0	5	$1\frac{1}{8}$	$2\frac{1}{2}$	50·0	72·5	Bevil and spur gear.	
Turner, E. R. and F. ..	184	4834	11 0	18 10	3 6	$5\frac{5}{16}$	$1\frac{1}{2}$	3	2 $0\frac{1}{2}$	$4\frac{3}{4}$	$\frac{7}{8}$	$1\frac{3}{4}$	41·0	78·8	Bevil and intermediate motion.	Prize £2 10s.
Richmond and Chandler	185	4890	16 0	21 0	2 $6\frac{5}{8}$	$6\frac{5}{8}$	$1\frac{3}{8}$	$3\frac{1}{2}$	1 $1\frac{1}{8}$	$5\frac{3}{4}$	$1\frac{3}{8}$	3	32·33	73·1	Horizontal spur and bevil gear, and intermediate motion.	Prize £2 10s.
							3rd Motion	.. ..	1 $2\frac{3}{8}$	$4\frac{3}{4}$	$\frac{3}{4}$	2				
Mellard (Limited) ..	200	5222	12 0	20 8	3 $11\frac{1}{4}$	$5\frac{3}{4}$	$1\frac{1}{2}$	3	1 $11\frac{5}{8}$	$4\frac{3}{4}$	$\frac{7}{8}$	$2\frac{1}{4}$	41·0	73·0	Bevil gear and intermediate motion.	Highly Commended.
Fardon	223	5792	14 0	22 4	4 1	$8\frac{7}{16}$	$1\frac{3}{4}$	3	0 11	$4\frac{13}{16}$	$\frac{15}{16}$	2	31·25	62·7	Bevil throws out.	
							3rd Motion	.. ..	0 11	$4\frac{13}{16}$	$\frac{13}{16}$	2				
Davis	240	6209	14 6	21 9	2 $7\frac{1}{2}$	$5\frac{5}{16}$	$1\frac{3}{8}$	$3\frac{3}{8}$	1 $9\frac{1}{2}$	$3\frac{5}{8}$	$1\frac{1}{8}$	$2\frac{1}{4}$	36·0	59·4	Annular spur and bevil gear.	
Corbett	245	6339	15 10	22 4	3 $11\frac{1}{4}$	$5\frac{3}{4}$	$1\frac{1}{2}$	3	1 $5\frac{13}{16}$	$4\frac{3}{16}$	1	$1\frac{3}{4}$	35·5	71·1	Bevil and intermediate motion.	Commended.
Denning and Co. ..	247	6413	10 0	16 10	3 $2\frac{1}{8}$	6	$1\frac{1}{2}$	3	1 $9\frac{5}{8}$	$5\frac{1}{2}$	1	$1\frac{5}{8}$	24·0	64·8	Bevil and spur gear.	
Williamson	284	6736	17 0	22 0	4 $7\frac{11}{16}$	$8\frac{3}{8}$	$1\frac{3}{4}$	$3\frac{1}{8}$	2 7	$5\frac{5}{8}$	$1\frac{1}{4}$	$2\frac{1}{4}$	37·0	70·9	Bevil and spur gear.	Commended.
Weighell	286	6749	10 10	20 0	3 $9\frac{5}{8}$	$7\frac{5}{16}$	$1\frac{3}{4}$	$3\frac{1}{2}$	2 3	$4\frac{1}{2}$	1	$2\frac{1}{4}$	15·75	74·8	Bevil and spur and intermediate motion, the 15·75 revolutions are obtained by the omission of the 2nd motion.	
							3rd Motion	.. ..	1 9	$8\frac{1}{8}$	$\frac{3}{4}$	$1\frac{3}{4}$	95·0	60·9		

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NOTE.—The approximate diameters of wheels and pinions have been obtained by calculation from the statements made by the Exhibitors as to the number of the teeth and their pitch.

employed is of very great importance in the question of determining the merit of different horse gears, it is by no means the sole question. We had in addition to determine whether the gear was well made, well proportioned, and formed of enduring materials, also to take into consideration how far the design is one which conduces to the safety of the animals and men engaged in working it, or who may be in its neighbourhood, and further whether it is provided with a clutch, with a break, and with other useful adjuncts. (See Table III., Section II., Class 2.)

The prizes, it will be seen, did not follow the order of merit in relation to the useful power developed, we having, as already explained, to take other points into consideration.

It must also be borne in mind that the mere useful results shown by column 15, if taken by themselves, might lead to an erroneous conclusion, because the multiple of gearing, it will be seen by column 14, varies from as little as $15\frac{3}{4}$ to 1 to as much as 95 to 1; and when it is recollected that the power absorbed in friction is so absorbed in consequence of its being transmitted through the shafting and gearing by which this multiplication is made, it is clear that in those cases where a high speed is developed a less amount of useful effect should be obtained than when only a low speed is reached, although the machines in the two cases may be equal in merit as regards their design and construction. The Exhibitor, therefore, who by only obtaining a lower speed with his driving-shaft, obtains also a higher effective result, is in truth throwing upon the user of his horse gear the loss of power in getting up the speed from the point where the exhibitor leaves it, while in another horse gear working at a higher speed, but with less apparent economy, no such further loss would be incurred by the user of it.

The table enters with so much minuteness into the details of the gearing of the different machines, that very little room is left for comment in this Report. We, however, call attention to the fact of the great necessity there is for having well-designed forms of teeth for the gearing, and point to the apparatus, No. 4834, exhibited by Messrs. Turner of Ipswich, which afforded, although its gearing multiplied as much as 41 times, the high percentage of 78·8. Looking at the machine, however, as a whole, we did not consider it equal in point of general completeness of design and excellence of parts to that exhibited by Messrs. Woods, Cocksedge, and Warner, to which we awarded the First Prize; but on an examination of the toothed wheels of Messrs. Turner's apparatus we found them so arranged as to run with an ease and freedom which fully accounted for the extremely favourable results in point of effective duty exhibited by this machine.

The modern horse gears which have come under our notice at the Oxford Show possess, owing to their being self-contained, portable, and easily fixed in any desired spot, merits which do not belong to the old-fashioned horse gears, with the large overhead first-motion wheels, but the authors of this Report believe that, owing to the use of these large wheels, the old-fashioned gear is one by which horse-power may be transmitted and converted into quick motion with less loss in friction and less wear of the parts than it can be by the modern gears; and it is believed that any one intending to employ horse-power always in one locality upon his property, would do well to thoroughly consider whether he should not erect in a building an overhead gear with large first-motion wheel, rather than avail himself of even the best of the portable forms of gear that have been exhibited at this Show.

The one-horse gears were not tried by the break. Owing to their having only one pole there was not any ready means of fastening the drum to them, and it would have been impossible, had these machines been put upon the break, to get the trials completed much before the close of the show. We therefore felt that we could, by applying the information which the trials of the two-horse gears had elicited, to the consideration of the merits of the one-horse gear, arrive at very reliable results as to the order of their excellence.

Although a horse gear can be judged of far better by mere inspection than a steam-engine can be, there is no doubt that the trial of the two-horse gears has been very useful; it has disclosed the very striking fact that in the case of Messrs. Turner's machine, No. 4834, multiplying as much as 41 times, more than three-fourths, namely 78·8 of the power employed to work the gearing, is given off as useful effect, and that in the machine of Messrs. Woods, Cocksedge, and Warner, No. 4042, a result probably of equal excellence in point of economy is obtained, inasmuch as that machine gives off close upon 76 per cent., actually 75·9, with the multiplication as high as 50 to 1, that of Messrs. Turner being only 41 to 1, and the trials also show that one of the exhibitors puts forward a machine which, while it only multiplies 36 to 1, yields but 59·4 per cent. of the power employed to work it.

F. J. Bramwell,
E. A. Cowper.

Awards:

Class 1.—*For Gears for one Horse.*

		£. s. d.
4038.	Woods, Cocksedge, and Warner	5 0 0
4889.	Richmond and Chandler	2 10 0
1099.	Hunt, Reuben	2 10 0
2024.	Hunt and Pickering	Highly commended
1696.	Coleman and Morton	Commended
6338.	Corbett, T.	ditto
4011.	Reading Iron Works Co.	ditto.

Class 2.—*For Gears for two Horses.*

		£. s. d.
4042.	Woods, Cocksedge, and Warner	5 0 0
4834.	Turner, E. R. and F.	2 10 0
4890.	Richmond and Chandler	2 10 0
1097.	Hunt, R.	Highly commended
5222.	Mellard's Trent Foundry	ditto
1698.	Coleman and Morton	Commended
6339.	Corbett, T.	ditto
6736.	Williamson Brothers	ditto.
4041.	Woods, Cocksedge, and Warner	ditto.

The reasons which influenced the Judges in their decisions have been ably stated in the Report. We may, before entering into some particulars as to construction, allude to the very large entry of these applications as a proof of the importance of the business therein, and the extent of the demand. On all farms where steam is not at command, the farmer must fall back upon horse gear for operations of daily occurrence—such as preparing food. Nay, even where steam power is used, we are convinced that horse gear, for certain operations, may be economically employed. For example, the pulping of roots should be a daily operation, as their virtue depends materially upon their freshness. It would be a costly business having to use steam for this purpose, one horse employed for an hour or two being sufficient. For reasons that are explained in the Report, it was not possible to try the One-Horse Gears. The experiments were not begun until late in the trial week, owing to Messrs. Bramwell and Cowper having been occupied with the Fixed Engine trials. We think that it would be quite possible to try this class (the One-Horse Gears) by manual labour—attaching the spring dynamometer to the end of the pole, and pulling round the gear by a rope, the men describing the same circle that the horse would travel in. The great point is to have a steady power, and this might be managed by having a sufficient number of hands. But in nearly every case when exhibitors showed the two descriptions, the 1-horse gears were identical in arrangement, only the parts were lighter; hence it was easy to come to a satisfactory conclusion regarding them.

Woods, Cocksedge, and Warner's 2-Horse Gear, No. 4042. 1st Prize of 5*l.* in Class II.—The machinery is contained in a strong oak frame. Stakes driven into the ground at the four corners secure its position. Can be used for four horses if required, and can be mounted on wheels for transportation from place to place. This is more especially useful for export trade. When intended for permanent fixture, timber should be laid down to which the frame can be securely bolted. The driving wheel is about 5 feet 2 inches in diameter, very strong, the cog gearing is separate from the wheel, and is made in eight segments bolted on, a layer of wood, $\frac{5}{8}$-inch deal or ash, intervening to reduce the jar. The segments being bolted on, can be readily replaced in the event of accident. The periphery of the wheel has a turned flange on the upper edge on which the friction pulleys travel, which, fixed to the frame, tend to steady the wheel and ensure proper gearing. The bearings are large, made of brass, and are fitted with lubricator boxes. The pinion is shrouded. The spindle, of wrought iron, works in a brass toe-pan with four adjusting screws, in the same manner as a millstone shaft. The universal joints are of forged iron. The intermediate motion is supplied with a gearing clutch for throwing in and out of gear, and the shaft carries three pulleys if required. A long and short spindle are supplied, the latter for driving a chaff-cutter. The price, 17*l.* 17*s.*, includes everything described except the pulleys.

No. 4041. Very similar to the above, without segmented teeth. Was commended. Price, 15*l.* 15*s.*

No. 4038—1-Horse Gear, First Prize of 5*l.* in Class I.—is carried on an angle-iron with four bolt holes, for attachment to either timber or stone. The driving-wheel, 3 feet 6 inches in diameter, is cast in one piece with a dome top, through an opening in which the oiling of the step is effected. The shaft is in a brass socket, not adjustable. The intermediate motion is supplied with clutch gearing, and the wheels are protected by a simple cap. The construction is very similar to that of the 2-horse gears—only on a reduced scale. Price, 11*l.* 11*s.*, without pulleys.

Richmond and Chandler.—2-Horse Gear, 4890. Second Prize of 2*l.* 10*s.*, Class II.—The frame is in two castings.—The uprights which carry the top are cast solid with the foundation plate; there are four bolt holes at the corners to fix the machine, and the upper and under castings are also bolted together by rods passing down through the uprights, and secured underneath.

The first-motion wheel is only 2 feet 6⅝ inches diameter, but very strong. The shaft has a bearing in the saddle, and works in a chilled foot step, oil being supplied by a small pipe. The increase of motion is obtained by bevil gearing. The bearings are of brass. The increase of speed is as 32·3 to 1. The gearings of intermediate motion are protected by a cover, the shaftings are of turned wrought iron. This is a well-made gear, running smoothly. Price, without pulley, 16*l.*

No. 4889. 1-Horse Gear. Second Prize of 2*l.* 10*s.* in Class I.—This differs entirely from the last described. The driving gear is cast on a flat top, which revolves. An upright pillar, round which the top works, is cast on the bottom frame, and is turned at both ends, to give the necessary bearings. A hollow pillar, cast with the top and carefully bored, revolves on the upright pillar. Thus the whole of the apparatus, including the driving-wheel, is composed of only two parts. First motion consists of a bevel wheel and pinion. The bearings are brass, and the universal joints are similar to those of the 2-horse gear. The pole is attached to the top by a strong bracket and bolt. The appearance is that of a circular box, and very complete—the top keeping out dust, &c., from the gearing. The top runs under a friction pulley, which, however, is hardly necessary. The speed is gained at twice in the intermediate motion, which is fitted with brass bearings, and is capped. Price, including two connecting rods (the second being for working a chaff-cutter if required), but no pulleys, 11*l.* 10*s.*

E. R. & F. Turner.—2-Horse Gear, 4834. Second Prize of 2*l.* 10*s.*, Class II. —The frame consists of two angle-iron brackets bolted down on an oak frame, supporting a cross-piece with a bearing for the shaft. Driving-wheel, 3 feet 6 inches diameter, with turned periphery and friction pulleys. Wrought-iron shaft, working in a cast-iron step bolted to cross timber. First motion consists of a strong spur wheel and pinion. Universal joint with cast-iron block, capable of working at a considerable angle. The bearings are cast iron, with lubricators. Intermediate gearing carried on angle-iron frame, and supplied with in-and-out clutch. The teeth geared well into each other, and the construction generally appeared very good. Price, 14. 10*s.*, not including pulleys.

Reuben Hunt —1-Horse Gear, 1099. Second Prize of 2*l.* 10*s.*, Class I.—This gear stands in a square frame of cast iron, consisting of four pieces. All spindles of wrought iron. The end of the shaft works in a cast-iron toe, which is separate from the frame and easily renewed; the first-motion wheel is covered with a bell-shaped top. The oiling is by a pipe through an opening in the cover; the bearings are of brass. Strong and well made, the bearings for intermediate motion are cast separately from the frame, and can be easily replaced. Price, 10*l.* 10*s.*, without pulleys.

1097. 2-Horse Gear.—Received a high commendation. Has a wooden frame, with 4 feet 6 inches driving wheel. Striking-out clutch, and cast-iron bearings. Price, 15*l.*, pulleys extra.

Hunt & Pickering highly commended for 1-Horse Gear, No. 2024. A cast T-iron frame in three parts; three angular arms on tripod frame bolted by three bolts to timber or stone. This appears a very substantial foundation. The wrought-iron shaft works in a removable bush. Chilled cast-iron toe capable of adjustment by three bolts, and india-rubber packings. A tension rod from the pole relieves the strain on the arm socket. A wrought-iron draw-bolt and short lever are used to keep the tension-rod in its position, the object being to equalise the strain from end to end of pole. The driving-wheel 3 feet diameter, with turned periphery and steadying pulleys. Ordinary four-square clutch in lieu of universal joint. There is no in-and-out gear. The frame of the intermediate motion wheels is peculiar. In place of pedestals and caps, the angular arrangement of the frame receives the bearings held in place by one adjustable pin. Price, 11*l*. 10*s*., with one pulley.

Mellard's Trent Foundry Company were highly commended for 2-Horse Gear, No. 5222. Frame of cast-iron in three parts. Standards attached to bed-plate by nuts and screws. Diameter of driving-wheel about 4 feet. Wrought shaft, with brass step in a square box. Centre of shaft drilled to allow of oiling. Pinion shaft, of wrought iron, carried on brass bearings. Clutch for in-and-out gearing. Intermediate motion frame of cast iron. Brass bearings throughout. Appears a strong, useful gear—not out of the way at 12*l*., especially as this price includes one pulley.

Coleman and Morton were commended for 1-Horse Gear. No. 1697 comprises a strong oak frame, to which is attached by bolts, the saddle of ribbed cast-iron, which is all in one piece. Driving-wheel, 3 feet 6 inches diameter. The shaft is carried in a bush attached to the saddle. The shoe consists of an iron plate. The bearing on the saddle is adjustable by a set screw. Pinion and shaft strong. Intermediate motion very light. Case-hardened cast-iron bearings. Price, 11*l*. 10*s*.

No. 1698 also commended. 2-Horse Gear.—This differs from the last in having the shaft hollow, cast in one piece with the frame. The driving-wheel revolves on a stationary shaft. No saddle frame above required. Works very steadily. Price, 15*l*.

As both Thomas Corbett's Gears were commended, and as they differ little but in strength, we shall confine our attention to No. 6339, that for 2 horses. The foundation plate is of cast-iron. The brackets, also of iron, are screwed to the foundation plate. The driving wheel is a bevel about 4 feet diameter. The shaft works in a cast-iron shoe bolted to the foundation plate, admits of adjustment by packing. Large friction wheels to steady, and to keep the teeth of driving-wheel well up to their work. The shaft is square, with turned collar and bored collar-plate, set in a cross-piece of oak; by this arrangement the rigidity of the driving-wheel is increased. The intermediate motion pulleys are supported on cast-iron brackets, and there is the peculiarity of an extra gearing by which a pulley can be worked at right angles to the ordinary pulley shaft, if required. This may be convenient in some cases, but there must be some loss of useful force by additional friction. In the event of the load being suddenly removed—as by a belt flying off or the work ceasing, or when the chaff-cutter is thrown out of gear—a break can be applied so as to prevent the pole acquiring an increased speed and striking the horse. Price, 15*l*. 10*s*.

The Reading Iron Works, Limited, were commended for No. 4011, a 1-Horse Open Gear.—Here the means of getting the speed is all contained within the frame. The gear is well made. Cast-iron double-angle frame, with corner bolt-holes for fastening down. The driving-wheel 2 feet 8 inches diameter, with turned periphery and friction rollers, fixed over the bevelled pinion, which is keyed on to a short shaft taking the spur wheel which gives the second motion. The shaft works in a chilled step. Long bored journals and turned bearings, in place of brass. The cap or top for the whole removable and easily replaced. Price, 7*l*. 7*s*. This is certainly a very cheap gear.

Williamson Brothers, of Kendal, were commended for a 2-Horse Gear, No. 6736.—Here again the speeds are all on the frame. A ratchet-wheel attachment is provided, which prevents the pole pressing on the horses when the latter are stopped sharp, or when the load is removed suddenly. Diameter of driving-wheel about 4 feet 7 inches. Main shaft cast; smaller ones wrought. Bearings of brass. Frame in three portions; brackets bolted to the frame. Cross bar in two parts, bolted together and to the brackets. The shaft is large. Face plate couplings are provided in lieu of universal joint, the exhibitors being of opinion that, as the latter wears, friction is increased. Price, 17*l.*

There should undoubtedly be some certain means taken to ensure the price put down in the catalogue being the regular selling price of the article, or, in other words, that the exhibitors should be bound to sell the very same article at the same price to any purchaser within a reasonable time, say a year.

Section III.—Mills.

At the end of the Judges' Report on Mills tried at Bury, it is suggested that improved arrangements be made for attaching the machines to the dynamometer, that the platform should be level all round, so that machines may be brought to, and removed from, the scene; that the trials be under a shed, and that the stone mills should be brought to trial on four wheels. We are happy to say that all these hints, save the last, were strictly attended to with manifest advantage. When once the Judges got fairly into harness, the progress, considering the cumbrous nature of the mills, was quite as rapid as could be expected. The method of bringing the mills to the scene of action was superior to the conceptions of Judges four years ago. Aveling's travelling crane whipped them up and carried them off in a twinkling; and so admirable is the machinery of "Little Tom," and so clever the driver, that the runner-stones were lowered on to the socket almost without manual labour. After watching the operations of this "Little Wonder" for a week, we fully endorse the encomiums bestowed on it in the Engineer's report, and think that the Society would do well to purchase this most useful motive power, which would be found valuable not only during the trials, but whilst the shedding was being erected.

The Judges express dissatisfaction at the nature of the results both from the stone and metal mills. The tests employed were as complete as time would admit, or as the circumstances required. The presence of a practical miller, who acted throughout as the Judges' assistant, was felt to be a valuable innovation, which it is hoped will be continued in the future. According to instructions issued by the Society samples were prepared of wheat and barley, such as, in the opinion of the Judges, were suitable for a farmer's purpose. Each exhibitor was allowed to work until he had properly adjusted his mill, and produced the quality as nearly approaching the sample as possible. On these points the opinion of the miller was of great value. Then, without stopping the mill or altering the feed, a run of five minutes was taken through the dynamometer, the power noted, and produce weighed. The Judges consider that the deficiency of result was, in many cases, attributable to bad management by attendants, rather than to faulty construction. In several instances the pulleys were not of the regulation dimensions; hence the speed was not right. Had the stone mills been driven faster, the work would have been better. No particular improvement has taken place in steel mills, and though several of the power-mills are very suitable for a farmer's purpose, and—on the score of price, handy form for fixing, and moderate durability—really desirable, the Judges were unanimous in condemning the class of hand-power mills as practically useless, on account of the power consumed for a miserable result, making it far more costly than a miller's fees; and they also wish to state their conviction that mills with stone grinders are not suitable for portable purposes.

Class 1.—*For Mills with Stone Grinders, for grinding Agricultural Produce into Meal, by Steam or Horse-power.* £20.

Awards.

6751.	John Weighell	£8
4836.	E. R. and F. Turner	7
7083.	Marshall, Sons, and Co.	5
4014.	Reading Iron Works Company	Commended.

Eleven exhibitors came forward. The great variation in price, which ranged from 30*l.* to 86*l.*, was particularly noted by the Judges. We cannot see how the high figures can be justified. Derbyshire stones are quite good enough for farmers' use; but even if French burrs are preferred a good mill ought to be bought for about 50*l.* The table prepared by Mr. Amos Jun. contains the results of the dynamometer experiments to which each mill was subjected. By reference to the 5th and 8th columns, which give the units of power required to grind 1 lb. of barley and wheat, it will be seen that the variation was immense, not only as between different mills, but in the same mill when operating on barley or wheat. This was probably, partly at least, the result of mismanagement. The influence of these figures in determining the prizes was subservient to the consideration of quality and quantity of work performed, indeed it must be apparent that the less thoroughly the corn was ground the lighter would be the operation. It will be seen that the first prize mill consumed more power than the second or third prize, and all were more than 100 per cent. in excess of the article No. 16, shown by T. Baker.

Weighell's Mill, 6751, was chiefly commendable as strongly framed, making good work, and being very reasonable, viz., 30*l.*, with 3-feet diameter Derbyshire stones. The frame was of wood, and the corn fed from the hopper in the old-fashioned way; which is probably best for a farmer, as requiring less delicate adjustment, and as indicating by its rattle when the feed is regular. The gearing was as 54 to 34, the revolutions 140 per minute, and very uniform and steady throughout; the quality of both barley and wheat-flour equal to test-sample.

Messrs. Turner's Mill, price 55*l.*, was exceedingly well made. The frame is of cast-iron; the table, which is very strong, supported by four columns, 5 inches in diameter. Foundation-plate, columns, and table, are held together by bolts running down the centre of each column. The gearing is by mitre-wheels. The bridge-tree supporting the shafting carries the pot with brass toe, adjustible by a lever worked by a wheel and screw. The grain is delivered to the stones by a silent feed—which we believe was Sir W. Fairbairn's invention—the corn falls upon a revolving cup, and is distributed evenly into the stones; the tube of the hopper is adjustible, being raised or lowered according as it is desirable to supply more or less feed. The stones, 4 feet diameter, are French burr, and enclosed in a stout iron vat. A screw crane is fixed on the table for lifting the runner. The bearings are large and well lubricated. The mill worked beautifully; friction very slight.

The mill exhibited by Marshall, Sons, and Co. (Limited), was supported on strong frame, the gearing being by mitre-wheels driving 3 ft. 6 in. Derbyshire Greystones. As the toe wears a thread on the shaft allows of the gearing being altered. This mill was run at 140 revolutions. Price 54*l.*

The mill shown by the "Reading Iron Works" was well made, the frame containing much weight of metal, the price appeared enormous, viz., 80*l.* without crane, for which an additional 6*l.* was charged. It is a large mill, the stones 4 feet in diameter, French burr bed, and Peak runner. The work was good, the mill went very steadily.

SECTION III.—CLASS 1.

TABLE IV.—RESULTS WITH MILLS WITH STONE GRINDERS.

Exhibitor.	Number of Stand.	Number of Article.	Barley Ground in 5 Minutes.	Continuous Horse Power.	Total Units of Power to Grind 1 lb.	Wheat Ground in 5 Minutes.	Continuous Horse Power.	Total Units of Power to Grind 1 lb.	Price. £.	s.	d.	Remarks.
			lbs.			lbs.						
Hancock and Foden ..	312	6967	57·12	12·4	35,342	62·87	8·97	23,566	50	0	0	
J. Weighell	286	6751	41·06	9·92	39,903	63·62	9·58	24,851	30	0	0	1st prize, £8.
Whitmore and Benyon ..	317	6984	..	..	..	..	..	..	55	0	0	Failed in Experiment.
Reading Iron Works ..	154	4014	53·25	8·19	25,384	40·09	4·42	18,223	86	0	0	Commended.
E. R. and F. Turner ..	184	4836	42.0	9·36	36,805	36·5	5·77	26,088	55	0	0	2nd prize, £7.
Robey and Co...	323	7111	38·56	5·74	24,587	45·03	7·18	26,323	50	0	0	
Ashby, Jeffrey, and Luke	9	481	..	..	..	..	..	..	45	0	0	Failed in Experiment.
Marshall, Sons, and Co. (Limited)	320	7083	37·75	7·85	34·313	82·25	9·21	18,468	54	0	0	3rd prize, £5.
Woods, Cocksedge, and Co.	155	4044	37·06	8·19	36,473	21·56	7·89	60,376	50	0	0	
T. Baker	16	747	121·5	12·19	16,556	18	5·34	48,932	48	0	0	
J. Tye	277	6683	51·0	10·89	35,215	..	..	..	55	0	0	

CLASS 2.—*For Mills with Metal Grinders for grinding Agricultural Produce for feeding purposes by Steam or Horse power.* £20.

AWARDS.

208.	Amies, Barford, and Co.	£8
6340.	Thomas Corbett	7
5954.	E. and H. Roberts	5
1671.	Smith and Grace	Commended.

Eleven Competitors.

Messrs. Amies, Barford, and Co. maintained the same position as at Bury with an almost identical machine, an improvement on Felton's American mill, with the manufacture of which they have been so long connected. The mill is slightly conical in shape. The feed is carried forward by a revolving screw running parallel to and above the cone, the speed of which can be regulated to suit the nature of the corn, &c. The grinding surfaces, *i.e.* on the cone and the concave, or breast, are made of cold blast white iron, specially prepared for the purpose, so hardened as to require no recutting. The grinding surfaces can be sharpened as they become dull by running coarse sand through the mill, and when worn out can be replaced at a moderate cost. This is a valuable mill, the quality of the work being proved by the excellent sample of flour. The framework is very strong; it can be readily fixed, and can be fitted with wheels for a portable mill if required. The mill selected for trial was one of medium size, adapted for about 4-horse power; price 18*l.* 10*s.*

Mr. Corbett's mill is on an entirely different principle. The grinding portion consists of two serrated disc plates of iron, deeply chilled on their grinding surfaces. One of these plates is screwed to a vertical frame, through which a horizontal spindle passes, which is fitted with a cast block of iron, to which is applied a second plate made to revolve against the fixed plate. A screw at the end of the spindle allows of the mill being regulated to produce a coarse or fine sample. The feed is simple and self acting, being effected by a worm rotating on the spindle, and a slide in conjunction, and immediately the mill stops the feed ceases. The grain is conducted to the centre of the fixed plate, where it is distributed regularly over the grinding surface. The efficacy of the mill is due in great measure to the peculiar manner in which the plates are grooved, as they cross each other from the centre to the periphery, thereby causing a shearing and wrenching action and pressure outward, so that no dust or glutinous substance can remain on the plates. To the end of the spindle which carries the revolving plates, a pair of spiral springs are applied, which give way to any irregularity of pressure, so that in the event of a nail or other foreign substance getting in, the same, if incapable of being ground down, will pass through without breaking the plates. The grinding surfaces are carried in the centre of the top frame and bearings, whereby side strain is obviated, and the motive power is applied direct. The frame is of cast iron and strong. The price of the machine under trial was 11*l.* The meal was well ground, and the power consumed was reasonable. Of its kind, this appears to be a very good mill.

The mill shown by E. and H. Roberts was on the same principle, only differing in minor details. The runner is adjusted by a screw working in a collar. Corn passes through the centre of the fixed disc, falling on a rotating plate with two arms, which distributes the corn all over the grinding surface. The sample was excellent. The price is 10*l.* 10*s.*

In Smith and Grace's mill, which was commended, we find three rollers cut straight across: No. 1, which is the driving roller, is used as a crusher for beans, peas, or Indian corn; No. 2 and 3 are rollers placed one under the other running the same way, but in an opposite direction to No. 1; No. 3 grinds barley,

SECTION III.—CLASS 2.

Table V.—Results with Steel Mills for Power.

Exhibitor.	Number of Stand.	Number of Article.	Barley Ground in 5 Minutes.	Total Units of Power to Grind same.	Units of Power to Grind 1 lb.	Continuous Horse Power.	Price.	Remarks.
			lbs.				£. s. d.	
Hunt and Pickering	64	2026	74·	512,300	6,888	3·1	9 9 0	
E. Page and Co.	163	4425	168·5	1,256,780	7,458	7·61	7 7 0	
E. and H. Roberts	232	5954	55·56	1,250,012	22,498	7·57	10 10 0	3rd prize, £3.
T. Corbett..	245	6340	48·5	846,000	17,443	5·12	11 0 0	2nd prize, £7.
T. Thomas	305	6920	22·25	602,540	27,080	3·65	32 0 0	Fine side.
			53·	630,740	11,900	3·82	..	Coarse side.
S. Corbett and Son	301	6872	37·	897,700	24,262	5·44	11 0 0	
Amies and Barford	3	198	42·25	1,059,944	25,087	6·42	22 0 0	
Ditto	3	208	75·25	1,402,292	18,635	8·49	18 10 0	1st prize, £8.
Beverley Iron Company.. ..	33	1499	71·	768,920	10,829	4·66	20 0 0	
Smith and Grace	38	1671	54·5	743,164	13,636	4·5	10 10 0	Commended.
J. D. Pinfold	276	6671	47·25	1,075,924	22,770	6·52	9 0 0	
Riches and Watts	326	7143	127·75	1,488,960	11,655	9·02	16 0 0	
Ditto	326	7145	29·	714,400	24,634	4·32	15 0 0	

SECTION III.—CLASS 3.

TABLE VI.—RESULTS WITH HAND MILLS (Metal Grinders.)

EXHIBITOR.	Number of Stand.	Number of Article.	Kind of Corn.	Total Number of lbs. Ground in 5 Minutes.	Total Units of Power.	Units of Power per Minute.	Units of Power to Grind 1 lb.	Total Number of Revolutions.	PRICE. £. s. d.	REMARKS.
P. and W. Hobbs	180	4744	Barley ..	4·25	32,000	6400	7529·4	119·25	5 5 0	
Ditto	,,	,,	Beans ..	26·6	12,850	2570	483·0	175·4	,,	
Smith and Grace	38	1672	Barley ..	5·00	34,000	6800	6800·0	178·0	,,	
Ditto	,,	,,	Beans ..	26·5	30,350	6070	1145·2	163·5	,,	
T. Corbett	245	6341	Barley ..	4·75	36,875	7375	7763·0	178·5	5 15 0	
Ditto	,,	,,	Beans ..	23·5	35,700	7140	159·0	161·0	,,	
Riches and Watts	326	7142	Barley ..	3·75	33,795	6759	9012·0	164·9	7 10 0	
Ditto	,,	,,	Beans ..	18·5	34,190	6838	1848·0	168·3	,,	
E. Page and Co.	163	4426	..	Declined trial.		..	..	..	4 4 0	N.B.—The four last machines, owing to inability to produce sample, informality of entry, error of classification as grinding mills, &c., were untried.
Hunt and Pickering ..	64	2028	..	Ditto.		..	..	..	4 10 0	
J. Davis and Son	240	6210	..	Ditto.		..	..	..	3 6 0	
S. Corbett and Son	301	6873	..	Ditto.		..	..	..	5 15 0	

wheat, &c., into meal. No. 2 is a roller cut coarser, which feeds the same, and thus we have a self feed. Both Nos. 2 and 3 run against steel concave plates cut in a manner similar to a millstone. The rollers are turned down at each end, say ¼ inch wide, to a plain surface; there are similar surfaces on the concave fitting them. It is therefore impossible to make the two grinding surfaces touch each other, thereby greatly reducing the wear and the power required. No. 2 roller is also used for bruising oats and other grain, the concave of No. 3 roller being adjusted so as to allow the corn to pass. The hopper is divided, so that corn can be ground and beans split simultaneously. Price 10*l.* 10*s.*

The mill shown by the Beverley Waggon Company was considered by the Judges as defective in principle: two rollers revolving at a different angle. The grinding surfaces are too limited, and the meal flies out of the machine. The sample was very irregular, and the cost great, viz., 20*l.*

Pinfold's new mill, with a vertical stone runner against a steel plate, is a combination that was not approved of. The meal was thrown about very much, and the wear and tear was likely to be great.

Class 3.—*For Mills with Metal Grinders for grinding Agricultural Produce for feeding purposes, by hand power.* £20.

Prizes withheld.

The reason for withholding the prizes for hand-power mills will be best understood by reference to the preceding table.

Section IV.—Crushers.

Is it desirable to encourage the manufacture of Crushing Machines, as distinguished from mills? Is it not possible for one machine, say a metal mill when set open, to answer as a crusher—the work not so perfectly done, but sufficiently so to render outlay in another machine unnecessary? This was not tried, and therefore the question must remain unanswered. Having a distinct class, it is evident that any machine which ground the corn, instead of merely bruising the oats and splitting the beans, was faulty and ineligible. Those shown by Amies, Barford, and Company, The Beverley Company, Dening and Company, and S. Corbett and Son were in reality grinding mills—could not crush perfectly—and were therefore put out of the race. As the machines one after another were put to work with similar results, the Judges ordered out a mill of Ransomes, Sims, and Head's, which was not entered for trial, and after testing it in a similar manner to the rest, placed it first, since it really flattened the oats and cut the beans. Being a small machine, it did less work than some others, but the power consumed was in proportion. The following was the award in Class I. for the Corn Crushers, by steam or horse-power:—

Class 1.—*For Corn Crushers, by Steam or Horse Power.* £15.

1017.	Ransomes, Sims, and Head	£6
933.	E. H. Bentall	5
4045.	Woods, Cocksedge, and Warner	4
4838.	E. R. and F. Turner	Commended.

Ransomes' Bean Kibbler consists of a series of steel triangular knives on a cylinder working against a steel fluted back. Each knife has three cutting

SECTION IV.—CLASS 1.

TABLE VII.—RESULTS WITH CORN CRUSHERS FOR POWER.

EXHIBITOR.	Number of Stand.	Number of Article.	Material Tried with for 5 Minutes.	Weight of ditto.	Total Units of Power to Crush same.	Units of Power to Crush 1 lb.	Continuous Horse-Power.	PRICE.	REMARKS.
				lbs.				£ s. d.	
Ransomes, Sims, and Head	22	1017	Oats ..	59·4	299,296	5035		10 10 0	1st Prize, 6*l*.
			Beans	100	128,968	1252			
E. R. and F. Turner	184	4838	Oats ..	90·5	418,488	4624	2·53	15 0 0	Commended.
			Beans	154·5	248,160	1606	1·5	..	
Woods, Cocksedge, and Co.	155	4045	Oats ..	134·5	646,720	4808	3·99	15 0 0	3rd Prize, 4*l*.
			Beans	255·5	492,184	1926	2·98	..	
Picksley, Sims, and Co.	104	3178	Oats ..	67·5	318,096	4712	1·92	13 13 0	
E. H. Bentall	20	933	Oats ..	110·5	407,960	3692	2·47	14 14 0	2nd Prize, 5*l*.
			Beans*	84·5	..	..	..	..	

* An accidental stoppage rendered the observation, as to power, in this experiment inconclusive.

surfaces, therefore is thrice reversible, and costs 3*d.* The barrel has two outside rings; by removing one the knives can be drawn out, and reversed or replaced. Damp beans can be cut as well as dry. The back is regulated by a set screw. The crusher consists of two revolving rollers held together by springs.

Bentall's crusher, 933, is almost identical, namely two plain rollers 18 inches and 10 inches respectively, set by a screw wheel acting on a spring. But the construction of the bean mill is very inferior. We have a barrel carrying twenty-two chilled knives, all cast together; instead of a steel back, a cutting plate is used, which is regulated by a set screw nut. The barrel, if a knife breaks, can be renewed for 5*s.*, and the cutting plate costs 1*s.* Price of power machine, 14*l.* 14*s.*

Woods, Cocksedge and Warner's Crusher, 4045, is noticeable for the diameter of the smaller roller, the proportion being much less than usual, viz., 42 inch to 18 inch, fraction is thus considerably reduced, and more work can be done. The roller of the bean mill is made of the hardest cast iron chilled. This roller has a cutting edge, and works against a plate also furnished with a cutting edge, and made of similar metal. These can be readily replaced at a trifling cost. The rollers are adjustible by a screw. It is strong and well made, with brass bearings.

E. R. and F. Turner, No. 4838, commended. In this the crushing rollers are identical with those in the linseed mill, viz. 48 inches and 10 inches diameter; the bean kibbling mill consists of a circular metallic disc, revolving with the spindle of the large roller, having cutting grooves radiating from its centre. A corresponding fixed plate is attached to the mill frame concentric with the revolving one. The corn falling through the centre eye of the fixed plate into the space between the two, is broken by the cutting edges of the grooves, and escapes at the periphery of the discs. The pressure is regulated by a screw acting on the revolving plate. These plates are made of a mixture of metal equal in hardness to the best cast steel. They are easily renewed, a pair of new plates costing 12*s.* 6*d.*

Class 2.—*For Corn Crushers, by Hand Power*, £10.

934.	E. H. Bentall	£6
4047.	Woods, Cocksedge, and Warner	4

934. E. H. Bentall's, which received the first prize, is exactly similar to 933, only smaller, the rollers 18 inches by 10 inches. The bean mill has twenty-two knives. Price, 6*l.* 16*s.* 6*d.*

4047. Woods, Cocksedge, and Warner.—The rollers are wide, 4¾ inches; diameters, 18 and 10 inches. The mill is well made; the shafting runs on brass bearings. Either wheel can be taken out in case of an accident without pulling the mill to pieces. The tongue of the feed is adjustible to ⅛ inch by a small spring and rack attached to the frame. The rollers are altered by springs, and the axle carries a series of flutings with a catch to fix the screws. The bean mill is similar to that for power, the bearings are all brass fitted, and furnished with cotton wick lubricators.

Class 3.—*Linseed Crushers, by Steam or Horse Power*, £5.

Award.

4840. E. R. and F. Turner, 5*l.*

4840. E. R. and F. Turner.—The rollers in this mill are respectively 48 inches and 10 inches diameter, and 4 inches wide, contact between the faces of the rollers being maintained and the pressure regulated by a pressure screw acting through a strong spring upon the bearings of the small roller. Price, 12*l.*

SECTION IV.—CLASS 2.

Table VIII.—Corn Crushers by Hand Power.

Exhibitor.	Number of Stand.	Number of Article.	Material tried with.	Total Number of lbs. Crushed in 5 Minutes.	Total Units of Power.	Units of Power per Minute.	Units of Power to Crush 1 lb.	Total Number of Revolutions.	Price. £ s. d.	Remarks.
P. and W. Hobbs	180	4745	Beans ..	27·75	36,500	7300	1315·3	199	5 5 0	
Picksley, Sims, and Co. ..	104	3179	Oats ..	10·75	42,500	8500	3953·4	154·8	5 0 0	
E. R. and F. Turner ..	184	4839	Beans ..	26·75	40,475	8095	1513·08	163	8 0 0	Large roll, 24 ins. diam. Small roll, 9 ins. diam. Face, 4 ins.
Ditto	,,	,,	Oats ..	9	32,350	6470	3594·4	178	,,	
E. H. Bentall	20	934	Beans ..	8·75	25,600	5120	2925·7	197·8	6 16 6	Large roll, 18 ins. diam. Small roll, 12 ins. diam. Face, 4 ins.
Ditto	,,	,,	Oats ..	15·25	39,980	7996	2621·6	178·9	,,	
Woods and Co.	155	4047	Beans ..	21·5	31,780	6356	1478·1	188·3	7 10 0	Large roll, 18 ins. diam. Small roll, 10 ins. diam. Face, 4½ ins.
Ditto	,,	,,	Oats ..	13·5	40,210	8042	2978·5	168·3	,,	

SECTION IV.—CLASS 3.

Table IX.—Linseed Crushers for Power.

Exhibitor.	Number of Stand.	Number of Article.	Total Number of lbs. Crushed in 5 Minutes.	Total Units of Power to Crush same.	Units of Power to Crush 1 lb.	Continuous Horse-Power.	Price. £ s. d.	Remarks.
E. H. Bentall	20	935	..	..	..	..	12 12 0	Failed in trial.
Woods, Cocksedge, and Co. ..	155	4049	78·25	440,484	5629	2·67	12 5 0	
Picksley, Sims, and Co.	104	3180	..	..	..	..	13 13 0	Failed in trial.
E. R. and F. Turner	184	4840	82·25	529,220	6434	3·2	12 0 0	P ize of £5.
Beverley Iron Co.	33	1499	..	..	..	..	20 0 0	Failed in trial.

SECTION IV.—CLASS 4.

Table X.—Linseed Crushers by Hand Power.

Exhibitor.	Number of Stand.	Number of Article.	Total Number of lbs. Crushed in 5 Minutes.	Total Units of Power.	Units of Power per Minute.	Units of Power to Crush 1 lb.	Total Number of Revolutions.	Price. £ s. d.	Remarks.
E. H. Bentall	20	936	5·5	40,090	8018	7289·09	145·6	5 5 0	Large roll, 18 ins. diam. Small roll, 12 ins. diam. Face, 4 ins.
Woods, Cocksedge, and Warner	155	4052	6·5	44,080	8816	6781·5	173·6	5 10 0	Large roll, 18 ins. diam. Small roll, 10 ins. diam. Face, 4½ ins.
E. R. and F. Turner ..	184	4841	8·75	40,955	8191	4680·5	158	6 10 0	Large roll, 24 ins. diam. Small roll, 9 ins. diam. Face, 4 ins.

SELECTED TRIAL.

Exhibitor.	Number of Stand.	Number of Article.	Total Number of lbs. Crushed in 5 Minutes.	Total Units of Power.	Units of Power per Minute.	Units of Power to Crush 1 lb.	Total Number of Revolutions.	Price. £ s. d.	Remarks.
Woods, Cocksedge, and Warner	155	4052	6·25	34,900	6980	5584	159	5 10 0	See particulars of sizes above.

Class 4. *Linseed Crushers, by Hand Power*, £10.

4841.	E. R. and F. Turner	£6
4052.	Woods, Cocksedge, and Co.	4

4841. This mill is identical with 4840, save in dimensions, the crushing rollers being respectively 24 and 9 inches diameter. Price, 6*l.* 10*s.*

4052. This is a useful, well-arranged, and reasonable machine, costing only 5*l.* The rollers are identical in size and form to those used in the hand power corn-crusher, made by this firm.

Section V.—Chaffcutters.

Class 1.—*For the Class of Chaffcutters to be worked by Steam or Horse Power*, £20.

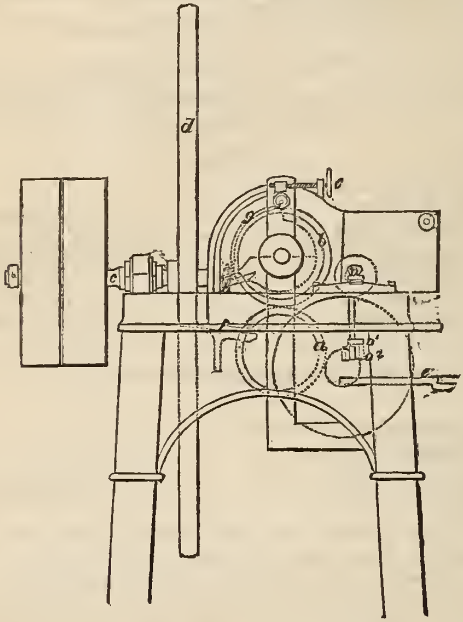
Catalogue Number.	Awards.	£.
4881.	Richmond and Chandler	10
959.	E. H. Bentall	equal 5
3182.	Picksley, Sims and Co.	equal 5
2669.	Carson and Toone	Highly Commended.
2782.	J. Cornes and Co.	Commended.
8690.	T. Allcock	Commended.
3168.	R. Maynard	Silver Medal.

Class 2.—*For the Class of Chaffcutters to be worked by Hand Power*, £10.

		£.
4877.	Richmond and Chandler	6
3183.	Picksley, Sims, and Co.	4
1673.	Smith and Grace	Highly Commended.
947.	E. H. Bentall	Highly Commended.

These trials were watched with great interest by the public. Each year the importance of cutting straw, as a means of economising more valuable food is better understood. The arrangements for the work gave general satisfaction. A solid floor was prepared, roofed over, on which the machines were fixed, and driven through the dynamometer by one of Ransome's portable engines. Both the engine and driver were spoken of by the Judges in high praise. The engine was always ready when wanted, and the steadiness of driving was admirable. The entries were very numerous—19 power-machines, and 20 for manual labour. Three or four makers, however, declined to come to trial, reducing the actual competition to 18 power and 13 manual machines. The results of the dynamometer trials are most interesting and unexpected. Considering the attention that has been expended on this class of machines for a period of over twenty years, we were not prepared to find the difference of power consumed for a given quantity of work to be more than 100 per cent. Some portion of this result may be attributable to skilful management, and such veterans as Messrs. Richmond and Chandler have little to learn. No doubt the bearings of their splendid machine, No. 4881, were well oiled, and the knives brought up to a razor edge; but other makers were equally attentive to their interests, yet none could produce similar results. Hence we must conclude that the method of gearing adopted by Messrs. Richmond and Chandler, and which we shall describe, must be economical. There is very little alteration in these machines since the Bury Meeting, but, as the report on that occasion merely enumerated the prizetakers, the following particulars may be deemed interesting:—The first peculiarity we notice is the moveable or expanding jaw to the mouth-piece, which jaw is hinged to the axle of the upper toothed roller, and is pressed down by a hand-screw, so as to securely hold the materials being cut, while admitting of considerable alteration according to the nature of the substances to be acted on. This will be understood by reference to Fig. 3. To

Fig. 3.—*Transverse Section of Messrs. Richmond and Chandler's Chaffcutter, No.* 4881.



the axle of the roller *b* is hinged the segmental plate *g*, the plate *h* being held down by the handscrew *c*. This is a decided improvement, inasmuch as we can insure a certain amount of pressure, which is further increased by strong spiral screws on each side of the mouth, replacing the weight-lever, with this advantage—that the pressure increases as the feed becomes thicker.

The point to which we would direct particular attention, as more especially influencing the power consumed, is the gearing arrangement by which motion is communicated from the fly-wheel to the feed-rollers, and this will be understood by reference to Fig. 4, which gives a plan of the machine. To the fly-wheel shaft *c*, are fixed two bevel pinions, *k* and *l*, gearing into two wheels of different diameters, one of which is keyed to *l*, while the other is loose on the line-shaft, and these two wheels are connected, when required, by clutch-gear. The pinion *k* gears into the large wheel, *k i*, which is loose on the line-shaft *m*, whilst the pinion *l* gears into *l i*, which is keyed on the shaft. When the clutch-boxes are in gear, and the larger wheel is being driven, the line-shaft imparts a slow motion to the toothed rollers by the usual change-wheels and pinions shown at *m i*; and when the clutch-boxes are out of gear, and the smaller wheel on the line-shaft is being driven, the rollers revolve at a greater speed. The alteration of the line-shaft to and fro, to bring the clutch-boxes

Fig. 4.—Plan of Messrs. Richmond and Chandler's Chaffcutter, No. 4881.

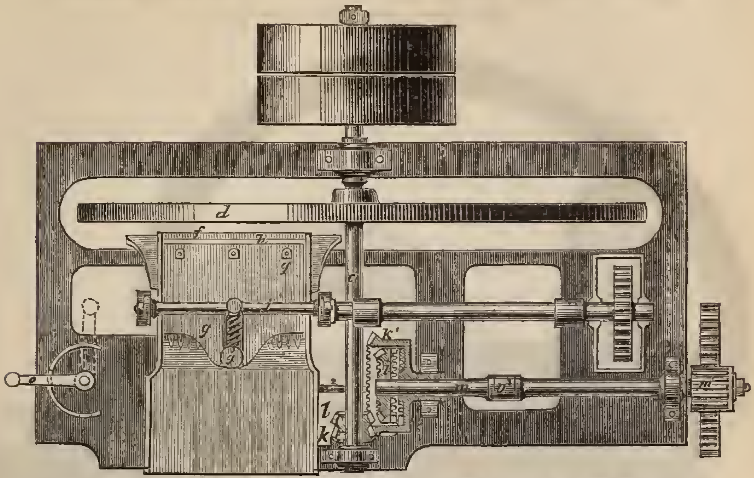


Fig. 5.—Longitudinal Section of Messrs. Richmond and Chandler's Chaffcutter, No. 4881.

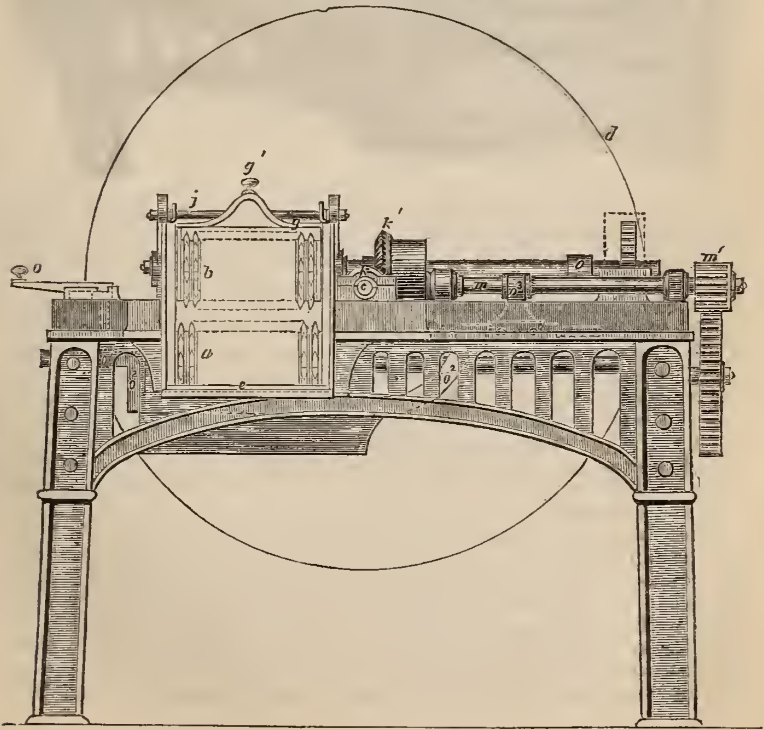
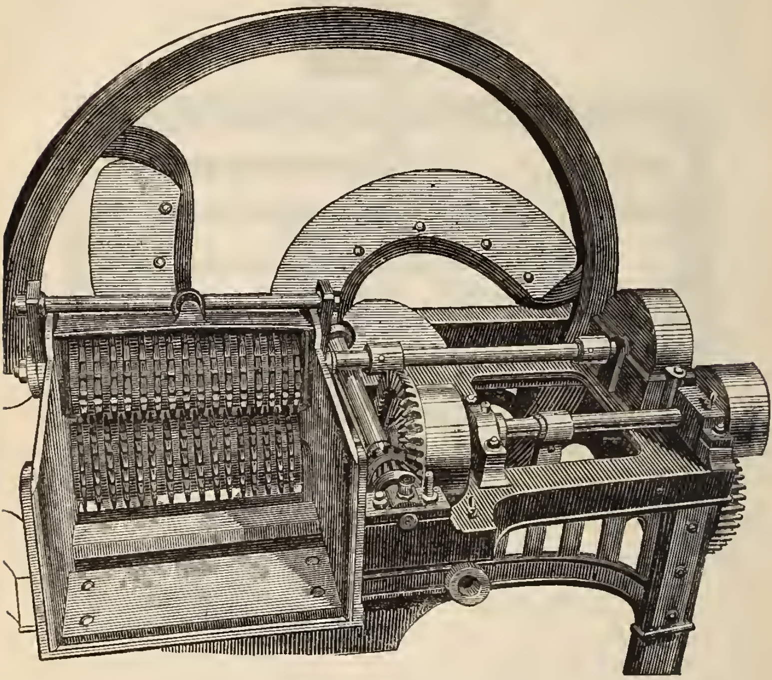


Fig. 6.—View of Messrs. Richmond and Chandler's Chaffcutter, No. 4881, showing Gearing.



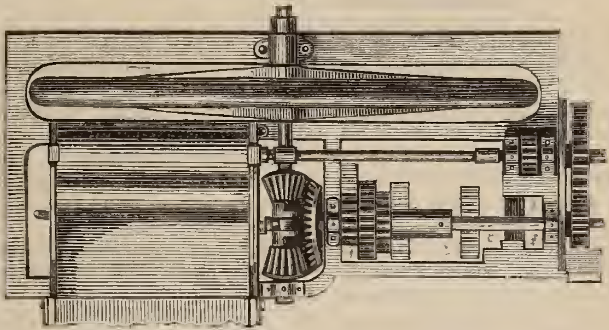
in and out of gear, is effected by a starting-rod through an eccentric handle. We conceive that having the gearing on the line-shaft so near to the fly-wheel shaft, and not on the second shaft, as is often the case, is a good arrangement, as saving strain and friction, and also balancing the wheels and pinions at *m i*. A travelling web is introduced in place of the ordinary bed of the feeding-box, carried on a pulley, which is fixed just behind the lower feed-rollers, and driven a trifle faster than the latter, in order that the straw may be ready for the rollers. This is a material help to the attendant, relieving him of the labour of pulling the straw or hay forward, and allowing him to concentrate his whole attention on the feed. The box in the power-machine which we are describing is $14\frac{3}{8}$ inches wide. The face of the box is made of chilled metal, and bevelled. This is done to prevent the knife-edge being blunted by contact, especially if badly fixed on the fly-wheel; but we could not ascertain that there was otherwise much advantage.

There is no reverse motion for the rollers, as it is not considered of any use; in the event of choking, it is only necessary to throw the machine out of gear, and reverse the pinion on the line-shaft. Two sizes of chaff, $\frac{3}{8}$ and $\frac{3}{4}$ inches, can be cut by the arrangements we have described without change of wheels; but a further alteration can be effected, if required, by change of wheels. The machine was admirably made, and worked very smoothly. Fig. 5 shows the back view of the box and gearing.

We noticed that an opening of 2 inches was left between the lower roller and the travelling web, and we are inclined to think that this, and the angle at which the teeth are set in reference to the feed-rollers, has much to do with proper delivery. In some cases the point of the tooth is brought too forward, and the back of the tooth is too long; so that either the litter is not caught by the teeth, or else, being caught, it is carried round, instead of being left at the mouth of the box. It will be seen by the table that this machine made extraordinary work. The cut was clean and continuous, and the sample in consequence particularly even; and, although not so fine as in some other cases it fulfilled the required conditions.

Bentall's Machine (No. 959), which was bracketed as equal with that of Picksley, Sims, and Co., was considered strong, simple, and serviceable. The frame is of wrought angle iron with cast top; the mouth of the box, 15¼ inches wide, by 4 inches high, when fully open. The fly-wheel has three knives, which lap over each other, each knife being fixed by 10 set screws. The feed-rollers are solid, and carry 18 rows of teeth, which resemble those of Richmond and Chandler

Fig. 7.—Plan of Bentall's Chaff-cutter, No. 959.

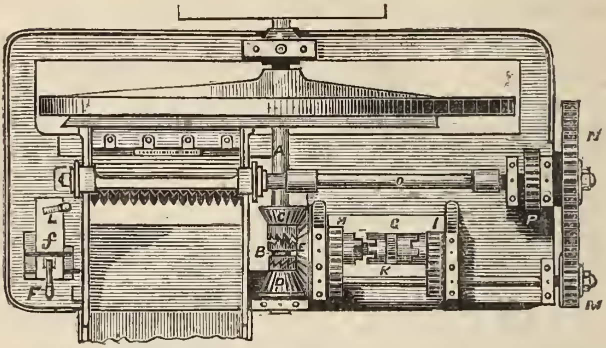


shape, and are not unlike the upper beak of a hawk. Three lengths of chaff are in cut without change of wheels, and this is effected by three gearing-wheels cast in one piece, sliding on the line-shaft, which will be understood by the preceding illustration, from a photograph. The working parts are well covered, and the position of the lever-handle, coming above the top of the box, would enable the workman, in the event of an accident, to stop or reverse the machine very readily. Supposing that his arm were drawn into the feed-rollers, his body must come in contact with the handle sufficiently to throw the rollers out of gear. Another commendable arrangement is the existence of a spring attached to the handle, which prevents the reverse gearing coming into action, except pressure is put on the handle. Unless some stop is provided in the attempt to stop the rollers, the handle is often and unavoidably, turned too far, and the rollers reversed. The fly-wheel is flanged and heavier than is often the case, which increases the steadiness in work. The price, without the driving-pulley, is 14*l.* 14*s.*, reasonable, considering the amount of good work put into this machine.

Picksley, Sims, and Co., have been for several years extensively connected with the manufacture of chaffcutters, and, from the character of the machines exhibited at Oxford, it is evident they understand how to make a good chaff-cutter. The peculiarities of the power-machine, No. 3182 in the Catalogue, will be most readily understood by the following plan:—

A, main-driving shaft; B, clutch on driving-shaft, fitted with parallel keys; C and D, bevel pinions (with clutch-teeth on inner face), working loose on driving-shaft, and each gearing in the bevel-wheel E, F handle for shifting the clutch, B, into gear with the bevel pinions C or D, as may be required.

Fig. 8.—Plan of Messrs. Picksley, Sims, and Co.'s Chaffcutter, No. 3182.

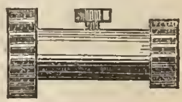


The engraving illustrates the clutch in gear, with the bevel pinion D, which gives the forward motion to the feed-rollers; by shifting the handle F until it is stopped by the catch *f*, the clutch is thrown out of gear, being left midway on the shaft between the two pinions. If the catch *f* be raised, the handle may be moved further over, and the clutch gears into *c*, which gives the backward motion to the feed—which is considered desirable when it is necessary to clear the box. G represents a clutch in the bevel wheel-shaft, fitted with a parallel key; H, a large spur pinion (with clutch-teeth on the fan), working loose on the shaft, and gearing into a small spur-pinion on the counter-shaft, K.

The clutch G is shown in gear with the small spur-pinion I, which communicates the slower motion to the feed-rollers, and consequently gives the $\frac{3}{8}$ inch cut. By moving the handle L, the clutch may be thrown into gear with the large spur-pinion H, which communicates the faster motion to the feed-rollers, and gives the long cut. M, a spur-pinion on the counter-shaft, K, gearing into a spur-wheel, N, on the end of the bottom feed-roller shaft. By changing the wheels M and N, any other two lengths of chaff may be produced. O, a jointed shaft for the top feed-roller, which gets its motion by means of a spur-wheel, P, gearing in one of equal dimensions on the bottom feed-roller shaft.

The working parts are well protected, the gearing simple and strong; the mouth of the box 14 inches by 5 inches. The feed-rollers are solid, and carry 15 rows of teeth. The knives, three in number, cover each other, two being at work at the same time. The chaff was regular, and the box constantly full; but it will be seen from the table that the power consumed was greater than with Richmond and Chandler's Machine, which is probably owing to more complicated gearing. The fly-wheel was noticeable for its weight—a desirable feature of a power-machine, as power is accumulated and given out as required.

Fig. 9. *Sliding Pinion.*



The chaffcutter for hand-power, by the same firm, No. 3183, fig. 9, has no clutches. The change of cut is produced by means of a sliding pinion, thus placed on the bevel wheel-shaft, in lieu of the clutch and clutch-pinions.

The chief peculiarity in *Carson and Toone's* chaff-cutter 2669, which was highly commended, consists in two pairs of rollers to assist the feed, these being grooved, instead of toothed. The mouth of the box is not nearly so large as in several instances, only $10\frac{1}{2}$ by 4 inches, yet, owing to the

SECTION V.—CLASS 1.

TABLE XI.—RESULTS OF TRIALS OF CHAFFCUTTERS FOR STEAM POWER.

NAME OF EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power. Total Number used.	Weight of Chaff cut in 3 Minutes.	Units of Power to cut 1 lb. Chaff.	Average Horse-power.	Price.	REMARKS.
				lbs.			£. s. d.	
T. Sheen	150	3885	188,811	10	18,881·1	1·90	12 0 0	
E. Page	163	4429	161,838	42	3,853·2	1·63	14 14 0	
T. Alleock	40	1690	194,643	79½	2,438·3	1·96	13 0 0	Commended.
R. Maynard	103	3169	196,830	89	2,211·5	1·98	45 0 0	Silver Medal.
Richmond and Chandler ..	185	4881	196,830	154	1,278·1	1·98	16 16 0	Prize of 10*l.*
J. Cornes	90	2782	237,564	98	2,424·1	2·40	13 0 0	
Davis and Son	240	6211	88,209	28	3,150·0	0·89	10 10 0	
Mellard	200	5224	145,800	68	2,144·0	1·47	10 10 0	
Lewis and Hoole	152	3901	139,968	70	1,999·5	1·41	12 12 0	
Hill and Smith			Failed in trial				8 0 0	
Carson and Toone	81	2669	194,643	78½	2,478·2	1·966	13 13 0	Highly commended.
P. and W. Hobbs	180	4746	137,781	54	2,551·5	1·39	12 12 0	
H. and G. Kearsley ..	219	5717	126,481	59½	2,125·7	1·278	10 10 0	
Hunt and Pickering ..	64	2030	112,266	50½	2,223·0	1·134	11 11 0	
Picksley, Sims, and Co. ..	104	3182	252,963	133	1,901·9	2·55	14 0 0	Prize of 5*l.*
E. H. Bentall	20	959	208,494	131⅓	1,585·5	2·106	14 14 0	Prize of 5*l.*
Ashby and Jeffery	9	482	134,500	61	2,204·9	1·359	9 9 0	
J. Warren	220	5726	189,540	98	1,934·0	1,915	18 18 0	

SELECTED TRIALS.

NAME OF EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power. Total Number used.	Weight of Chaff cut in 3 Minutes.	Units of Power to cut 1 lb. Chaff.	Average Horse-power.	Price.	REMARKS.
T. Alleock	40	1690	344,088	148	2,324·9	2·08	13 0 0	
Richmond and Chandler	185	4881	322,218	267	1,206·8	1·95	16 16 0	
J. Cornes	90	2782	403,137	168	2,399·6	2·44	13 0 0	
Picksley, Sims, and Co. ..	104	3182	398,763	217	1,837·6	2·41	14 0 0	
Carson and Toone	81	2669	338,256	154	2,586·0	2·05	13 13 0	
E. H. Bentall	20	959	282,123	189	1,492·7	1·71	14 14 0	
R. Maynard	103	3169	437,400	223½	1,957·0	2·65	45 0 0	

The second trials were run for 5 minutes instead of 3.

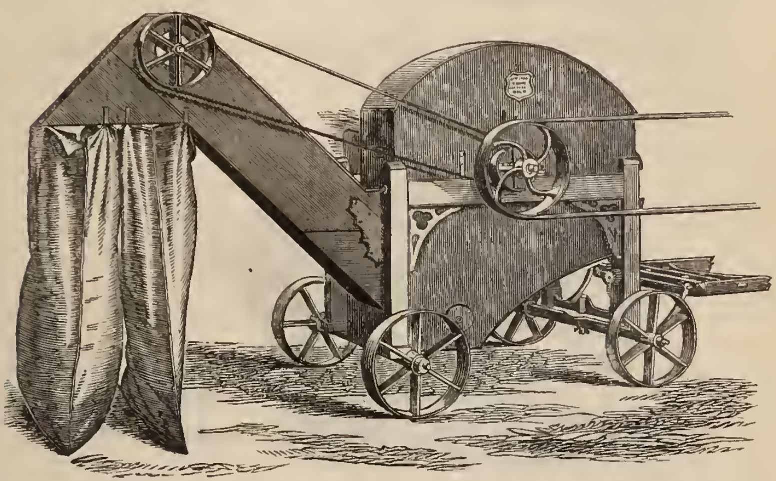
SECTION V.—CLASS 2.

TABLE XII.—RESULTS OF TRIALS OF CHAFFCUTTERS BY HAND POWER.

EXHIBITOR.	Number of Stand.	Number of Article.	Total Number of Units of Power.	Weight of Chaff cut in 3 minutes.	Units of Power to cut 1 lb. of Straw.	Price.	REMARKS.
				lbs.		£ s. d.	
E. H. Bentall	20	947	15,850	12	1320·8	5 15 6	Highly commended.
Ashby and Jeffery	9	485	11,150	8	1393·7	3 17 6	
P. and W. Hobbs	180	4747	10,430	7	1490·0	5 5 0	
J. Cornes	90	2788	11,730	5	2346·0	4 15 0	
T. Sheen	150	3882	16,470	4	4117·5	5 5 0	
Hunt and Pickering ..	64	2029	9,100	7	1300·0	5 5 0	
Southwell and Co.	157	4172	9,150	7	1307·1	3 12 6	
T. Allcock	40	1692	9,750	6	1625·0	5 0 0	
E. Page	163	4431	10,090	8	1261·2	7 10 0	
Smith and Grace	38	1673	14,000	11	1272·7	5 17 6	Highly commended.
Picksley, Sims, and Co. ..	104	3183	11,110	10	1111·0	6 0 0	Prize of £4.
Richmond and Chandler..	185	4877	14,180	13	1090·7	7 7 0	Prize of £6.

efficient action of the rollers and the form of the knives, a large quantity of chaff was cut. A light sheet-iron shield is fixed to the frame between the fly-wheel and pulley, to keep the chaff from collecting round the inner periphery of the latter.

Fig. 10.—Messrs. Carson and Toone's Chaffcutting Engine on wheels, with Chaff Elevator.



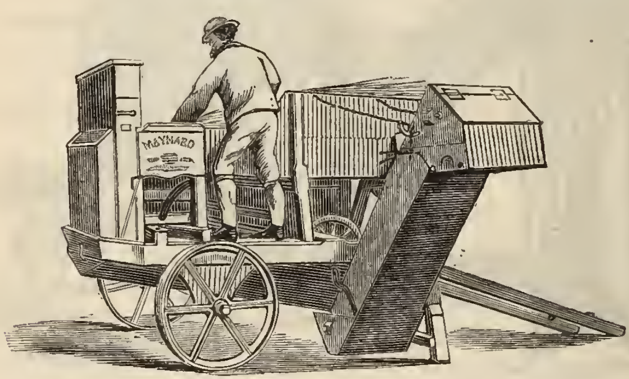
The chaff was excellently cut, not $\frac{3}{8}$, but about $\frac{1}{4}$ inch. It was clear that the first set of grooved rollers levelled the straw, and prepared it to be carried to the mouth by the second set, and thus materially assisted the attendants. In order to secure strength, the wheels are of malleable iron, the spindles are large, bearings of brass, and frame of wood, which Messrs. Carson and Toone find more durable, the iron being liable to fracture. This machine can be mounted on wheels, and fitted with a bagging apparatus, consisting of a case enclosing the knife, with an elevator on one side, from which the chaff is delivered into bags. On the large and exposed sheep farms in Wiltshire, this addition is found very valuable, as chaff can be cut however rough the wind may be.

Messrs. Cornes and Co. are old hands, having been prizetakers in former years. The workmanship, as shown in their power machine, No. 2782, appears less perfect than in some; the gearing was noisy. The gearing by clutch on the shaft, for throwing in and out of work, is fixed on the frame in front of the knives, and totally uncovered, and exposed to all the dust, &c., besides being somewhat dangerous. At the bottom of the box is a 4-inch roller, made of wood, fluted with iron, which travels at the same speed as the feed-rollers. Rollers have 13 rows of teeth.

The leverage for pressing down the box is placed at the side. Two lengths of chaff, $\frac{3}{8}$ and $\frac{5}{8}$ inch, are cut by a change of pinion, which is not so simple or so expeditious an arrangement as some others. The mouth of the box is $13\frac{1}{2}$ inches by $3\frac{1}{2}$ inches. Price 13*l.*

Thomas Allcock, of Radcliffe-on-Trent, was commended for his serviceable power machine, 8690, which lacked the finish of some of the larger makers; and the axle of the fly-wheel not being true made it wobble. Two sizes of chaff are cut by a simple alteration of shaft. Three knives, which lap over each other, and two of which are always cutting. Mr. Allcock fed the box himself. The feed rollers are peculiar in having a double set of teeth, or more properly the intervals between the sets of projecting teeth are raised into small sections, and thus the rollers have a double action on the fodder; whether it was this, or the excellence of management, the feed was very regular, and the sample of chaff particularly good. The quantity cut was only small. The mouth of the box is 13 in. wide, and the price 13*l.*

Fig. 11.—*R. Maynard's Patent Portable Steam-power Sifting Chaff Engine, No.* 3168.



R. Maynard, of Whittlesford Works, Cambridge, exhibited his Portable Steam-power Sifting Chaff-Engine, which is intended to be used in conjunction with a portable thrashing machine to cut the straw, screen, and bag the chaff as fast as the straw comes from the machine. It is driven by a strap direct from the fly-wheel of the engine, the pulley, on knife shaft, being 28 in. diameter, revolves 270 per minute, and as there are 5 knives we get 1350 cuts in that time. The chaff as cut falls on to a sieve, which separates the cavings, unavoidable in a power machine; these cavings are brought out of the end of screen, and in one machine a caving elevator is provided by which they are returned to the box, incorporated with the straw, and cut over again. The chaff, after passing through the riddle, falls into a shoot, which, being finely perforated, allows the dust to separate during the passage of the chaff to the elevator, on which a sack is hung to receive it. The Judges distinguished this machine, which they did not consider could come into competition, by awarding it a "Silver Medal."

Section VI.—Oilcake Breakers.

The importance of these simple machines, and the demand that must exist for them, was proved by the numbers competing for the prizes—no less than thirty in the two classes for hand labour and power. The growth of agriculture is indicated by this development. Linseed and other oilcakes occupy a prominent position as feeding materials extraneous to the farm, and although other substances have come into competition of late years, they still stand in the front rank.

SECTION VI.—CLASS 1. TABLE XIII.—OILCAKE BREAKERS FOR STEAM POWER.

NAME OF EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power to break 112 lbs.	Time to break 112 lbs. of thick Cake.	Time to break 112 lbs. of thin Cake.	Units of Power to break 1 lb.	Average Horse Power.	PRICE. £.	s.	d.	REMARKS.
				° ″	° ″						
Holmes and Sons	65	2143	43,736·	1 15	..	390·5	1·00	15	0	0	
	,,	,,	36,444·8	..	1 10	325·4	·95				
Amies and Barford	3	214	77,268·8	1 55	..	689·9	1·22	6	0	0	1st Prize, £6.
	,,	,,	72,899·68	..	2 20	650·89	·95				
Hunt and Pickering	64	2032	77,268·8	2 25	..	689·9	·97	6	0	0	3rd Prize, £4.
	,,	,,	71,075·2	..	2 35	684·6	·83				
Reading Iron Works Company	154	4015	58,318·4	2 32	..	520·7	·69	6	6	0	
	,,	,,	56,123·2	..	2 30	501·1	·68				
Woods and Co.	155	4054	73,617·6	2 30	..	657·3	·89	6	0	0	
	,,	,,	75,084·8	..	2 55	670·4	·74				
E. H. Bentall	20	962	114,441·6	2 20	..	1021·8	1·48	6	6	0	
	,,	,,	Machine broke during trial								
W. N. Nicholson	160	4324	46,648·	1 30	..	416·5	·94	10	0	0	
	,,	,,	40,812·8	..	1 52	364·4	·65				
E. R. and F. Turner	184	4842	See selected trials					10	10	0	2nd Prize, £5.
	,,	,,	..	..	..	..	..				
S. Corbett and Son	301	6876	40,084·8	1 15	..	357·9	·97	12	0	0	
	,,	,,	43,736·	..	2 22	390·5	·50				
Mellard	200	5229	68,060·8	1 20	..	543·4	1·38	5	0	0	
	,,	,,	62,686·4	..	1 33	559·7	1·22				
Coleman and Morton	41	1699	56,492·8	3 30	..	504·4	·50	4	14	0	
	,,	,,	51,027·2	..	4 5	455·6	·38				
Maynard	103	3170	48,104·	1 30	..	429·5	·97	10	10	0	
	,,	,,	55,339·2	..	1 55	494·1	·84				

SELECTED TRIALS.

NAME OF EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power to break 112 lbs.	Time to break 112 lbs. of thick Cake.	Time to break 112 lbs. of thin Cake.	Units of Power to break 1 lb.	Average Horse Power.	PRICE. £.	s.	d.	REMARKS.
E. R. and F. Turner	184	4842	55,395·2	1 11	..	494·6	1·42	10	10	0	
	,,	,,	43,736·	..	1 20	390·5	·99				
Amies and Barford	3	214	53,217·	2 8	..	475·1	·57	6	0	0	
	,,	,,	45,927·	..	2 10	410·0	·64				
Hunt and Pickering	64	2032	80,919·	1 55	..	722·4	1·28	6	0	0	
	,,	,,	58,320·	..	2 35	520·7	·68				

Class 1. *For Oilcake Breakers, for Large and Small Cake, to be worked by Steam or Horse Power*, £15.

Catalogue Number.	Awards.	
214.	Amies and Barford	£6
4842.	E. R. and F. Turner	5
2032.	Hunt and Pickering	4

Amies and Barford maintained the position they achieved at Bury, viz. first in both classes. In No. 214 the frame is strong and well made. The two pairs of rollers are set by an eccentric lever with a screw handle. When used for cattle, a slide conveys the cake clear of the lower rollers, as in the class of chaff-cutters, success depends intimately upon the form and lead of the teeth. Those on the upper rollers are, of course, the larger, and are known as sheeps' teeth; those on the lower being distinguished as lambs' teeth. The closer the upper rollers are set, the more effective will they be, and the less will be left for the lower ones to do. Price, 6*l.*

E. R. and F. Turner, No. 4842.—The rollers are 18 inches wide. The sheeps' teeth have very little lead. Nineteen rows in the upper and twenty-one sections in the lower rollers. For beasts and sheep a sample sufficiently fine can be obtained by passing the cake through the upper rollers only. The lower ones can be opened sufficiently wide to let the produce of the first pass through. This is not so good a plan as to have a slide, by which the cake is kept clear.

Hunt and Pickering, No. 2032.—This is a strong mill. The teeth on the upper rollers are set at a considerable angle. The driving wheel rolls upon the pinion. The adjustment is effected by a short lever working an eccentric, provided with a shutter to keep the cake out of the lower rollers. The wheels are very strong. A slide is attached to the mouth, which regulates the feed.

Class 2.—*For Oilcake Breakers, for Large and Small Cake, to be worked by Hand Power*, £10.

Catalogue Number.	Awards.	
225.	Amies and Barford	£6
5230.	Mellard Company	4
6877.	S. Corbett and Son	Commended.

The second prize for small breakers was awarded to the *Mellard Trent Company* for No. 5230. Here we have one pair of rollers, and a screen with $\frac{3}{8}$ opening to remove dust cake. The frame was not made strong enough, there being a good deal of rattle. The sections of the rollers fitted on a square shaft, and packed so as to allow of a little independent motion. The regulation of the breakers secured by eccentric motion. The moderate price, only 2*l.* 15*s.*, may have been an element considered.

Thomas Corbett and Son were commended for No. 6877. Here again the frame might have been stronger. The sheeps' teeth are rather small. The angle at which they are placed is considerable. There was too much play between the sections, so much so that the risk of contact between the teeth on the different rollers appeared considerable. This might easily be remedied by intermediate workers. Price, 3*l.* 10*s.*

SECTION VI.—CLASS 2.

TABLE XIV.—OIL-CAKE BREAKERS BY HAND POWER (to break 56 lbs. of Cake).

EXHIBITORS.	Number of Stand.	Number of Article.	Units of Power to break 56 lbs. of Cake.	Time required to break 56 lbs. of Cake.		Units of Power to break 1 lb. of Cake.	PRICE.		
				°	″		£.	s.	d.
Reading Iron Works Co.	154	4016	9,200	7	5	164·2	3	3	0
Coleman and Morton ..	41	1700	8,610	5	50	153·7	3	3	0
E. Page	163	4434	8,720	9	15	155·7	3	15	0
Woods and Co.	155	4055	9,820	6	30	175·3	3	3	0
Hunt and Pickering ..	64	2031	7,800	9	58	139·2	3	10	0
Southwell and Co. ..	157	4177	10,780	7	45	192·5	3	3	0
S. Corbett and Son ..	301	6877	6,420	4	25	114·6	3	10	0
P. and W. Hobbs ..	180	4748	9,000	9	5	160·7	3	3	0
Ashby and Jeffery ..	9	487	9,630	10	44	171·9	3	3	0
Picksley, Sims, and Co.	104	3185	7,620	10	15	136·0	3	3	0
T. Corbett	245	6343	10,280	5	45	183·5	4	10	0
R. Hunt	23	1102	10,680	5	52	190·7	3	3	0
Mellard..	200	5230	6,440	5	0	115·0	2	15	0
W. N. Nicholson * ..	160	4327	8,000	4	48	142·8	5	5	0
Ditto †	..	4326	9,690	5	16	173·0	3	3	0
E. R. and F. Turner ..	184	4843	6,520	6	20	116·4	4	15	0
Amies and Barford ..	3	225	7,000	4	45	125·0	3	10	0
E. H. Bentall ‡	20	960	..	7	50	..	3	3	0
SELECTED TRIALS.									
Amies and Barford ..	3	225	6,300	4	52	112·5	3	10	0
S. Corbett and Son ..	301	6877	6,300	4	20	112·5	3	10	0
Mellard..	200	5230	6,800	4	25	121·4	2	15	0

SECTION VII.—TURNIP-CUTTERS.

CLASS 1.—*For the Class of Turnip and Root Cutters*, £15.

Catalogue Number.	AWARDS.	£.
1308.	R. Hornsby and Sons	7
2033.	Hunt and Pickering	4
1105.	R. Hunt	4

CLASS 2.—*For the Class of Root-Pulpers*, £15.

		£.
1315.	R. Hornsby and Sons	7§
3189.	Picksley, Sims, and Co.	4§
1313.	R. Hornsby and Sons	4‖
3190.	Picksley, Sims, and Co.	Highly Commended.‖
6346.	T. Corbett	Commended.‖
6879.	S. Corbett and Son	Commended.

In the Class of Turnip Cutters and Pulpers there was considerable compe-

* Machine with two pairs of rolls. † Machine with one pair of rolls.
‡ Work done, and time only noted. § For steam or horse power.
‖ Specially adapted for hand power.

tition, and the trials in the latter class especially were carefully watched. Two distinct principles were seen in the different machines, viz., a barrel or cylinder with knives on the surface, and spaces or openings through which the cut root passed; and a disc carrying the cutters, the cut stuff passing through openings on the face of the disc, the difference between cutters and pulpers being simply the form of the knife. After a very patient inquiry the Judges were unanimously of opinion that the disc principle was right, especially in the case of pulpers, for several reasons. The centrifugal force in the barrel tends to throw the root away when it comes in contact, and to give it a rolling action; this adds to the work, and, in the case of a pulper, causes a portion of the juice to be squeezed out of the root, which is a great drawback. The Judges took particular notice of the keeping properties of mangold pulp as cut by different machines. In many instances when the barrel is used the change was rapid, the pulp turning quite dark after 3 or 4 hours, whilst in the best instance of disc cutting it was fresh and little altered after 72 hours. That machine which cuts the mangold sufficiently fine, with the least loss of juice, must be the right machine provided we get a fair amount of work done. The difference in the quantity of liquid produced during the experiments was very great. The plan adopted in the trials of both cutters and pulpers was to allow a given weight of roots in each case. Note the time occupied and the power consumed. We proceed to notice the three machines to which prizes were awarded in Class 1 for turnip and root cutters by hand power.

In *Hornsby's Turnip Cutter* the knives on the disc occupy just the same position in relation to the disc that the knives of a chaff cutter do to the fly-wheel, and for the same reason,—that the knives may be constantly cutting. To make the simile complete we must imagine that the hopper full of roots represents the box full of straw, the pressure of the roots above acting like the rollers on the chaff machine in keeping the material against the knife. There are 13 cutters on each side of the shaft, each cutter perfectly distinct, and attached in position by a small nut and bolt very similar to Gardner's original knives, plenty of space being left above the knife for the cut turnip to pass through, and these openings are the only exit for the root, inasmuch as the circumference of the disc carries a number of projections at right angles to the disc, and which come close up to the face plate, and thus this machine, like the

SECTION VII.—CLASS 1.

TABLE XV.—RESULTS OF TRIALS OF TURNIP CUTTERS BY HAND POWER (each machine to cut up 2 cwt. of roots).

EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power to cut 2 cwts. of Roots.	Time to cut 2 cwts. of Roots.		Units of Power to cut 1 lb. of Roots.	Price.		
				″	′		£	s.	d.
Woods and Co. ..	155	4058	15,520	4	14	69·2	5	5	0
Hunt and Pickering	64	2034	10,320	4	30	45·6	4	5	0
R. Hornsby and Son	27	1308	15,110	3	0	67·4	4	10	0
E. H. Bentall ..	20	968	13,050	5	15	58·2	5	5	0
T. Corbett	245	6345	13,830	4	3	61·74	5	5	0
R. Hunt..	23	1104	12,830	3	58	57·27	4	5	0
Carson and Toone	81	2685	22,430	4	59	100·13	4	10	0
Southwell and Co.	157	4179	13,780	8	20	61·57	4	4	0

pulper, must cut to the last piece. The knife-bar can be removed by slacking. Three bolts, and 2 slicing knives, precisely like chaffcutter blades, can be substituted, should it be thought desirable to slice for bullocks, the thickness of the slice, $\frac{7}{8}$, being the same as the small strips; the small knives, can be replaced, without removing the bar, for 3*d.* each. The quality of the work was excellent, and the machine well made in every part. The hopper is of such a form that the roots can be thrown in with a scuttle and feed themselves without any attention being required. The price 4*l.* 10*s.*

Hunt and Pickering, of Leicester, adhere to the barrel principle, the knives being an improvement on those used in Gardner's machines, considerable lead is given, which facilitates the discharge of the cut portion. Each knife is separate, being bolted on to the barrel, the bolts well below the opening through which the cut turnip passes; hence the clearance is good. In case of breakage the hopper must be removed. The cylinder and knives are of cast steel. The small knives can be replaced by slicer knives for cattle. Price, 5*l.* 5*s.*

Reuben Hunt, of Earl's Colne, Essex, exhibited a combined slicer and finger cutter on Gardner's principle. The slicer knives being placed on the opposite side of the barrel cut only when the motion is reversed. The slicer knives are in one piece with cutting edges, diminishing towards the centre, by which arrangement it is held that the risk of breakage is reduced. The knives are screwed on to the barrel, and cost 5*s.* the pair. The knives for cutting into strips are on Gardner's well-known principle, some slight lead being given to facilitate the clearance of the cut stuff. The hopper is of wrought iron. The upper portion of the frame is cast iron, with sockets for the wooden legs, which are bolted in. The machine is well made, strong, aud capable of getting through a quantity of work.

Those who still believe sliced turnips the best food for fattening cattle should inspect the operation of feeding as carried out by R. Willacy, of Penwortham Priory, who showed a working plan of his cattle feeder—a carriage on flanged wheels running on rails carrying the roots and oil-cake, and cutting, breaking, and delivering the same into his patent trough as the carriage travels forward. This is a plan by which the animals can be fed with great rapidity, and Mr. Willacy's inventions are very commendable. Unfortunately, when the slicer was brought under trial, a nut came displaced, and the experiment was suspended. The trough, which can be made either in wood or stone, is an important item in the invention, as but for a larger receiving area than usual it would be impossible to prevent a waste of material. As it is the beast is prevented intruding his nose, during the operation, by a swing rail, which he pushes forward in the act of feeding, and so has free access to the trough.

Pulpers.

The competition in this class was very considerable. The Judges tried both hand and power machines, and awarded a portion of the sum at their disposal to a small pulper, considering that particular cases might occur, in which it would prove useful; but the power required in order to get through a reasonable amount of work is so considerable that horse or steam is the more suitable power.

Messrs. Hornsby, as at Bury, were again in the first place. Their machines are now so well known as hardly to require description. The cutting is effected by a revolving disc fitted with a series of steel knives, which radiate from the centre. Each knife is distinct, being held in place by a key. The

SECTION VII.—CLASS 2.

TABLE XVI.—RESULT OF TRIALS OF ROOT PULPERS BY STEAM POWER (quantity cut, 3 cwt. of Roots).

Name of Exhibitor.	Number of Stand.	Number of Article.	Units of Power to pulp 3 cwts. of Roots.	Time. ′	″	Units of Power to pulp 1 lb. Roots.	Average Horse-power.	Price £	s.	d.	REMARKS.
R. Hornsby and Sons ..	27	1315	78,732	1	38	234·3	1·47	6	15	0	
R. Hunt	23	1110	88,209	3	12	262·5	0·84	4	10	0	
Woods and Co.	155	4060	110,079	3	11	327·5	1·05	7	7	0	
Mellard	200	5232	76,545	3	5	227·8	0·75	5	5	0	
*E. H. Bentall	20	969	88,209	1	50	262·5	1·46	7	7	0	
†E. H. Bentall	..	974	71,442	1	43	212·6	1·26	5	5	0	
T. Corbett	245	6346	72,900	1	10	216·9	1·90	6	0	0	
Picksley, Sims, and Co. ..	104	3189	65,610	1	7	195·2	1·79	6	5	0	
S. Corbett and Son	301	6878	78,732	0	59	234·3	2·43	6	10	0	
E. Page	163	4436	95.499	3	25	284·2	0·84	5	0	0	
Hunt and Pickering ..	64	2036	64,152	1	50	190·9	1·06	6	0	0	

SELECTED TRIALS.

Name of Exhibitor.	Number of Stand.	Number of Article.	Units of Power to pulp 3 cwts. of Roots.	Time. ′	″	Units of Power to pulp 1 lb. Roots.	Average Horse-power.	Price £	s.	d.	REMARKS.
Mellard	200	5232	86,751	1	7	258·2	2·36	5	5	0	
R. Hornsby and Sons ..	27	1315	77,274	1	32	230·0	1·53	6	15	0	Prize of £7.
T. Corbett	245	6346	77,274	0	52	230·0	2·70	6	0	0	
Picksley, Sims, and Co. ..	104	3189	67,797	0	50	201·7	2·46	6	5	0	Prize of £4.

* Machine with barrel cutter. † Machine with disc cutter.

SECTION VII.—CLASS 2.

TABLE XVII.—RESULT OF TRIALS OF ROOT PULPERS BY HAND POWER (quantity cut, 1 cwt. of Roots.)

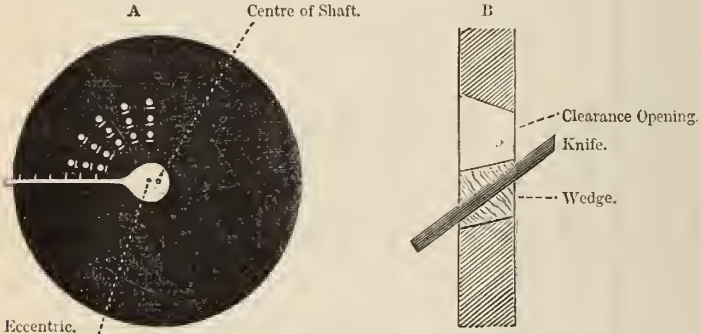
EXHIBITOR.	Number of Stand.	Number of Article.	Units of Power to cut 1 cwt. of Roots.	Time to cut 1 cwt. of Roots.	Units of Power to cut 1 lb of Roots.	Price.	REMARKS.
				′ ″		£ s. d.	
R. Hornsby and Sons ..	27	1313	19,830	5 24	176·0	4 18 6	Prize of £4.
R. Hunt	23	1106	20,650	9 53	184·3	4 5 0	
Woods and Co.	155	4062	15,100	5 38	134·8	4 10 0	
E. H. Bentall *	20	975	11,550	6 20	103·1	4 4	
E. H. Bentall †	..	972	31,840	6 35	284·2	4 14 6	
Picksley, Sims, and Co. ..	104	3190	13,120	4 1	117·4	4 10 0	Highly commended.
S. Corbett and Son	301	6879	27,700	3 0	247·3	4 10 0	Commended.
Hunt and Pickering ..	64	2035	10,630	12 15	94·9	3 10 0	
Southwell and Co.	157	4181	12,350	7 7	100·2	3 10 0	
T. Corbett	245	6347	20,080	5 40	179·2	4 10 0	Commended.

* Machine with disc cutter.

† Machine with barrel cutter

chief peculiarity consists in an eccentric cleaning bar, furnished with a number of small projections, which traverses the spaces between the knives and keeps them clean, and also insures the last piece being cut, as it cannot escape except through the round openings in the disc above the knives, which are $\frac{7}{8}$ of an inch in diameter. The eccentric is $\frac{3}{16}$ of an inch, and the traverse of the bar $\frac{3}{8}$ in. The knife points being arranged in circles at $\frac{3}{8}$ in. distances struck from the eccentric and not from the centre of spindle, insures their passing between the projections on the bar, which will be better understood by the following diagram. The illustration B gives a section of the disc showing the clearing opening, position of knife, and wedge to secure the same.

Fig. 12.—*Illustrating Messrs. Hornby and Sons' Root Pulper, No.* 1315, *constructed on the disc principle.*



A—Plan of Disc.

B—Section of Disc.

It follows, from the arrangement of the knives, that at each revolution they take a fresh track. In consequence of the closeness of the disc to the face-plate, and the presence of the cleaner, every portion of pulp must pass through the circular clearance openings on the disc; hence the sample is uniform, and free from shreds or portions of rind. The capacity and shape of the hopper, which gradually inclines towards the disc, ensures regularity of feed. The roots cannot get wedged, as was the case in several of the machines: but the work is best when the hopper is kept full, as the pressure from above helps to keep the roots against the knives. One point that may be noticed, as affecting the regularity of feed, is that the side of the hopper has no taper. Each knife has $\frac{3}{4}$ of an inch wearing surface. There are 12 rows of knives, 13 in each row.* The radius of the disc is $19\frac{1}{2}$ inches, working surface $13\frac{1}{2}$ inches. The machine is very strong, and admirably made. Price 6*l.* 15*s.* The hand-power machine, which received a prize of 4*l.*, is identical with the above on a smaller scale. The pulp made by these machines remained comparatively fresh after a period of 72 hours—a point of great importance.

Picksley, Sims, and Co., have adopted the disc principle. The rows of cutting points are in one piece; there are 12 sections, each containing 20 cutters, which have barely $\frac{1}{2}$ inch wear. The clearing opening extends the whole radius of the disc, and this allows of long strips occasionally coming through, and must be considered as a less perfect arrangement than Hornsby's circular apertures. The sections are attached to the disc by 4 bolts and nuts. In case of breakage they are easily replaced, the cost being 1*s.* each.

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* Each knife can be removed without taking to pieces by the attendant at a cost of 3*d.*

The hopper is very deep, and the angle such that there is no fear of choking. The great difference between this and the machine first described was in the quality of the pulp, and this, we thought, arose from two circumstances,—the long, narrow clearance openings, and the possibility of a narrow slice passing between the disc and the hopper or face-plate. It was also noticeable that more pulp came out of the top, and there was more juice expressed, consequently more pressure. Price, without pulley 6*l.* 5*s.*

Of the machines with knives on a revolving barrel, the Judges, though disapproving of the principle, considered the entries of *T. Corbett*, and *Corbett and Son*, which are identical save in trifling details, deserving of commendation on account of the quantity and quality of the work. The casing of the barrel is in 6 sections; the teeth, which are diamond-pointed, are chilled, and cast with the sections. There are 5 rows of teeth in each section, and 9 teeth in each row. The teeth, or knives, are self-sharpening, being thickest at the base. Half-circular openings in front of the teeth, $\frac{5}{8}$ inch, admit the pulp, when made, into the barrel. A weight suspended from the axle tends to remove the pulp; but as there is some space between the bottom of this weight and the inside of the barrel the pulp gets pressed into a compact mass, which would soon decompose and smell. Moreover, this pendulum cleaner must, to a certain extent, bruise the pulp and thereby cause an extraction of juice. The sections can be replaced at 2*s.* each—rather a serious expense in the event of frequent breakage. The price, with pulleys, 6*l.* 10*s.* The work was much better than we anticipated.

R. Mellard, of the Trent Foundry, exhibited a treble-action disc root-pulper, stripper, and slicer, the different actions being secured by a double disc and a moveable door. The form of the hopper was not good, and consequently the roots clogged several times; the bearings were roughly made, the quality of the pulp fair.

E. H. Bentall showed both disc and barrel pulper, the latter furnished with a worm cleaner worked by cog-gearing. This machine threw the pulp about very much, and the roots were rolled round and round in the process of cutting, consequently the juice was expressed. The disc-cutter was roughly made, the disc-shaft not true; and this, and too much opening between the disc and the face-plate, accounted for the proportion of large strips which came out with good pulp.

Section VIII.—Steaming Apparatus.

For Steaming Apparatus for the Preparation of Food for Stock, £20.

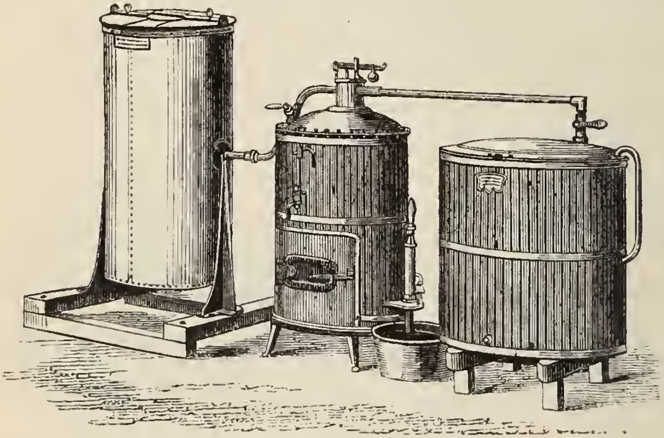
Awards.

352.	Amies, Barford, and Co.	£12
235.	Amies, Barford, and Co.	8

In those districts where the potato is grown largely as a field crop, an economical steaming apparatus becomes almost a necessity, for the value of the small chats when steamed, over the same in a raw state, is very considerable, and sufficient to render the investment a good one. Messrs. Amies and Barford, of Peterborough, have been long favourably known in connection with these apparatus, and on the present occasion their only competitor was a friendly one—viz., Mr. Valentine Barford, a brother of one of the firm.

No. 232. Price, 26*l.* 10*s.*—Consists of a wrought-iron vertical steam-generater, holding 30 gallons of water, fixed in the centre, on one side a galvanised-iron vessel, so placed on an axis as to swing, and thus readily disgorge its contents when reversed. This vessel is capable of holding 9 bushels of potatoes or other vegetables. The steam is conveyed by a 1-inch pipe. On the other side of the generator is a strong double-cased galvanised-iron boiler-pan, holding 60 gallons, for boiling water, linseed compounds, &c., maize, barley, or for brewing purposes. This boiling pan has an escape-pipe from the jacket, which takes the steam into the bottom of the pan. Besides economising fuel by this arrangement, we insure the agitation of the materials that may be operated on, and prevent their settling. The condensed steam is collected in a vessel, to be again pumped into the boiler.

Messrs. Amies, Barford, and Co.'s Steaming Apparatus, No. 232.



In the first trial with this apparatus, the steam was up and ready for use in 16 minutes after the fire was lighted. The 60-gallon pan-full of cold water was raised to 180° in 27½ minutes; 2 bushels of maize placed in the water thus heated was boiled in 36 minutes. In the second experiment the steaming pan was filled with chaff, and steamed for 10 minutes, demonstrating the capacity of the apparatus for such work, where it is considered desirable. This pan is also reversible, being attached to the boiler by a ball and socket joint; thus it can readily be emptied and cleaned, without detachment from the boiler. In a short trial, which was undertaken to show the capacity of the boiler to generate steam, the temperature of the water in the pan was 190° at commencement; time, 30 minutes; 55 lbs. of water pumped in; coal consumed, 4 lbs.; temperature of water in pan at end of experiment, 208°. The same height of water in boiler and pan at the end of trial as at the beginning.

No. 235. Price, 19*l.* 10*s.*—This was precisely similar to No. 232, only smaller. The steam generator is on the same principle. The vessels hold 6 bushels and 40 gallons respectively. Such a steamer would supply the requirements of 30 cattle and 50 pigs, and the cost of steaming chaff will not exceed 3*d.* and potatoes 6*d.* a ton for fuel. The steam was got up in 18 minutes, and the pan-full of old tough potatoes, which were well cooked, in 46 minutes.

Valentine Barford. No. 6756. Price, 7*l.* 10*s.*—In this the water encircles a cast-iron corrugated fire-box; the boiling pan and steamer, which are placed in connection; the latter being at the top contains 35 gallons of fluid, 3 bushels of roots, chaff, &c. The apparatus simple and easy to clean, and might be useful to market-gardeners or small occupiers.

Section IX.—Dairy Implements.

At the present time there are few questions of more vital importance to the British farmer than those bearing upon the economic management of the dairy. Dr. Voelcker was the first to decry the slovenly unscientific practices which we fear in many instances still prevail, and to suggest the treatment of this important industry in a more business-like and commercial spirit. His words were as idle tales to many, but the Americans soon made use of his ideas. The progress made in the last twenty years has been so great, that at the present time some of our finest cheese comes from there. They established the factory system, which we are more slowly adopting. In another part of the report will be found a description of the practice at Derby. A successful result or two will induce co-operation in other districts, and so we should not be surprised to find ere long factories all over the dairy counties.

The milk trade for the supply of large centres has increased wonderfully since the cattle plague, and we hear that some American gentlemen have commenced operations in the vale of Aylesbury for the purpose of compressing the milk into a very small compass, thereby reducing the carriage and fitting it for consumption on shipboard in our colonies and large towns without deterioration. From all this work it is clear that the subject of dairy management is coming under review, and it is well for this Society, which should be first to direct attention to such implements as experience and experiment prove to be the most suitable, that the Judges at Oxford were all practical men, who thoroughly understood the subject, and spared no pains to arrive at satisfactory decisions, amongst other things, submitting the Power Churns to a dynamometer test. This, though it may be interesting, is not of much practical importance, since it is not a question of power but of efficiency that decides the value of a churn. We may remark that neither the atmospheric nor the tubular churn were entered for trial.

The following report was furnished by Mr. Gilbert Murray :—

At the meeting of the Royal Agricultural Society at Manchester last year the Local Committee offered prizes for dairy implements, to adjudicate which, the judges of the miscellaneous department ordered a trial of churns. This trial was incomplete, inasmuch as no detailed results were furnished. It was, therefore suggested that the subject should come under consideration at Oxford; and it was decided by the Council that henceforth dairy implements should form part of the implement classification, a decision which the importance of the subject justifies.

Class 1. *For Churns worked by hand power.*—There were upwards of 100 entries. As it was manifestly unfair to compare large and small churns for hand power, they were separated into two divisions, and whilst the whole of the class money was given to the former, the Council consented to allow the sum of 7*l*., not awarded in Class 3 (cheese tubs), to be divided into two prizes of 4*l*. and 3*l*. respectively, and given for churns adapted for small occupations. The award being—

To No. 564.	Thomas Bradford for his counter-current churn ..	£4
„ 3412.	Phillip Johnstone	3

The trials commenced on Tuesday with churns suited to small occupations. It was deemed desirable to try each churn both with milk and cream. The trials began with the latter, Mr. Bradford's counter-current churn doing excellent work; and the ease with which the butter was got together, and completely free from the buttermilk, without being touched by the hand, as also the facility its construction affords for perfectly cleansing

SECTION IX.

Table XVIII.—Churns; Table of Results.

Name of Competitors.	Size of Churn.	Number of Stand.	Catalogue Number.	Time.		Price.			Quantity.		Temperature.	Remarks.
	lbs.			'	"	£.	s.	d.	lbs.	ozs.		
Allway and Son	7	73	2376	23	30	1	12	0	4	3	69	Small churns. Cream test. Weight of cream 9 lbs. 4 ozs.
Waide	10	67	2226	11	0	2	15	0	4	1	69	
Eastwood	12	237	6085	17	10	1	18	0	4	11	69	
Johnstone	8	115	3412	19	45	1	15	6	4	8	69	
Bradford	6	10	564	11	0	2	0	0	4	5	69	
Ditto	6	10	567	11	0	3	0	0	4	5	69	
Thomas Taylor	6	199	5185	19	0	1	15	0	4	2	69	
Eastwood	12	237	6085	16	30	1	18	0	0	9½	69	Small churns. Milk test 20 lbs. 8 ozs.
Bradford	6	10	564	12	30	2	0	0	0	9¾	69	
Johnstone	8	115	3417	20	38	3	10	0	0	9¼	69	
Tinkler	12	162	4413	13	29	3	10	0	0	8	69	
Thomas Taylor	10	199	5184	11	27	3	10	0	0	7¼	69	
Waide	10	67	2226	14	27	2	15	0	0	5½	69	
Allway and Son	7	73	2376	16	30	1	12	0	0	4½	69	
Robertson and Richardson	20	132	3549	12	30	3	5	0	12	7½	56	Large churns. Cream test 27 lbs.
Bradford	24	10	570	17	0	4	10	0	12	6½	56	
Eastwood	32	237	6092	16	45	2	12	0	13	3	56	
Hathaway	40	11	575	15	0	6	0	0	15	3	56	
Tinkler	32	159	4416	13	30	4	15	0	12	15½	56	

Ditto	32	159	4416	13	30	4	15	0	12	$15\frac{1}{2}$	56	Large churns. Cream test 27 lbs.
Waide	32	67	2231	19	0	4	5	0	12	14	56	
Alway and Son	28	73	2372	19	30	5	5	0	13	0	56	
Thomas Taylor	32	199	5184	21	30	3	10	0	13	1	56	
Eastwood	32	237	6092	29	0	2	12	0	9	12	56	Second Trial. Cream 26 lbs. 10 ozs.
Hathaway	40	11	575	25	0	6	0	0	10	11	56	
Allway	28	73	2372	23	45	5	5	0	10	6	56	
Thomas Taylor	32	199	5184	22	45	3	10	0	10	6	56	
Tinkler	32	159	4423	19	45	4	15	0	10	1	56	
Hathaway	..	11	575	10	0	6	0	0	3	1	..	Large churns. Milk test 61 lbs. 8 ozs.
Bradford	..	10	572	16	0	8	10	0	3	1	..	
Tinkler	..	162	4418	18	0	5	15	0	3	10	..	
Waide	..	67	2237	16	0	5	15	0	2	7	..	
Thomas and Taylor	..	199	5179	20	0		..		2	9	..	
Eastwood	..	237	6098	23	0		..		3	4	..	
Robertson and Richardson ..	..	132	3550	25	0		..		3	$1\frac{1}{4}$	..	
Waide	..	67	2237	23	48	6	10	0	3	$10\frac{1}{4}$	..	Horse, steam, or other power milk test 198 lbs.
Eastwood	..	237	6098	36	0	5	7	6	2	$13\frac{1}{2}$	..	
Tinkler	..	162	4422	35	0	6	5	0	3	$11\frac{3}{4}$	..	
Thomas Taylor	..	199	5179	60	0	8	8	0	4	0	..	
Bradford	..	10	572	15	0	8	10	0	3	15	..	Quantity of milk in this case 40 gallons.
Robertson and Richardson.. ..	..	132	3550	23	45	5	10	0	4	$1\frac{1}{4}$	..	
Tinkler	..	162	4421	22	0	7	5	0	3	$11\frac{3}{4}$	..	

the inside of the churn, combined with the superior quality of the butter it produced, clearly entitled it to the first prize.

The second prize fell to Mr. Johnstone for his Box Churn on the American principle, the chief merit of which is its simplicity of construction and ease of working. The capacity of this class was from 6 lbs. to 12 lbs. of butter. They were all tried with 9 lbs. of cream each at a temperature of 69°. The time of churning occupied by each varied from 11 minutes to 23 minutes 30 seconds, and the quantity of butter produced from 4 lbs. 8 ozs. to 4 lbs. 1oz. Although there was some variation, yet the quality of butter was good in all. The small churns were also tested with milk, at a temperature of 69°. The quantity allowed to each was 20 lbs. 8 ozs.; the quantity of butter varied from $9\frac{3}{4}$ ozs. to $4\frac{1}{4}$ ozs., and the time occupied in churning from 12 to 16 minutes.

In large churns for hand power there was a strong and close competition. The barrel principle was well represented by Tinkler, Hathaway, Waide, and Robinson. Messrs. Alway sent a tin barrel churn with chambers at each end to hold hot or cold water, in order to give the power of varying the temperature at pleasure. The barrel churns were all constructed of oak, and were finished models of workmanship. A new feature in this variety is the various adaptations for allowing the air to escape from the inside of the churn while in motion during the process of churning. In Tinkler's this is accomplished by one end of the spindle being hollow, terminating inside the churn in a perforated face plate, which prevents the milk from escaping by the same channel, a small upright pipe is inserted into a loose airtight collar on the spindle, discharging its air or gas through a bell-mouthed opening above the level of the barrel. In several of the others the same object is obtained by attaching a small quadrant-shaped iron disc to the inside of the frame of the churn, a circular valve attached to a short lever, or in some cases having a projecting head, presses against the disc at each revolution, and allows the air to escape; the valve is so placed as always to be at the highest point when open. The well known Napier dasher was well represented by Mr. Tinkler, to which the judges awarded the first prize. Mr. Hathaway's was well finished, and its working was very satisfactory. The construction of the beaters differs from that of Tinkler's in their being made of one straight board, having only a single opening at the bottom, whilst Tinkler's are formed of a series of bars. Mr. Bradford showed his churn on the midfeather principle, working in the same manner as his celebrated washing machines. This churn produced a fine quality of butter; but the quantity fell below that made by Tinkler's churn. It was, however, commendable for the ease and despatch of cleansing and removing the butter; the Judges therefore awarded this the third prize. Eastwood's was an oblong churn, with double action of the beaters, and made a fair quantity of butter. Thomas and Taylor's was a curious application of eccentric motion, combining a horizontal and vertical current inside the churn, dashing the cream from end to end whilst rotating; it gave a good quantity and fair quality, and the facility of removing the butter is of considerable importance in this mode of construction. This class were all tried with 27 lbs. of cream each; their maximum capacity was from 30 lbs. to 40 lbs. The quantity of butter varied from 12 lbs. $6\frac{1}{2}$ ozs. to 15 lbs. 3 ozs., and the time occupied in churning from 12 minutes 30 seconds to 21 minutes 30 seconds. In consequence of the great difference between the maximum and minimum results, namely about 20 per cent., it was thought desirable to select five of the competitors for a second trial with 27 lbs. each of cream, at a temperature of 56°, the quantity of butter varying from 9 lbs. 12 ozs. to 10 lbs. 1 oz. The time occupied in churning was from 19 minutes to 29 minutes. The great difference in the quantity of the butter compared with the former trial was entirely due to the quality of the cream. We next subjected the whole of the churns shown in this class to a trial with 61 lbs. 8 ozs. of milk which had not been skimmed; some of it was two days old, and the whole had become sour. The temperature of the milk was 65°. The quantity of butter varied from 2 lbs. 9 ozs. to 3 lbs. 10 ozs., and the time occupied in churning from 10 minutes to 25 minutes.

Class 2. *Churns worked by horse, steam, or other power.*—As they were all of large capacity, it was found impracticable to try them with cream, from the difficulty of obtaining sufficient quantity, and therefore the trials were confined to milk alone; in order that there should be no difference in the quality of the milk, the Judges put the whole in one of Taylor's large churns, and served it out to the different competitors in lots of 6 gallons; each time the measure was filled, the churn from which it was drawn was turned round two or three times; when each competitor had received 6 gallons they commenced again at the first, and so continued until each had received his full quantity, no competitor receiving two measures in succession, with the exception of Thomas and Taylor, whose churn was of extra large size, and, therefore, was allowed double quantity; the others received 198 lbs. each; the temperature of the milk was 70°; the quantity of butter produced by each varied from 2 lbs. 13¾ oz. to 4 lbs. 1¼ oz., and the time occupied in churning from 15 min. to 35 min.; they were driven at speeds varying from 30 to 45 revolutions per minute, owing to the high temperature the butter was in some instances very soft and inferior in quality. It was thought desirable to test the comparative power consumed by the three churns which were selected for prizes, consequently a trial was made; each churn was supplied with 40 gallons of water, and run for 10 minutes. The results are given in the subjoined table. The satisfactory result in Bradford's case is accounted for, partly by his midfeather principle, giving an impetus to the churn, and partly by the slow speed required, whilst the excessive power consumed by Robinson and Richardson's churn was due to complicated gearings.

SECTION IX.—CLASS 2.

Table XIX.—Dynamometrical Results with Power Churns.

Exhibitor.	Number of Stand.	Number of Article.	Number of Revolutions per Minute.	Total Units of Power for 10 Minutes.	Price.	Remarks.
					£ s. d.	£ s. d.
R. Tinkler	162	442	40	34,590	7 5 0	1st Prize 4 10 0
Robinson and Richardson	132	3550	40	101,466	6 15 0	2nd ,, 0 0
T. Bradford and Co. ..	10	572	30	23,560	8 10 0	3rd ,, 2 10 0

N.B.—The three machines above mentioned were selected for Dynamometrical experiment from the entire number tried.

Class 3. *Cheese Tubs.* — Here there was only one exhibitor, Mellard's Trent Foundry Company, No. 5235, which was on Cockey's principle, with considerable alterations and additions, patented by Pugh; its merits mainly depend on the facilities it offers for regulating the temperature of the milk. Prize of 3*l.* awarded.

Class 4. *Cheese Presses.*—There was little variety and no material improvement on the old principle. The pressure of each press was fairly tested, and compared with a weight of 1 ton 16 cwts. 3 qrs. 6 lbs. on the large presses, and 15 cwts. 3 qrs. 2 lbs. on the small presses. The Judges awarded the first prize to Southwell & Co., for article 4187, who showed the best principle of construction with good workmanship and material. The second was awarded to Mellard & Co., 5236; this was similar to the first-prize press, with the exception that it had no graduation of the pressure on the fulcrum, and consequently a less range of continuous pressure. The third prize was awarded to Messrs. Cornes and Co., for a press, No. 2798, on exactly the same principle of construction.

Class 5. *Dairy Utensils.*—In this class Alway & Son exhibited a fine collection, including everything necessary for the manufacture of butter, to which was awarded a prize of 2*l.* 10*s.*; and the same sum to Carson & Toone, for their cheese-turner, and general collection of cheese-dairy furniture. To Southwell & Co. was awarded a prize of 2*l.* 10*s.*, for their Cheshire and Scotch curd-mills. To James Cornes and Co., for their curd drainer and cheese making apparatus, a useful invention, the Judges awarded a prize of 2*l.* 10*s.*

Mr. John Hutt, of Water-Eaton, rendered great assistance during the trials in furnishing milk and cream in large quantities on the shortest notice, and also dairymaids to make up the butter.

This Report would be incomplete unless reference is made to the *Atmospheric Churn.* This was not entered for trial. But as it is specially recommended for its ability to obtain from new milk the whole of the butter, and leave the milk perfectly sweet for use, it was thought desirable to test this point, and a trial was arranged, which was superintended by Mr. Jackson. On July 10, 10 lbs of the previous evening's milk was placed in a 2 gallon churn, at a temperature of 67°; churning commenced at 1·35 P.M., at 1·42 butter in beautiful light granules appeared, and at 1·45 the work stopped; at 1·55, 5 ozs. 14 drachms of fine butter was made up, and the buttermilk could not be distinguished by taste from ordinary skim milk, and it is remarkable that the largest amount of butter produced by any of the hand-churns from a similar quantity of milk only reaches 4 ozs. 14 grs., and the average amount obtained from the hand-churns was 4 ozs. and 4½ grs. Unfortunately this trial was supplementary, and no test was applied to determine the quality of milk, as compared with that used in the other trials. The Judge believes it to have been superior, which may account for the result. This being the only churn that can successfully deal with new milk, it becomes of value to small establishments, when very fresh butter is wanted. The churns are made of various sizes, and a small one might often be employed with advantage.

Section X.—Bone Mills.

Awards.

1504.	Beverley Iron and Waggon Company	£9
1505.	Beverley Iron and Waggon Company	6
623.	W. Crosskill and Sons	5

Bone-mills were not under trial at Bury. The competition at Oxford was limited to the Beverley Iron Company, Messrs. Crosskill and Sons, and Mr. James of Cheltenham. Oldham and Booth, though present, did not enter for trial. As far as we could judge there was neither novelty nor improvement in the Beverley machines. Both firms enjoy a reputation in this particular department, and make very strong and useful machinery. Mr. James's implements were altogether of a different character, much smaller, and adapted for horse-power. A short description of the entries may be interesting:—

Beverley Iron and Waggon Company, 1504.—Varies in price according to whether it is supplied with wheels and travelling frame for a portable engine, or as a fixture, from 210*l.* in the former case to 190*l.* in the latter; has 2 sets of rollers, each roller composed of alternate rings of teeth, and bands or washers which slide on to the barrel fixed with bolts and nuts, so as to be readily replaced when worn down or in case of accident. The teeth are wrought iron, case hardened. In the upper rollers $\frac{3}{4}$ inch wide with $\frac{7}{8}$ spaces between. In the lower rollers $\frac{1}{2}$ inch wide with $\frac{5}{8}$ spaces. In order that the rollers may be kept clean, iron pickers are fixed on the frame, and act between the teeth. There is a friction sheave provided, which prevents accident from the presence of iron or stones. The bones after passing through the rollers are received by a revolving screen, which has 3 dimensions of mesh, and removes everything but the very coarse and partially broken bones, which can be carried up to the rollers and re-crushed. An additional 10*l.* will do this. Every kind of bone can be dealt with. The Judges awarded a prize of 9*l.*

The machine No. 1505, exhibited by the same firm, is smaller. A self-feeding apparatus is attached, consisting of 2 revolving chains in a box. We did not see much merit in this, as owiug to the irregular character of the bones the attendant had quite as much work as he would have had with an ordinary mill. The price (95*l.*) ineludes friction sheaves and self-feeding apparatus. This mill has only one pair of rollers similar to the lower pair in the larger machine. It is very strongly made and capable of doiug a quantity of work; the revolving screen is fitted with 3 different sized meshes—viz., $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{13}{16}$ inch. It was noticeable that, although provided with only half the grinding surface of the larger mill, the difference in the quantity of tail was not great, and hence it would appear that this machine will be found most suitable for a farmer's or small manufacturer's purpose. We do not, however, think it would answer for a farmer to buy raw bones, and make his own superphosphate; the manufaeturer gets an equal result with far cheaper materials. Prize of 6*l.*

Crosskill aud Sons. No. 623. Price, 90*l.*—Resembles the last closely. We noticed with satisfaction that the gearing is well guarded. The rollers are the same width, by 14 inches. The revolviug screen is somewhat shorter, making only two samples, $\frac{1}{2}$ inch and $\frac{7}{8}$ inch, and set at a greater incline, which may account for the difference obtained in the comparative trial. Prize of 5*l.*

No. of Catalogue.		Raw Bones.	Three-eighths.	Five-eighths.	Thirteen-sixteenths.	Refuse.	Power.
		cwts.	lbs.	lbs.	lbs.	lbs.	
1505	Beverley Iron Company	3	51	89	109½	86½	19,500
			One-half.	Seven-eighths.			
623	Crosskill and Sons ..	3	46	138	..	152	18,750

A third entry, No. 1506, of the Beverley Company deserves recognition, on account of its moderate price, and a reciprocating screen capable of separating $\frac{3}{4}$ and $\frac{5}{8}$ inch bones. No. 1507.—A still cheaper mill, costing only 50*l.* The teeth are a shade smaller, and the width of the box less. It will not grind the largest bones, but otherwise is a very useful machine. The screen moves more rapidly than in the others, and consequently a better sample is made.

Mr. James's mill, No. 5486, is on a much smaller scale, costs 22*l.* 2*s.* with screen complete, and consists of two pairs of deeply fluted rollers of east iron; each pair driven by a separate pulley and at different speeds. The fluted rollers are not adapted to deal with raw bones, and would soon choke, although it is possible that with bones boiled or steamed they would work well.

Mr. James's second article exhibited was just the same in principle, only on a still smaller scale, and with one pair of rollers only. As the bones have to pass through the mill a seeond time, the coarser roller is exchanged for a finer one, and thus a tolerably fine sample should be made.

Section XI.—Guano Breakers.

Prizes withheld.

The sum of 20*l.* was placed at the disposal of the Judges. The implements are of little practical use to a farmer, because the operation they perform is not of frequent occurrence, and the advantage of mechanism over manual labour is not sufficiently great to render outlay desirable; for these reasons we think it rather fortunate than otherwise that the two machines that were tried worked so indifferently that the Judges withheld the prize. The exhibitors were P. & W. Hobbs, Basingstoke, and Thomas Corbett, Shrewsbury. Messrs. Hobbs's mill was cone shaped, with a series of wrought-iron sections, carrying four and three teeth alternately. These sections are of different thicknesses, and the bottom of the mill is formed in divisions to fit the teeth, hence the guano lumps entering at one end are first broken roughly, and then finer until the manure is delivered as a fine powder. There is a screen attached to the hopper, and worked by a cam, this separates the dust. Three men were required to manage the mill; and we feel certain that two men with a wire sieve could do as much and as well without an outlay of 5*l.* 15*s.* The machinery is too elaborate for the work required to be done.

Corbett's machine also described as a novelty, consists of an 8-in. fluted roller, working against a shell kept in place by a weight and lever, so if a stone or any metal enters, the shell gives way and lets it through. The end of the screen rests on the roller, and receives vibrating motion from the inequalities of the fluted surface. This mill failed to finish its work, small pieces of guano working into balls would not go through, notwithstanding all the efforts of an assiduous attendant.

From this experience, and looking at the comparative inutility of such an implement, we venture to suggest that this prize should not be repeated.

Section XII.—Coprolite Mills.

Award.

4844, 4845, 4846 } E. R. and F. Turner .. .. £10.

There was no competition in this section. Messrs. Headley and Tye's articles, although entered for trial, were not put into a condition for working, and hence were struck out. Messrs. E. R. & F. Turner exhibited machinery which appeared highly suitable, and for which they have had a considerable demand. The coprolites are first reduced in a crushing-mill, which, as more expeditious and less costly, is preferable to mill-stones sometimes employed. One pair of rollers will reduce sufficiently fast for three pairs of stones to grind. The crusher consists of two powerful rollers of chilled iron, kept in contact by levers with balance weights. It is frequently worked in conjunction with the grinding-stones, and is then driven from the same lay shaft to which the pinion with disengaging clutch is attached. The gearings and framework are particularly strong. The coprolites are reduced in the crushing mill to a considerable degree of fineness; some coarse particles, however, remain, and it is an open question whether it would not answer to separate these by a fine sieve and recrush. It would certainly relieve the stones and expedite the grinding, which is desirable. The mill is on precisely the same principle as their corn-mill already noticed, only much more powerful. The stones are 4 ft. 6 in. in diameter, of best French burr. When it is desirable to drive the crusher and not the mill, the latter can be thrown out of gear by raising the pinion on the stone-spindle effected by a lever. The driving-wheel or lay-shaft is geared with well-seasoned wood cogs, and works with iron pinions

SECTION XII.—CLASS 1.

Table XX.—Results with Coprolite Mills (Crusher).

Exhibitor	Number of Stand.	Number of Article.	Diameter of Rolls.	Length of Rolls.	Revolutions per Minute.	Quantity Crushed.	Time occupied.	Horse-Power required to perform above in 1 Minute.	Average Horse-Power required to drive Machine.	Price.	Remarks.
			Inches.	Inches.		lbs.	′ ″			£. s. d.	
E. R. and F. Turner ..	184	4846	12	12	22	496	4 58	16·78	3·88	50 0 0	4 bushels, weighed out, of coprolite, at 124 lbs. per bushel average.

Table XXI.—Results with Coprolite Mills (Grinding Mill).

Exhibitor.	Number of Stand.	Number of Article.	Diameter of Stones.	Weight of Runner.	Description of Stones.	Revolutions per Minute.	Quantity Ground.	Time occupied.	Horse-Power required to perform above in 1 Minute.	Average Horse-Power required to drive Machine.	Price.	Remarks.
			feet ins.	cwt.			lbs.	′ ″			£. s. d.	
E. R. and F. Turner ..	184	4844	4 6	31½	French Burr	98	481	21 28	177·35	8·21	140 0 0	Mill.
Ditto	184	..	..	..	..	..	..	..	..	..	10 10 0	Crane.

Memorandum.—With the power above-mentioned, it will be seen that 5992 lbs. of coprolite would be crushed per hour, and 1344 lbs. ground per hour. Hence two such crushers would supply nine such grinding mills.

on the stone spindle. The bedstones are firmly secured in cast-iron coned frames of great strength, and fitted with the necessary adjustment screws. From the solidity of all the parts, and the truth of the workmanship, these mills work quietly, and make a very fine sample, a point of great importance. Attached to the mill is a crane, which is found absolutely necessary, in order to take up the stones. The Judges saw the machinery in operation, and were highly satisfied with the quality of the work, and accordingly awarded the money, 10*l.*, placed at their disposal, after having seen the nature and quantity of work in a given time, particulars of which will be gathered from the Table.

Section XIII.—Flax Breaking Machines.

Awards.

7199.	John Eliot Hodgkin	£6*
7202.	John Eliot Hodgkin	4†

The cultivation of flax in England is once again occupying attention, whilst in Ireland linen is the staple manufacture, and employs a large portion of the industrial population of the North. It is agreed on all sides that the crop is easily grown, allows of a considerable range of soil and climate, and, wherever a market exists, pays well. Whatever the practice in Ireland as to home manufacture, we are certain that in this country it will not answer; and that, except a demand exists for the crop as it grows, it cannot be cultivated. The high price of labour necessitates its most economical application, which can only be done by the use of machinery on a large scale. The sum of 10*l.* was placed at the disposal of the Judges, and this they awarded to John Eliot Hodgkin of West Derby, whose machinery was much admired, and merits a short description; his only competitor being Messrs. Dening and Co. of Chard, whose breaker was of a very simple description—viz., a frame carrying two wooden rollers fluted with iron, driven by fly-wheel and handle. The straw is held by one workman and forwarded through the rollers as required, whilst the other turns the handle of fly-wheel, and by making half-a-turn and reversing, a rubbing action is given to the rollers, which to some extent broke the wood, but did not remove it to any degree. The work was very inferior to that by Mr. Hodgkin's machines. Two hand and four power breakers were exhibited by the latter.

No. 7202, to which the prize of 4*l.* was awarded, is priced at 9*l.* 9*s.* in the Catalogue, invented by Edward Brasier, and improved by the exhibitor; consists of a central fluted roller, surrounded by three smaller rollers, which revolve by friction from the central roller, and are held down in place by springs. The motion is affected by a double ratchet, which gives reciprocating motion, rubbing the flax backwards and forwards, or else passing it through, at the will of the attendant. The ratio between backward and forward stroke can be altered by an adjustible cam. The rollers are fluted out of solid metal, and the pressure on the flax is regulated by indiarubber springs. The feed is 16 inches wide; the action is perfect, not only in consequence of the breaking of the shive or woody matter, but because a large proportion is actually separated and falls down to the ground, leaving very little to be removed by the scutching blades. A gentle blow from the latter completes the process, and the waste arising from tow is reduced to a minimum. It is difficult to overestimate the importance of good breaking, as the foundation of economical results.

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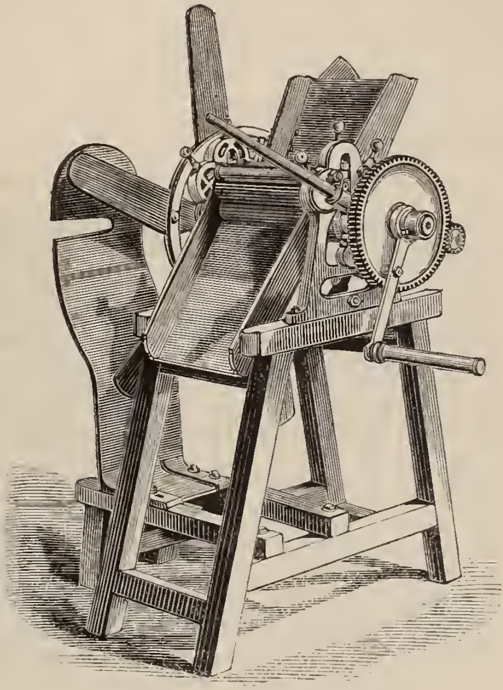
* For steam or horse power. † For hand power.

The second hand-machine, No. 7201, as represented in our illustration, is similar to the above, only the rollers are 14 inches wide in the feed, and an independent scutcher is attached. The ratchet handle works the rollers, the wheel is for turning the scutching blades; the price is 13*l.* 13*s.* From 40 to 50 lbs. of clean flax can be prepared in a day.

Fig. 14.—*Mr. J. E. Hodgkin's Shamrock Hand Flax Breaker and Scutcher, No.* 7201.



No. 7197.—Two-horse-power machine (including patents by Brasier, Hodgkin, and Bremmè), is a beautiful machine, consisting of a large central roller, round which three smaller ones revolve by contact. Reciprocating motion is given by an eccentric, and forward motion by a small pinion wheel; the pinion moving forward slowly at each stroke of the eccentric, and finally completing the revolution of the central roller. The machine is either sent out on wheels as a portable mill, or else without. The prices are respectively 70*l.* and 55*l.*

No. 7199 is not so large, costs only 42*l.*, and has a radial slot to alter pinions for speed, so that according to the nature of the straw the proportion between the reciprocating and forward motion can be regulated. This machine was selected by the Judges for the first prize of 6*l.*

No. 7196 is a larger machine than any, having six rollers round the central roller, but precisely similar in construction. Price, 80*l.* This is adapted to a large manufactory. The broken flax is delivered on to a revolving platform.

No. 7198. Price, 35*l.*—The mechanism by which the rollers work is somewhat different. Reciprocating motion is obtained by three cogged wheels working round a central wheel, and by sun and planet motion causing cranks to revolve as they pass round the central wheel, giving backward and forward motion. This has two top and two bottom rollers, of different pitch. This machine has a quicker and more jumping motion, and the great friction evolves considerable heat, which is of importance in working hemp. The scutching machinery, attached in some cases to the rollers, completed the work so effectually commenced by the rollers.

Section XIV.—Tile Machinery.

Awards.

6675.	J. D. Pinfold	£8*
6604.	J. Whitehead	7†
4439.	Edward Page and Co.	Commended.†

The sum of 15*l.* was placed at the disposal of the Judges without restriction as to the kind of machine, whether to be worked by hand or other power. In the class of hand power machines only three makers presented themselves, viz. Whitehead, Page, and Kearsley. At Oxford care had been taken to have a quantity of clay suitable for the work. On former occasions, the results have not been satisfactory from inattention to this important condition. Two proficients from the neighbouring brickyard were employed to work over the clay. Then each exhibitor was requested to screen some clay, notes being taken of time and power, and then of the number of 2 inch tiles made during a minute's run, the hand dynamometer being used. Kearsley, whose machine was roughly made, though probably of a useful character, had not provided a screen, consequently did not go to trial. The following tables on p. 513 give the results as regards Whitehead and Page.

Whitehead's machine, price 24*l.*, commended itself in two respects. The first a provision to prevent accident—the piston cannot be driven home too far; at the end of the rack two cogs are left out and replaced by a movable stop; when this point is reached the teeth of the pinion pass over this space, and the piston remains stationary, but when reversed, bite, and so draw back the piston. Secondly, the manner in which the screen or die frame are attached by a sliding clutch on the top, and by a groove on the bottom of the machine, together with the manner of fastening the lid, which is simple and efficient. Width of mouth is $16\frac{3}{8}$ by $8\frac{3}{8}$ inches high. These machines have a high practical character, being found to stand rough usage. The Judges awarded 7*l.*

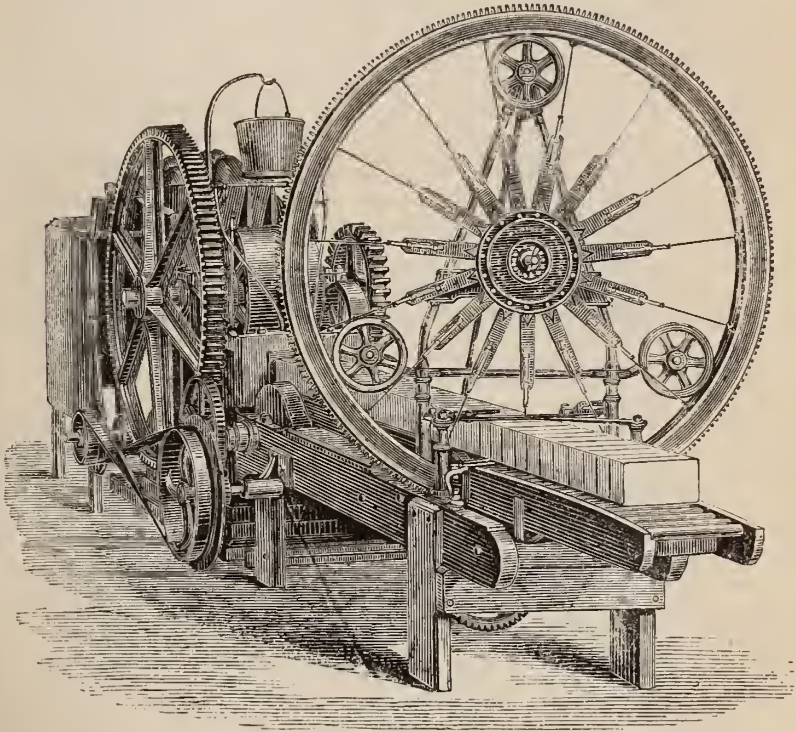
Messrs. Page and Co.'s machine, price 20*l.*, is well got up. The screen and die are kept in place by a pin at the bottom, forming a hinge, and at the top by two keys—a faulty arrangement, as was seen during the experiments, one of the pins becoming loose. Moreover, more time was occupied in altering than in Whitehead's. Throws out of gear in order to return the piston after exhausting the box. The mouth is rather larger, and Mr. Page can make different sizes, up to 12, and even 15 inches. The 2-inch pipes were fairly made, but the clay was less screened.

As regards the comparative merits of hand and power machinery for tile making, it must be noted that two-inch pipes can be made, rolled, and placed

* For steam or horse power. † For hand power.

on shelves, and the clay brought from the pug mill for from 2*s.* 3*d.* to 2*s.* 9*d.* a thousand, and we much question if the work can be done cheaper and as well by any power machine. It is quite a different question with bricks. The weight of clay is so much greater that it must be slow work by hand, and machinery answers well because it is not necessary to have such accuracy. In Pinfold's largest machine—a splendid affair—the cutting apparatus is driven by gearing from the machine, and cuts as the clay is travelling, so no stop is necessary. The cut is a little straggling owing to the resistance of the clay and the

Fig. 15.—*Mr. J. D. Pinfold's Tile-making Machine, No.* 6674.



spring of the wire, but it is not at all the worse, but rather an advantage, as the mortar takes a better hold; but with pipes a clean cut is most important, otherwise continuity cannot be maintained. Pinfold's machines are so made that they can deal with clay in a moderately dry state, and for brickmaking it is not necessary (though it is generally desirable) to prepare clay in any way. The large machine has a patent self-acting feed, consisting of powerful screws which, as they work the clay forward, subject it to the action of a pug mill. The rollers are provided with a safety brake, so that if any stone or tool got in, the machine is brought to a standstill. The rollers are powerful, and great care is taken to lubricate the clay and prevent undue friction by a proper supply of water. The self-acting cutter, which is very ingenious, consists of a large wheel with cog gearing on its circumference. The wires radiate from the centre like spokes and can be tightened or even replaced without stopping the machine; before coming in contact with the brick they pass between, and are momentarily held by two springs, and this detention gives them velocity, as well as tends to clean them. The wheel is fixed at such an angle in reference to the table as to secure a straight cut. It was this machine that conquered the brickmakers at Manchester, and brought them to their senses, and, as a triumph of mechanical genius, we could not do less than name it here; and we trust that any deficiency in our description will be made clear by the *illustration.* Pinfold's machine selected by the Judges for competition was on a much smaller scale, and had no self-feed. The clay is fed into two powerful rollers, the space between which can be regulated by screws. It is provided with safety friction break and a travelling cutter which moves forward during the act of cutting at the same rate as the clay, and hence makes a square cut. The work is thus continuous, and goes on just so long as there is clay supplied. The great feature in Pinfold's machine, and which in the opinion of the Judges more than counterbalanced the extra power, was the ability to deal with clay in a less prepared state, and the economy of labour thereby.

Whitehead's machine, with two tables and two boxes in the centre, is precisely similar in construction to the hand-power machine. One box being filled whilst the other is working requires much manual labour and attention. The safety gear is here immensely valuable. The principle of these machines does not appear so suitable for power as for hand labour. The results of the trials are expressed in the table on the following page.

It must be borne in mind in reference to the above that Pinfold's machine carries rollers which consume much power, but save expense in preparation of the clay.

Section XV.—Draining Tools.

Class 1.—*For the class of Draining Tools*, £10.

Award.

2137. Hunt and Pickering £6
5774. Clarke and Son 4
4576. F. Parkes and Co. .. .. .. Highly Commended.

Out of a class of seven competitors, the above were adjudged most worthy of the prizes and commendation. We question the necessity of this prize. In earlier days, when thorough drainage was believed in by few, it was important to distinguish the class of tools required for really effective work, but now experience has brought about a great change of opinion; and, therefore, the Society's money might be saved without detriment to the cause. The tools were of the best quality and well mounted. In the case of Hunt and Pickering, the iron socket in the grafting tool was continued nearly to the handle, this gives much strength.

Miscellaneous Implements.

Miscellaneous Awards to Agricultural Articles and essential Improvements therein, Ten Silver Medals.

196. Amies, Barford, and Co., Portable Metal Corn-Grinding Mill with Dressing Apparatus.
245.} 246.} Amies, Barford, and Co., Campains' Patent Anchors for Steam Cultivation.
5800. Barton, W., Cottagers' Patent Cooking Stove.
5437. Howard, J. and F., Patent Self-acting Appliance to Horse Rake.

SECTION XIV.—CLASS 1. TABLE XXII.—TILE MACHINERY.

Exhibitor.	Number of Stand.	Number of Article.	Duration of Experiment.	Openings in Screen.	Weight of Clay Screened.	Units of Power Consumed.	Units of Power per 1 lb. of Clay Screened.	Price.	Remarks.
			Min.	Inches.	lbs.			£ s. d.	
J. Whitehead	260	6604	1	$\frac{3}{16}$	123	7825	63·6	24 10 0	
E. Page and Co.	163	4439	1	$\frac{1}{4}$	114	8190	71·8	20 0 0	

Exhibitor.	Number of Stand.	Number of Article.	Duration of Experiment.	Number of Pipes Made.	Diameter of Pipe.	Units of Power Consumed.	Units of Power per Pipe.	Price.	Remarks.
			′ ″		Inches.				
J. Whitehead	260	6604	1 0	55	2	7950	144·5	As before.	5 dies 2 ins bare; triblet, bare $\frac{7}{16}$ ins. thickness.
E. Page and Co.	163	4439	0 58	47½	2	7605	160·1	As before.	5 dies 2 ins. bare; triblet, full $\frac{3}{8}$ ins. thickness.

TILE MACHINERY (Power).

Exhibitor.	Number of Stand.	Number of Article.	Duration of Experiment.	Number of Pipes Made.	Length of Pipe.	Feet Run of Pipes Made.	Units of Power Consumed.	Units of Power per feet run of Pipe.	Price.	Remarks.
			Min.		Inches.				£ s. d.	
J. D. Pinfold	276	6675	5	177	15⅝	215·7	649,260	3010	55 0 0	Roller Machine.
J. Whitehead	260	6605	5	305	13½	343·1	215,100	627	36 0 0	Double Action Piston.

N.B. No. 6675 Machine produced 4 tiles 2 inches each continuously.
No. 6605 Machine produced 5 tiles 2 inches each at each single Stroke.

7747. 7748. 7749. Murray, G., collection of Models for a Cheese Factory.
6631. Pooley and Son, Automatic Grain Scale.
7113. Robey and Co., Patent Self-feeding Apparatus for Threshing Machine.
3478. Sainty, J. and B., Patent Wood Covering for Temporary Buildings, &c.
6696. 6697. Sinclair, James, Chemical Fire Engines.

Highly Commended.

240. Amies, Barford, and Co., Steam Cooking Apparatus.
797. Baker, T., Tip Cart.
2260. Ball, W., and Son, Patent Double Break on Waggon.
694. Barrows and Stewart, Improved Windlass for Steam Cultivation.
1513. Beverley Iron and Waggon Company, Self-acting Sheaf Delivery to Reaping Machine.
6350. Corbett, Thomas, Improvement in Hand Clover-Seed Barrow.
7552. Davey, James, Improved Cart Harness.
2811. Fowler, J. and Co., Traction Engine on Springs.
1914. Hart and Co., Self-registering Corn-Weighing Machine.
2147. Holmes and Sons, Improvement in Hay and Corn Elevator.
1338. Hornsby and Sons, Combined Corn Dressing and Screening Machine.
5913. Hunter, T., Dickson's Patent Double-drill Turnip Cleaner.
6033. MacKenzie, T., and Son, Reaper and Mower Knife Grinder.
5555. Murray, G. W., and Co., Combined Double-furrow Plough and Sub-soiler.
337. Perkins, Thomas, Patent Folding Shafts for Reaping and Mowing Machines.
4701. Rainforth and Son, Improved Patent Corn Screen.
4883. Richmond and Chandler, Litter Cutter.
3472. Sainty, J. and B., Improved Cattle Crib.
4201. Southwell and Co., Improvement in Ridging Plough.
3324. Smith, William, Sheep Rack.
6747. Thomson, R. W., Patent Road Steam Engine.

Commended.

169. Barford, J. P., Improved Carriage Jack.
1477. Denton, Henry, Improvement in a Chain Harrow Carriage.
6044. MacKenzie and Sons, Improvements in Turnip and Mangold Drill.
7822. Major, H. J. and Co., Roofing Tiles.
3471. Sainty, J. and B., Improvements in Field Gate.
3476. Sainty, J. and B., Sheep Fencing.
3382. Winder, R., Machine for Tarring Sheepfold Netting.

Notwithstanding the enormous and unparalleled collection of implements at Oxford, there were in reality few novelties, and many of the new machines were anything but improvements. Simplicity of arrangement is too often sacrificed in order to arrive at a variety of movements, to effect a result which after all is not worth the complication it enforces. We think it would be desirable in future to associate an engineer as one of the tribunal. Questions continually arise which a practical farmer, however shrewd and intelligent, cannot decide; moreover, he is somewhat at the mercy of the exhibitor, whose tale runs glibly, and who is prepared with special pleading which it is difficult for a non-expert to meet. We proceed to notice some of the more prominent alterations in, and additions to, the miscellaneous department, and we may pause to elucidate the meaning of this somewhat ambiguous term. In the first instance, and when the necessary importance of the implements exhibited rendered it desirable to bring into prominence objects which did not come under any of the heads for which prizes were offered, the attention of the Judges was directed solely in this direction. Of late years it has been found desirable to modify this rule, and at the present time it is in the jurisdiction of the Judges to notice, either by medal or commendation, novel additions to an implement, even though that implement comes into competitiou on another occasion. The Miscellaneous Judges have no sinecure office. The inspection of every implement, and the probability that in many instances repeated visits will be necessary, entails an amount of patience and labour that demands our sympathy. Frequently, exhibitors, despite the notices that are posted twice a day, are not on their stands, and consequently it is impossible that everything can be properly seen. The practical knowledge and shrewdness requisite to resist the insinuating arguments of the inventor, which, however wide of the mark, carry weight from their evident sincerity, render the office one of great difficulty. On the one haud it is most desirable to encourage improvements, on the other it is mischievous to give prominence to worthless inventions.

Robey and Company, of Lincoln, exhibit Bell and Roper's Patent Self-feeding Apparatus, to be attached to their thrashing machine. The object of this invention is to do away with the necessity for men on the machiue. The corn being carried from the rick and delivered into the drum by machinery, the latter can be entirely enclosed, and hence the scattering of grain inevitable in an open drum is avoided, and the risk of accident, either from the feeder getting into the drum or from the breaking of a beater, prevented. The apparatus consists of a shoot 13 feet long, fixed to the thrashing machine frame at one end, the other suspended by a crane or pulley so as to be just over the centre of the stack, but clear of the sheaves. Inside the shoot an endless leather strap 6 inches wide revolves, being driven by a pulley from the drum. The rollers carrying the strap are 12 inches in diameter, and revolve about 150 revolutions per minute. The strap carries iron teeth 3½ inches long to prevent the sheaf slipping back, and also three or four solid plates of iron, which act as cups to carry up any loose corn which would otherwise accumulate on the stack. Over the centre of the drum is what is called the sheaf-divider, consisting of a series of claw teeth on a shaft worked by a cranked lever. These teeth tend to separate and carry the corn down to the drum, the mouth of which is contracted by broad pieces of wood placed in the intervals between the teeth. In order to prevent too rapid delivery and consequent clogging, a check-rake, on the opposite side of the drum, consisting of six teeth moved backwards and forwards intermittently with the teeth of the sheaf-divider, retains a portion of the sheaf whilst the remainder is delivered, and thus a regular feed is secured. The check-rake is worked from the crank shaft of the sheaf-divider by a connecting-rod, and its movements can be regulated by means of a slot so as to deliver with varying degrees of rapidity according to the nature of the crop. The sheaf, when the band has been cut, is laid in the shoot, with the butt upwards, and is delivered parallel with the beaters. The action of the rake teeth tends to rumple the straw, which in consequence is more broken in its passage than as ordinarily fed. This may be a serious objection in some localities, and must be valued accordingly. The Judges awarded a Silver Medal to this apparatus.

Campain's anchors for roundabout steam culture are designed to supersede the ordinary snatch-block and claws which require so much attention, and seldom are really efficient to resist a severe strain. Mr. Campain, a practical farmer living in the neighbourhood of Peterboro', finding the inconvenience of this, turned his attention to the subject, the result being the implement under notice. Messrs. Amies and Barford, the exhibitors, bought the patent, and are the sole proprietors. The merits of the anchor were tested during a two days' trial last autumn. It consists of a powerful oblong frame, carried on four disc wheels, very similar in form to Fowler's disc anchor, and provided with a box for stones or earth when extra weights are required. The rope pulley may either be carried above or below the frame—probably the former plan is most suitable for the roundabout system, because the rope is more off the ground. The novelty and merit of the arrangement consist in the presence of a strong axle placed at the end of the frame carrying eight powerful tines; on one end of the axle is a ratchet in four segments into which the teeth of a lever handle fit. The distance between the segments represents the space through which the anchor is required to traverse on the headland. As long as the lever is up the tines ride on the surface of the land, but when their movements are stopped the strain of the rope which is being wound on the windlass causes the tines to bury themselves, and thus afford a powerful resistance both to side and forward strain. As the tines descend the hind disc wheels rise to some extent, but the anchorage is found ample, and the strain of rope tending to draw the anchor forward on the headland is thoroughly counteracted. There is a great saving of labour. The porter boy, previous to the departure of the implement for the opposite anchor, liberates the lever handle from the ratchet notch, adjusts the steerage if required, and can then leave the anchor; as soon as the plough commences to return from the opposite headland, the strain of the rope towards the windlass round the sheaf or pulley, draws the anchor forward until the lever comes in contact with the ratchet section, when it is at once arrested, the tines bury themselves, and strain is resisted. The price of each anchor is 25*l.* A Silver Medal was awarded.

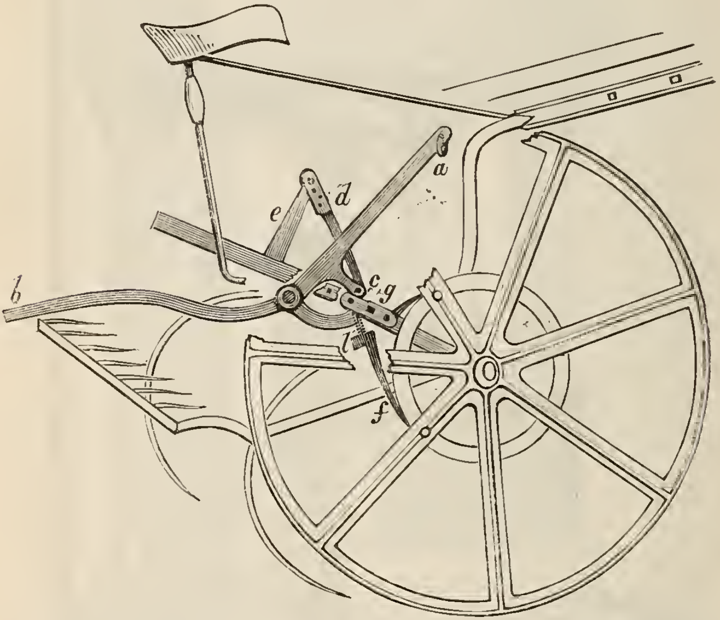
Henry Pooley and Son were commended at Manchester for automatic grain scale for weighing corn in bulk, an extremely ingenious machine, but to which the high price of 100*l.* prevented the judges awarding a medal, as they would otherwise have done. This year the exhibitors have completely altered the machine, made one apparatus do the work that before required double machinery, and consequently reduced the price from 100*l.* to 35*l.* A short description, together with a drawing, will convey some idea of the principle. An overhead shoot, with an outlet controlled by a valve, conducts the grain into a divided oscillating trunk, open top and bottom, which swings upon trunnions resting upon the platform of a weighing machine; the trunk passes through the platform, and vibrates between the inclined sides of a hopper, which forms a portion of the platform, these inclined sides meeting at the bottom and uniting at the division or partition, form the apex of a triangle. Each side of the triangle, when alternately brought closely against the sides of the hopper, converts that portion of the trunk which is in contact with it into a close vessel, being retained in position by a bolt. The grain falls into that portion of the trunk immediately under the shoot, and when the load is nearly imposed upon the machine, the outlet valve of the grain-shoot cuts off the supply of grain partially, allowing only just so much to fall gently into the machine as will complete the load with accuracy. Weight being ascertained, the bolt is withdrawn by the action of the machine, when the hopper tumbles over, releasing one of the lower triangular outlets from contact with the side of the hopper; the grain is discharged, and at the same instant the side of the trunk, which was previously empty, is prepared for the reception of another load of grain, its lower outlet being closed by the hopper, and its upper portion being brought directly under the shoot. Each discharge of the trunk is registered by a counter, one figure of which is moved with every vibration of the trunk. The operations of loading, weighing, discharging, and registering go on without intermission so long as the supply of grain continues, the only impelling motion being the weight of the grain itself. The reduction in price and greater simplicity of construction justified a silver medal.

Messrs. Howard's horse-rake, with self-acting leverage, appears an improvement on former attempts in this direction, because the means by which the

Fig. 16.

action is produced are simple and the emptying rapid, the teeth coming to the ground again with sufficient rapidity. There are several commendable points. The axle is of solid steel, and placed in the centre of the rake; the machine is thus very strong, and there is no tendency in the wheels to work outwards, a defect noticeable in all rakes with short axles bolted or fastened to a frame. The means by which this self-action is produced are as follows: On the axle, inside the travelling wheels, are small wheels, on which are placed friction bands connected with the frame; when the rake is full, leverage is applied to the break bands, they are tightened and become a part of the wheel, and travel round, carrying the teeth and load until a sufficient height is attained. The leverage is then released, the breaks cease to bite, and the rake falls to the ground. The illustration will explain more clearly the mechanism.

Fig. 17.—*Self-acting Leverage to Messrs. J. and F. Howard's Horse Rake, No.* 5437.



The driver can either ride or walk. If riding the right foot is used to slightly depress the actuating lever at the point *a*, if walking he raises the lever at *b*, as will be seen by reference to the illustration. This alteration causes the tightening of the break-straps and consequent elevation of the rakes. The connecting link *d* is jointed to the foot lever at *c*, which centre *c*, when depressed by the action of the attendant is coincident with the centre of the axle of the rake, consequently the lifting motion of the cradle and tines does not influence it, although the lever arms *d* and *e*, with the cradle and break bands *f*, are carried forward when the rake is unloaded; thus, the first lever being depressed, the requisite friction is put on the brake bands, through the double-ended lever *g*. The break bands can be tightened when necessary by the screw link *l*.

A capital *cottager's cooking stove* is shown by W. Barton, of Boston, whose large cooking ranges have attained a considerable reputation. This is an invention of Mr. T. Richards, of Wincanton, and was considered by the judges so cheap and practical, that they awarded a silver medal. The stove occupies a 2 ft. opening, and stands 2 ft. 3 in. high. It can be used either as an open fire or as a close stove. When used as a close stove for cooking, the fire is closed at the top but open in front. The hot-plate is 24 inches by 15 inches for boiling, stewing, &c., or as an ironing-stove. The oven, placed under the fire, is 14 inches wide, 13 inches high, and 12 inches deep, and with its flues occupies all the width, and so is capable of baking everything. The flues run completely round the oven on each side, and enter a main flue into the chimney. The oven is of wrought iron. As an open fire the top is removed and placed against the back, and a fall door is let down, and acts as a sloping back to the fire, a good arrangement, as it is impossible to heap on too much fuel. In the chimney is a damper to regulate the draft, and the flues are easily cleaned. Altogether this is a very complete range, easily set and reasonable in price, being only 2*l.* 10*s.* Another range contains a small boiler in addition, which increases the cost by 1*l.* 5*s.*

A silver medal was awarded to *Mr. Gilbert Murray*, of Elvaston, Derby, who exhibited articles 7747, 7748, and 7759, models of plant for cheese making on the American factory system, of cheese press, and of a factory for 300 cows, and having taken an active part in the establishment of a factory at Derby, which has been in operation for some months, we are indebted to him for an explanation of proceedings, and for a description of the processes. A company having been formed, the services of two competent Americans were secured, and although the subject was only discussed in December, the first cheese was made on April 8. The models shown were on a scale of 1½ inches to the foot. The cans used for conveying the milk from the grower to the factory are cylindrical, of the same width throughout. The lid exactly fits the cylinder like a piston, and so accommodates itself to the supply of milk, thus preventing waste or undue agitation. In the centre of the lid is a tube projecting 6 inches inside; this, when filled with cold water, tends to lower the temperature of the milk. As the evening's milk arrives it is emptied into a large tin which stands on the platform of a portable weighing-machine, the weight being duly entered in duplicate, one entry going back to the sender. In the bottom of the weighing-tin is a brass valve, corresponding to a hole in the centre of the weighing-machine platform; to this valve a small brass chain is attached, by which it can be raised and the milk allowed to escape into a tin tube, which conveys it direct to the vats in the making room. The vats consist of two separate parts; the outside part is constructed of two-inch deal board, tongued and grooved, and supported on wooden legs; the inner case consists of strong tin secured to a rim of 4 inches deep and 2 inches wide; in the inside between the bottoms of the outer and inner vats is a space of 2 inches, which contains the steam pipes, and into which cold water is carried in order to lower the temperature of the milk when required. As soon as the whole of the evening's milk has arrived, and been run into the vats, the cold water is turned on and soon fills the space between the vats, about 6 inches from the bottom; and at the contrary end to which the water enters, an overflow pipe is inserted, this pipe conveys the water to a small overshot water-wheel, the small quantity of water gives a regular but intermittent motion to the wheel; this motion is communicated to a shaft running longitudinally through the building, to this shaft are again attached a series of wooden rakes, which float on the surface of the milk, and by their action keep up a continuous agitation, thus preventing any cream from rising. When the morning's milk arrives it is weighed and run into the vats, and mixed with that of the previous evening; by opening a tap at the bottom of the vat the cold water is all run off, and steam turned on, by an inch pipe running round the inside of the vat. This pipe has small perforations throughout its length, and through these the steam is equally distributed; when the proper temperature has been attained the rennet and annatto are added, the mass is well stirred, and is then covered up until the curd has formed. To facilitate the separation of the whey the curd is cut with knives specially constructed for that purpose, the temperature is then slowly raised, until the whey has arrived at a proper state of acidity; it is then run off by means of a syphon into a drain in the floor, which conveys it into the whey cistern outside, the curd is then tipped into the dry vat, and is here well stirred by the hand and exposed to the atmosphere, the principal object being to lower the temperature of the curd before salting. In order to reduce manual labour to the minimum, in many of the American factories there is a difference of three feet in the level of the floor of the making-room, this is there called the drop; by opening a trap in the end of the milk vat the curd is emptied into the dry vat without being touched by hand. Mr. Murray has introduced a considerable improvement by the application of a simple mechanical arrangement of the screw principle, by which, when the whey is run off, the vat containing the curd is raised to the level of the dry vat; the screws at each end of the vat are of different pitch of thread, so that when elevated to its full height the one end is four inches higher than the other, a valve at the lower end is opened and the curd easily passes into the dry vat. The curd when salted is put into hoops, these are placed in the presses, and pressure of from 3 to 5 tons applied. The American presses consist of a screw working through a nut attached to a strong wooden beam; a circular print, 6 inches in diameter, is loose reefed on to the bottom end of the screw; this print is for the purpose of distributing the pressure on the follower, which fits into the inside of the hoop on the top of the cheeses, the screw is turned by a hand lever fitting into holes in the print; the only practical objection to this system is there is no continuous pressure. Mr. Murray has likewise invented a new press, by which a large number of cheeses can be pressed at the same time; each cheese is placed separate, and the pressure applied by means of screws working in bevel gear and turned by a crank-handle. A ratchet-wheel, to which is attached a lever, is placed on the spindle, and by this means any amount of continuous pressure can be obtained, the cheese only requires to be kept from 10 to 12 hours in the press, they are then raised by a lift to an upper floor, where they are turned daily until fit for market.

Messrs. J. and B. Sainty, of Wisbeach, Cambridgeshire, exhibit several novelties. The first claiming our notice, for which they obtained a silver medal, is a simple and cheap form of wood covering for temporary buildings, walls in process of building, also for various purposes in a garden as protection from frost, placing around trees in a park to keep off cattle, &c. It is portable—rolling up into a small space—and light, being made of pieces of deal, $\frac{3}{8}$ by $3\frac{1}{4}$ inches, lapping over each other; the edge of the under board being bevelled, allows of the curve required for many purposes. The boards are fastened together by galvanised wire pins, being merely a loop with ends of wire twisted together. The openings for these pins being made across the grain of the wood, there is no fear of their drawing out. The rows of pins should be about 18 inches apart. The upper surface of the wood in the specimen is planed: this adds considerably to the expense, and is undesirable when tar is used. The roofing is made in lengths of about 3 feet 6 inches, but this may be altered according to the purposes for which it is required. Price $13\frac{1}{2}$*d.* a yard, with one face planed.

The next novelty of Messrs. Sainty's, which was highly commended, is a very excellent cattle crib, with angle-iron posts and wood frame, which is so constructed that four cattle must feed at opposite corners, and cannot disturb each other. Every practical farmer knows the difficulty of preventing master beasts disturbing their companions by pushing them away from the crib.

The posts are 4 feet high, being 1 foot higher than the top of the box. A piece of strong board, 6 inches deep by $1\frac{1}{8}$ inch thick, is fixed by two nuts and bolts to the top of the post; it runs diagonally, terminating against the opposite post at the lower part of the box, intersecting the line of the frame, so as to leave 12 inches of feeding-space and acting as a brace, increasing the strength of the frame, and perfectly preventing the beast getting more than his share of food. It is securely bolted to the frame, and further strength is afforded by an iron tie-rod between the posts and just above the frame. The bottom of the crib can be readily removed, if it is considered desirable. It is thoroughly strong, and very reasonable in price, viz., 19*s.* unpainted.

A third novelty consists in the spring fastenings for field gates, as well as in several details. The posts, instead of being solid throughout, are made of two pieces of timber, 3 by 8, connected together at the top by a cap covered with zinc. Under the ground the fastening is effected by a cross face-plate 7 inches by 3 inches, and 2 feet long, which extending 8 inches on each side beyond the posts forms considerable resistance when well rammed, which is increased by a spur or stay 3 feet long. The ground for 6 inches round the post is dug out, and the space filled with sawdust saturated with gas-tar, which, when compressed, forms a solid, compact mass, preserving the timber, which should be well dressed with tar previous to setting. Mr. Sainty prefers deal, when thus treated, to oak, as being lighter and less costly. The set-screws in the post for the hinges pass through an iron plate let into the post by flanges at bottom and top; this prevents any play. The eye on the gate passes to the head by an iron rod, and has an adjusting nut and diagonal iron rods, so that all parts can be braced up. The top and bottom rail and middle upright are of wood. Four iron parallel rods replace the ordinary slices. There are no through mortices. By means of a double bent spring two pins are held in openings on an iron plate attached to the clapping-post, and released by leverage from the handle in the centre of the spring. The handle can be locked. This catch is adjustible in the event of the posts or gate giving. Price complete in oak, not recommended on account of weight, 2*l.*; in deal, painted, 1*l.* 11*s.*

The last of Messrs. Sainty's inventions that requires a short description is a remarkably simple, cheap, and expeditious plan of erecting temporary fencing. Angle-iron standards, with sharpened ends and cross-bar, are driven into the ground by a hammer; strong round iron loops, at proper intervals, receive the rails; the latter lapping do not require to be very tightly held, save the top bar, one end of the loop for which terminates in a screw-nut, and by means of a small wooden wedge the fastenings can be made as tight as possible. The bars are of sawn deal, about 4 inches by $\frac{3}{4}$, and can be fixed with great ease and celerity. The inventor believes this a great improvement on ordinary sheep-hurdles, and where a fence is required to remain in position for a few days it may be so, but it is hardly so suitable for daily shifting as either hurdles or nets. In moving such a fence, it all coming to pieces is a decided advantage, as it packs away in a cart in a close compass without fear of breakage. We believe the price is 1s. 1*d.* per yard. The Judges commended the hurdles and field gates.

Amies, Barford, and Co.—No. 196. This simple combination of a metal grinding mill, with a dressing-machine attached, received a medal on account of the excellent quality of the sample, proving that a metal mill, when properly adjusted, can grind as fine a sample as any stones. The flour was made into bread and supplied to the Judges, who thus had practical evidence of its quality. The combination is not so valuable for home use as for the colonies, for which it can be recommended, as the price, 37*l.* 10*s.*, is not excessive. The mill is identical with that which received the first prize at Bury and again at Oxford, but is fitted with a simple flour-dresser, which, being placed in a sloping position underneath the delivery spout of the mill, receives the meal, and dresses it in its passage to the skip. It is driven off the spindle of the mill by a band running over grooved pulleys, with very little additional power, and being held by 3 brackets only can be readily detached from the mill. 30¾ lbs. of flour were taken out of a bushel of wheat.

COMBINED STEEL MILL AND BOLTER (Special Implement).

EXHIBITOR.	Number of Stand.	Number of Article.	Corn ground.	Weight of Ditto.	Time occupied.	Total Units of Power required to grind 1 bush. of Corn.	Units of Power to grind and dress 1 lb.	Continuous horse power.	PRICE.
			Bush.	lbs.	′ ″				£. s. d.
Amies and Barford	3	196	1 Barley	56¼	2 47	1,115,592	19,832	12·14	7 10 0
			1 Wheat	62½	2 55	1,297,200	20,755	13·48	

MEMORANDUM.—In tbe 1st Experiment the original 56¼ lbs. barley gave 10¼ lbs. meal, 44¾ lbs. offal, and 1¼ lbs. waste. In the 2nd Experiment the original 62½ lbs. wheat gave 30¾ lbs. meal, 29¾ lbs. offal, and 2 lbs. waste.

James Sinclair's (Corporation-street Manchester) "*L'Extincteur*" fire-engines have been improved considerably, and are a most valuable protection against fire, especially on account of their being available at once. Most interesting trials took place in a field opposite to the showyard; two large wooden trays. 14 feet by 6 feet, charged with coal and petroleum spirit, were well ignited, the flames were acted upon by "L'Extincteur," and perfectly extinguished in 22 seconds, the operator standing about 2 yards from the fire. The large-sized "Extincteur" was used, costing 6*l.* 6*s.* It may be described as a plain cylinder of best Swedish block charcoal iron, 3 feet high and 11 inches diameter, and capable of containing 10 gallons, having a smaller tube, perforated with numerous holes, about 2 inches diameter, in its centre. The cylinder is filled with water, and a given quantity of high-dried lime and tartaric acid introduced, a portion of bicarbonate of soda being placed in the inner tube, the mouth of which is screwed down tight. Chemical action commences immediately. Carbonic acid gas is generated, the pressure of which varies from 35 to 70 lbs.; the greater the pressure, the greater the ejecting and extinguishing force. The gas is suspended in the water; the moment it comes in contact with the flame the gas is liberated and the flames are extinguished. The exhibitor guarantees that the charge will retain its force for a period of three years. The "Extincteur" is strapped upon the operator's back, who can thus approach the fire and direct the jet, by means of a flexible tube and nozzle, fitted with a tap, to any part of the flames. The value of such an apparatus, as a means of checking a fire at its origin before ordinary means can be brought into operation, is so great, and the results of the trials so satisfactory, that the Judges unauimously awarded a silver medal. The same principle is applied to a hand-power engine, to be worked by five men. This consists of a large tank, divided into two equal compartments holding 25 gallons each, but open at the top; the engine should be kept full of water, and the chemical materials placed in packets of suitable size for a charge, in a box fixed on to the tanks, the high-dried lime and tartaric acid on one side, and the bicarbonate of soda in the other. When required for use, the materials are introduced into the two compartments, the fluids are brought into contact in the air-chamber, and the gas generated with sufficient rapidity; as the water is replenished additional ingredients are added, and thus a most powerful means of extinguishing a fire is provided. The fluid is discharged in a powerful stream, and can be throwu 50 feet high. The tanks are made of galvanised iron, aud will keep charged for any length of time; so that, if desired, the chemical agents may be kept in the water. This apparatus was also tested. A pile of deals 21 feet long by 4 feet wide and 6 to 9 feet high, were set up on end, the interstices filled with shavings, and the whole freely dressed with coal-tar and petroleum spirit. When thoroughly ignited the pump was set to work, and the fire was extinguished in less than a minute. The charred timber was dressed over again with tar and petroleum, ignited a second time, and put out in 45 seconds. The price of this engine is 45*l.* 10*s.* This is an invention of Mr. W. B. Decks, the manufacturer and improver of the "Extincteur."

Mr. Sinclair also exhibits respirators for smoke, foul air, and choke-damp. A large india-rubber air-tight bag, containing a supply of air sufficient for respiration during a period of about 20 minutes, is fastened to the back, and furnished with the necessary pipes and valves; a mask excludes the external air from the mouth and nostrils. This apparatus will be found valuable where it is necessary to enter a building on fire.

Mr. Thomas Perkins, of Hitchin, has invented a folding shaft to be attached to the near side of the pole of reaper or mower, in connection with a fixed shaft on the off side. When travelling, and one horse only being required, the shaft turns up close to and above the pole, being secured in its place by a bolt through a bracket. When brought down for work, position is secured by a shoulder on the plate. Another feature in Mr. Perkins's arrangement is an adjustible back band, one chain passing through a loop on pole which is common to both shafts; the proportionate length is adaptable according to the height of the horse, Working by shafts, the driver can be seated on the pole immediately between his horses, being protected from the rake arms by a light iron shield, which also affords a rest to the back. The advantages of working in shafts are manifest; we secure steadiness in traction; the weight is removed from the horses' shoulders to their backs, and the machine can be backed and turned round with greater facility. The price of the pair of shafts, which are made of hollow iron, varies from 2*l.* 10*s.* to 2*l.* 13*s.*; the folding-shafts only 1*l.* 10*s.* to 1*l.* 11*s.* 6*d.* each. It will be remembered that Hornsby and Sons introduced the shaft on the off-side, which they considered a great improvement. If this be so, we cannot question the addition of Mr. Perkins being in the right direction. The judges highly commend this invention.

Traction-engines, suitable for agricultural purposes, will come under consideration next year. The Judges, however, considered that Thomson's road-steamer, as a comparative novelty, and a new engine on springs, by John Fowler and Co., of Leeds, were deserving of high commendation, omitting to notice, until too late, the admirable 5 horse-power engine of Aveling and Porter, which was employed in carrying out the horse-gear experiments, and which, from its price and capabilities, is very suitable for farm use. It is, therefore, at their request we add a description of the Rochester engine.

In *Thomson's road-steamer* No. 6747, the novelty consists in the use of india-rubber tires to the wheels. The property of the india-rubber to flatten under the load, and its enormous elasticity, enables the engine to travel over rough and uneven surfaces, and it is said even over soft ground, with great facility and with smoothness. Some rather exaggerated statements appeared in the 'Times' and other papers as to the capabilities of the engine. The admirable action of the india-rubber tire is unquestionable; its durability has to be proved. It is admitted that the very best material is required, and we fear the oxidation would be considerable, especially in contact with acids. The tire has been protected to a considerable extent by the addition of a flexible steel envelope. The wheel consists of a broad iron tire, with narrow flanges, perforated with small holes, which allow of circulation of air, and so keep the rubber from adhering to the wheel. The india-rubber ring is 12 inches broad by 5 inches deep, kept in place by the flanges; over this is an endless chain of steel plates, each plate being about 4 inches wide and placed at similar intervals. The chain and india-rubber are not rigidly connected, but can move round independently of each other and of the inner ring which they enclose. This is a remarkable fact, and accounts, in some degree, for the successful operation, but must cause considerable friction. The steel envelope, whilst it materially protects the india-rubber by coming in contact with the rougher surfaces, does not materially affect the traction power, because, being loose, the plates are flattened down upon the road, and, if we may so express it, participate in the elasticity of the rubber. The engine and boiler are vertical, being so placed on the frame that the weight is principally carried by the two hind wheels. A smaller central wheel in front affords the steerage, and is remarkably sensitive, the capacity for turning and backing surpassing any previous invention. This is principally owing to the reduced surface covered by the engine. The form of the boiler allows of gradients of 1 in 10 being surmounted. The Judges had the engine moved about the yard, and it went out and drew a plough on one occasion; but, as further experiments were impossible, we submit an extract from the Report of Mr. John Anderson, Superintendent of Machinery to the War Department, which shows what was done under his actual supervision at Leith :—

"On the first day that I saw it, the streets were wet and sticky to a degree. A train of waggons had previously been prepared, containing 10 tons of flour, besides their own weight; they were standing at the bottom of a slippery street with a gradient of about 1 in 17; to this train the little engine was attached, and away it marched as if it had no load, went up to the top of the hill, and then down the other side, no breaks being required. It was done so neatly, and so much as an ordinary matter of course, that I could not help wishing that the War Department had one of them.

"After depositing its load somewhere in Leith, it was ready for other work, so down it ran to the Portobello sea-shore, at the rate of 10 miles an hour. On surveying the sands, it seemed an impossibility that it could walk on such soft sinking ground; but on it rushed through all, over some quicksands, ran into the sea, and along its edge in every direction, in the most wonderful manner.

"But this does not convey the true state of the case. I was walking, and my feet sank several inches at every step, but the wheels of the engine did not sink above one-third of my depth; and au empty carriage that followed on the same track as the engine, with the carriage wheels on the engine track, sank 5 inches deeper. This fact teaches the whole lesson: the carriage wheel, being a circle, presented but a small surface, but the flattening of the engine india-rubber tires gave a web-footed surface, which explains it all.

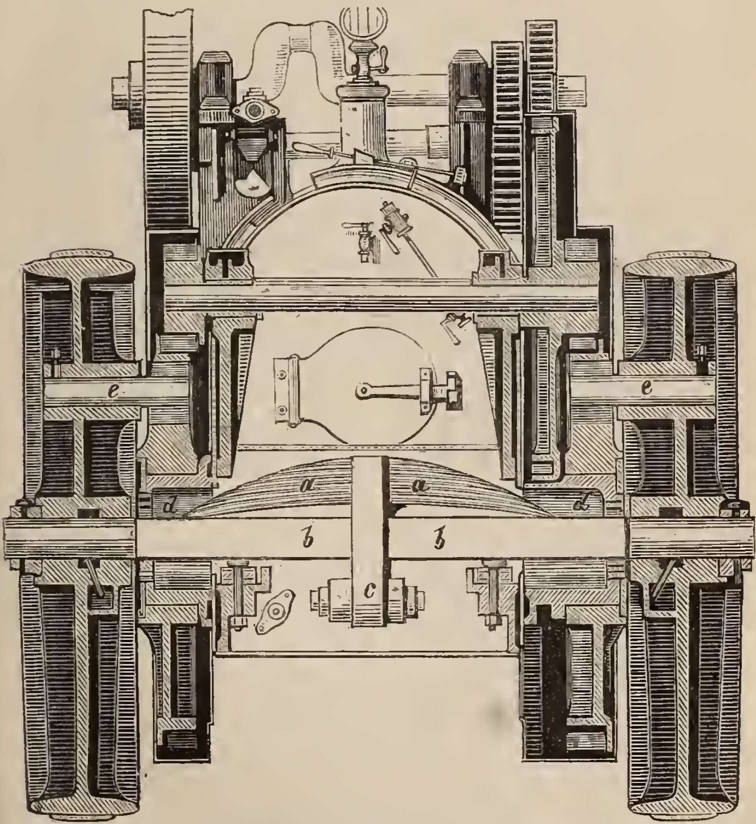
"It is necessary to state that the little engine weighs about 6 tons when fully loaded with water and fuel: the engine cylinders are but 6 inches in diameter, so that when compared with, say the Boydell engine, it is a pigmy.

"It is used at present in doing any kind of odd work that may be required, and well does it earn its living.

"Its next job, after returning from the sea-side, was to remove an old worn-out boiler from the docks to a yard at some distance, where old boilers are broken up. The boiler and waggon, with the fastening chains, weighed upwards of 22 tons, and the boiler on the waggon stood some 25 feet high. Up to this the engine backed, and was securely attached; then off it marched along the quay, over a rising swing-bridge, and along other quays, until it reached its destination. But the charm of the above performance was in the way in which it was done. No shouting, no refractory or desultory pulling of horses; but by the expenditure of a few pounds of coal and water the whole was accomplished with ease and celerity; and so accustomed are the people in Leith to its performance that no notice was taken of it, except by the country horses, for the town horses seem to know that it is their friend rather than their enemy."

The engine was tried at Oxford, drawing a 4-furrow plough. The land was very dry, and the impression made on the surface by the wheels was not great, even when taken over the fresh furrow. A great width of headland was necessary in order to get the plough round; and we are inclined to think that on a soft sticky surface great power would be consumed in moving the engine, and that even with india-rubber wheels direct traction is not so economical as a wire rope. The engine exhibited at Oxford was 8 horse-power nominal, the cylinders being 6 inches by 10; the weight, in work, 6 tons; and the price at Edinburgh 600*l.* The load such an engine can draw on an ordinary road depends upon the inclines: if nothing above 1 in 30, 18 tons; if 1 in 12, then only 12 tons. We believe that an omnibus has been constructed and is at work between Leith and Edinburgh; and, should the india-rubber prove sufficiently durable, it is quite probable that much may be done in this direction. The engine travels at 6 to 7 miles an hour, and runs like a carriage on springs.

Fig. 18.—*Section through hind axle of Fowler's Traction Engine on Springs, No.* 2811.

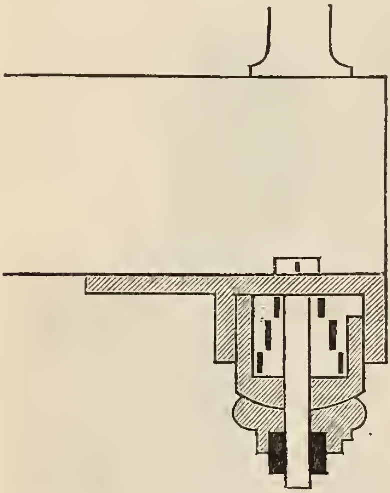


Fowler and Co. have achieved a mechanical triumph in their traction engine on springs, No. 2811, which was thought by many to be impracticable on account of the action of the spring interfering with the driving-gear. The manner in which this difficulty has been surmounted will be understood by reference to the following drawing, which is a section through the hind axle.

Fig. 19.

aa is a large spring resting on the hind axle, *b*, to which the boiler is firmly suspended by a strong link, *c*. The brackets, *dd*, are bolted to the boiler, and take hold of the axle by means of slotted openings, through which the axle passes; this allows of an up and downward motion of the axle, according to the pressure placed on the spring *a*. The brackets have also a cylindrical portion surrounding the square slots, through which the axle, *b*, passes (*vide* sketch, Fig. 19). This is turned, and forms the centre pin or stud, round which the two last spur-wheels of the road-motion gear are turning.

Fig. 20.—*Section of the front axle of Fowler's Traction Engine.*



The road-wheels, which are loose on the hind axles, are connected with these spur-wheels by means of pins, *ee*, which can be taken out on one or the other side if the engine is required to turn very sharp corners.

It is thus evident that the hind axle will move up and down in the slotted brackets according to the play and the vibrations of the spring, whilst the driving spur-wheels will continue to gear into the corresponding pinion undisturbed by the action of the spring. This is a very ingenious arrangement, which appeared to the Judges to answer perfectly.

The front axle rests on a spiral spring, which is placed in the cylindrical portion of the cast-iron bracket supporting the smoke-box end of the boiler, as shown in the following section.

The ability for rapid change of direction is not so great as in either Thomson's or Aveling's inventions. The engine is of 8 horse-power nominal, and costs 400*l.*

Although the Miscellaneous Judges omitted to notice Aveling and Porter's nominal 5-horse power Traction-Engine, Article No. 6653, which was so usefully employed as the power in the horse-gear trials, we have been requested to explain that this was entirely an oversight, which was only discovered when the awards had been completed, and therefore not in any way to be considered as disparaging to this engine, of which they entertain a very favourable opinion. Without the test of actual comparison and experiment it would be unwise to pronounce an opinion as to the relative merits of the different traction-engines which appeared at Oxford, more especially since this class will come into competition next year. The engine before us, of which a side-view is given in fig. 2, p. 462, is noticeable for the small space it occupies, for its lightness, and for the actual power of which it is capable, consequent on great strength. Mr. Aveling worked the engine with a break on the fly-wheel, and showed a power of 10 horses, with a pressure of from 55 to 60 lbs. per square inch. Hence it is quite reasonable to expect a result equal to 15-horse power, under a pressure of about

80 lbs., of which the boiler is capable. The peculiarities of this engine, as differing from the ordinary traction-engine of this firm, are, the substitution of gearing for pitch chain in driving gear, and the absence of brackets to carry the shaftings. The side-plates of the firebox-casings are continued backwards, and between them is bolted a stiff cast-iron frame. This is a great improvement, giving great steadiness, and avoiding risk of accident from the tearing out of the brackets. The reversing gear is simple and inexpensive, and also acts, to a limited extent, as an expansive gear. It consists of an eccentric, mounted on a sleeve, capable of being turned on the crank-shaft by means of a lever, having a pin entering a spiral slot cut in the sleeve. Price 260*l.* The perfect control of the engine by the attendant was seen in the work done during the horse-gear experiments, the object being to have a perfectly steady power. And this was so much the case, that the points of the spring dynamometer remained stationary, or only varied within very small limits.

Messrs. Hornsby and Sons, of Grantham, show an adjustible corn-screen, with blower and dressing-apparatus, which is a very useful combination, as for an outlay of 18*l.* 18*s.* the farmer gets the use of three distinct machines, separately, if desired, or as a screen and blower combined, or a screen and dressing-machine. To use the machine as a blower, the riddle-shoe is removed and its gearing thrown out of motion by a drop-fork. The hopper has two moveable side-plates, contracting the mouth so as to deliver the feed within the the area of the riddle; these are removed for blowing, and the corn is spread over a larger area, and is consequently acted upon more evenly by the blast, which can be regulated at will. In winnowing, stones, &c., are completely removed. The hind legs of the frame run on cast-iron wheels, and by handles in front one man can move the machine with ease. The corn, after being winnowed or blown, enters the mouth of an adjustible screen, and is separated according to the size of the grain by the expansion or contraction of a wire-mesh, effected by a strong spring working in a hollow shaft. This improvement was highly commended, as also a new screen shown by *W. Rainforth and Son*, of Brayford Head, Lincoln, in which the screen consists of corrugated tinned wire, No. 17 gauge. The mesh is ½ inch, originally square, but converted by pressure into a diamond form. The frame is composed of 3 strong steel rings, having a groove sufficiently deep to receive and retain the wire-screen. Thus it is practicable, to have one-half the screen of a different mesh to the other; this, however, is not generally required. The shaft, or axle, is 1⅞ inch, partly hollowed out to carry the screw by which the screen is adjusted. No tying of the wire and no springs are required. The price varies from 12*l.* to 18*l.*, according to the diameter of the cylinder.

The Judges were precluded from noticing the numerous novelties in double ploughs that formed so conspicuous a feature of the show, inasmuch as these implements will form the subject of trial next or the following year; but an adaptation by *Messrs. G. W. Murray and Co.*, of Banff, in which the first plough was replaced by a powerful subsoiling tine, was considered worthy of high commendation. A strong malleable cast-iron bracket is attached to the beam. The subsoil tine is carried by a joint and stud proportionately strong. The depth is regulated by the fore-wheel, and the tine prevented from burying itself and turning over by a stay on the bracket. A lever handle within reach of the ploughman enables him to take the tine up, or assist its entrance into the subsoil. The tine is fitted with a shoe 6 inches wide. The great advantage of this combination is that the subsoiled ground is immediately covered by the plough, and thus the effects cannot be interfered with by horse pressure. Without a proper trial, it is not always possible to judge of efficiency; but, looking at the strength of the various parts, we have no doubt the results will prove satisfactory. The price is rather more than the additional metal justifies, viz. 16*l.* 16*s.*

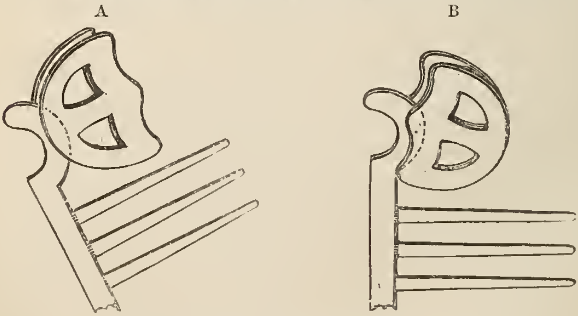
Whilst on the subject of ploughs we must notice article 4201, an improved ridging plough, which was highly commended. Shown by *Southwell and Co.*, of Rugeley. The mechanism by which the angle of the breasts is altered is simple—consisting of a shaft fixed on two uprights between the sole and beam, furnished with two arms, and working from a central rod by a universal joint. The ploughman acts by a handle and catch on the cross-bar, by which he can fix the position of the mould-boards, rendering them rigid.

Barrows and Stewart, of Banbury, was highly commended for a 4-wheeled windlass for steam cultivation, with one leverage for reversing the drums; the same action that raises one drum lowers the other. This is effected by having the axles in two planes, connected by a crank. On the central frame, and immediately below this crank, is a half circular rest, on which the crank travels. The shaft out of gear rests on the lower part of the circle, the shaft in gear occupies the upper portion, the lever handle being kept in position by a bolt. The windlass is carried on a strong oak frame; the centre bearing having to sustain great weight, is braced by a T shaped iron girder, placed under the woodwork. The drums are supported by a double set of curved wrought-iron spokes. The spur wheel, which is very strong, is bolted to the drum, and can be readily detached. Several of these windlasses are at work. The price, without ropes, is 75*l*. The merit of this arrangement consists in the saving of manual labour, one man being able to work both the windlass and engine.

Thomas Baker, of Compton, Newbury, showed a useful tumbler or tip-cart, suitable for removal of nightsoil, liquid manure, &c. The barrel is hung on the frame, $3\frac{1}{2}$ inches behind the centre of the wheels. The frame is of H iron. The plates 5 inches deep, and rib $1\frac{3}{4}$. The axle is turned and driven into a socket below the frame; keyed through by a steel pin $\frac{5}{8}$ thick, with a turned collar in front. The advantage of placing the barrel behind the wheels is, that the load on the horses back is reduced, the barrel acting as a counterbalance to the shafts. The arrangement for tipping is simple and efficient. The wheels are fitted with iron naves and strong tires. Price 17*l*. Highly commended.

The Beverley Iron and Waggon Company were highly commended for a manual delivery reaping-machine, fitted with Norfolk's patent self-acting tipping platform. The delivery is behind, by means of an ordinary hinged open platform; but instead of being held up and let down by the workman's foot,

Fig. 21.—*Norfolk's Self-acting Apparatus for tipping platform of Manual Delivery Reaping Machine, No.* 1513.



A—Position of Cam when the platform is elevated.
B.—Position of Cam when the platform is down.

this is automatic by the following simple arrangement:—A crescent-shaped cam is driven direct from the driving-wheel, being alterable as to speed by change of cog-wheel; this acts upon an iron half-circular upright attached to the platorm; when the circumference of the cam is in contact with the upright, the latter is pushed forward into a slanting position, the platform is elevated, and remains so until the circular portion leaves company, when the upright returns to its original position, the platform drops, and remains down until acted upon by another revolution of the cam. The preceding sketches will illustrate the action.

The improvement claimed is, reducing the work of the attendant, who, getting a better purchase from which to work his collecting rake, can give all his attention to one object, and is more likely to be able to get rid of a big crop. This is an important point.

In the event of it being desirable to clear the platform more frequently, as in a very heavy crop, the speed of the crescent can be increased; but at the same time it is clear that the period during which the platform remains on the ground is lessened, and therefore the difficulty of clearing is increased. How far this is a serious objection only a trial could determine. The additional machinery is very small, and the price of the reaper complete is 15*l.*, which is a moderate sum.

T. McKenzie and Sons, Dublin, exhibited a mower and reaper knife grinder and rest, which was highly commended, consisting of a wooden frame supporting a 22-inch grindstone, with bevelled edges. A crank from the spindle of the grindstone propels a reciprocating "Wishatta" stone, the under surface of which has two faces sloping from the centre to fit the angle of the knife. The knife is held in position by a pinching-screw, the reciprocating stone is worked by a handle. The grindstone acting as a flywheel, any pressure that may be required can be applied; and for such knives as have the blades attached to the upper surface of the bar it is an excellent little tool. In addition, we find a punch, chisel, file, and hammer supplied for the sum of 3*l.*

Thomas Corbett, of Shrewsbury, has introduced several improvements into the broadcast barrow distributor for clover and grass seeds. Instead of the shifting circular plates, with perforations attached to the under side of the box, to give more or less feed, we have a slide in two parts, meeting at the centre of the box and fixed by a bolt working in a slot of sufficient length to allow one-half of the drill to be closed, in case at the end of the field a narrow portion remains to be sown. Another advantage of the continuous slide is the certainty with which the box can be adjusted. The box is hung on 2 iron brackets, and is thrown out of gear by elevating the box. Turnips can be distributed; this is effected by extra holes in the slides. Price 3*l.* 10*s.*

J. McKenzie's drill for mangold or turnips on the ridge, which was highly commended at Manchester, has been considerably improved, and is now commended for the improvements. The drill consists of 2 sliding barrels on shaft, the surface of the barrels having channels of different sizes, according to the seed to be sown; the action depends upon which portion of the barrel occupies the centre of the seed-box. One improvement consists in the substitution of springs with stud fitting into grooves on the barrel, in place of a pinching-screw; when the spring is raised, the barrel slides to and fro as required. The driving-power is obtained from the rollers, which cover in the seed by means of an endless india-rubber round band, working off a pulley on to a grooved cone, adjustible for three different speeds. The simplicity of the arrangement and the quality of the workmanship renders this a most excellent machine.

Henry Denton, of Wolverhampton, was commended for 1477, chain-harrow on a carriage—the horse working in shafts, and the harrow, for transit, wound round a roller on an axle, which has been considerably improved since Manchester principally in the winding being made self-acting by clutch-gearings. When the roller is thus connected with the wheel, the horse drawing forward causes the harrow to be wound up, an operation which was formerly done by hand. The bar at the end of the harrow, to give proper weight to the harrow, is now jointed.

Messrs. Holmes and Sons introduced a novel arrangement in a corn-elevator.

The hind-carriage is on an axis, fore-wheels lock under the frame. Crank and gearing enable the fore-part of the machine to be moved in any direction, whilst the hind-part of the machine remains stationary, or is only moved to a small degree. This is considered a useful improvement, deserving of high commendation as it allows the straw being delivered to different parts of the stack as required, and saves labour on the stack. The horse-gearing is so arranged that the horse travels in a circle partly under and partly round the tail of machine The price, 46*l.*, is reasonable.

Messrs. Richmond and Chandler's litter-cutter for hand-power is a capital machine, on account of its simplicity and the quantity of stuff that can be cut with moderate draught. At first sight it may seem absurd to do such work by hand; but an inspection of the tool will show that, though only a small affair and cheap, it is quite up to its work. The fly-wheel carries one large blade. When the knife is at work the feed-rollers are stationary; hence no loss of power, which would be the case if the rollers in rapid motion were forcing the straw against the blade, neither could an even length of litter be cut. This important condition is secured by intermittent spaces in the gearing of the pinion and wheel. Exactly as the knife enters the cut, the plain surface of the driving-pinion comes in contact with a plain surface on the wheel of the roller; consequently the latter ceases to move until contact of teeth ensues, by which time the knife has passed the box. When the straw has been worked forward 10 inches the knife has performed a revolution. This intermittent action is attended with a certain amount of jar; hence the machine is not adapted for very fast motion. The revolutions of the fly-wheel should never exceed about 100 per minute; hence, if driven by power, a slow motion is absolutely indispensable. Highly commended. Price 5*l.* 5*s.*

James Davey, of Eynsham, Oxford, has made several improvements in cart and plough harness, which the Judges considered worthy of high commendation. In the cart-harness, the object is to prevent the chafing of the back and doing away with the friction of the crupper. The cart-saddle is padded with leather, and has three-friction-rollers introduced in the tree to carry the backband and prevent the working of the saddle backwards and forwards. The front of the saddle is elevated, so there is no pressure on the withers. The friction of the backband cannot possibly wear the saddle, as the chain is carried over a plate of forged iron fitted to the lower part of the saddle. The whole of the breeching-gear is composed of three straps, doing away with the crupper altogether. The two straps from the cart-saddle, to which they are attached by hooks and short chains, cross each other over a circular pad lined with leather and filled with flock, the straps being kept in position by a brass pin on the pad, but having freedom to move with the motions of the horse; these straps terminate by buckle and straps to the seat of the breeching. The straps are very strong, consisting, in some cases, of three ply, of different sizes, sewn one on the other, combining great strength with comparative lightness. The breeching-straps are double. The trace harness is made with a novel backband, which keeps tight under the horse's belly, so that there is no risk of a horse catching his hind foot, which occasionally happens with ordinary harness. Another idea is to make the same harness do for carting or ploughing; for this purpose an extra pair of backbands and extra traces are supplied. The quality of the work appears excellent.

David Hart and Co., of Wenlock Road, City Road, London, exhibited an automatic self-acting and self-registering weighing-machine for grain, invented by W. H. Baxter, of London. The corn is placed in a hopper, and falls on to a horizontal cylinder divided into four compartments; the axis being suspended on the end of a beam, supported in the centre, and carrying the weights sliding on a graduated scale, the position of the cylinder is maintained by four stops at equal distances on one end of the cylinder. When a weight of corn equal to the scale has passed into the compartment the weight depresses the cylinder until the stop has cleared the friction-roller, and at the same moment the mouth of the hopper is closed. This is effected by a cam on the opposite side of the cylinder, which holds up a crank-rod while the corn is falling and closes the opening as soon as the cylinder moves. A registering dial is also connected with the machine. This machine, having only recently been made, was not properly adjusted, and required further testing. Price 21*l*. The Judges highly commend.

William Ball and Son, of Rothwell, show a simple break on the hind wheels of a waggon. A long leverage is worked by a wheel and screw attached to the under side of the back frame; the fulcrum is placed at the end of the cross-beam, and thus the length of the arm of power renders the action easy and the result instantaneous. A wheel revolving rapidly can be brought to a standstill at once. The screw is an improvement on the springs, which were liable to get out of order. The surface of the break is a block of wood, some 4 inches deep, and the leverage allows of wear up to the frame. Highly commended.

Mr. Richard Winder of Farningham, Dartford, has brought out a simple machine for tarring sheep-netting, being an addition to, and to be used in connexion with, his folding-machine, which was noticed at Manchester. The apparatus consists of a large trough, with flat bottom and sloping ends; the bottom of thin sheet iron, the rest of wood. Under the centre is a sheet-iron firebox, perforated with a number of ½ inch holes for draught. In the eentre of the box is a friction roller, fixed about an inch from the bottom, under which the netting passes. The trough is filled with sufficient tar to cover the roller; consequently, as the netting is drawn forward it must be thoroughly coated with the tar. The netting, as wound on the drum of the sheepfolding machine, is fixed at one end of the trough; the end is carried under the friction-roller on to a drum at the opposite side. The same driving-wheel is used. Stockholm tar is ordinarily employed, but where hares and rabbits abound a mixture of Stockholm tar and gas tar are used. We should recommend the addition of soot, if the latter can be made to mix. Mr. Winder states that whereas sheep will often get the netting into their mouths and nibble at it when Stockholm tar only is used—which they appear rather to like—they very decidedly object to the gas-tar. If this is so, it would be a wise precaution to use the mixture, especially as the expense would be considerably lessened. The tar must be kept boiling during the operation; 100 yards of netting, the quantity carried on the drum, can be operated on in 15 minutes. It should remain for three or four days on the drum under cover, when it becomes dry and can be used. The eost of the trough, without the drums, is 2*l*. The Judges commended this machine.

Thomas Hunter, of Maybole, Ayr, exhibits Dickson's patent double-drill turnip-cleaner, which was highly eommended, consisting of two expanding harrows, the range of expansion being from 20 to 36 inches. The shape of each harrow somewhat resembles a figure of 8, and by running one harrow in advance of the other—effected by shortening the attachment to the tree—narrow furrows can be worked. The last pair of tines on each harrow is replaced by a cutting-blade covering the width disturbed by the teeth in front. This is valuable for cutting up strong-rooted weeds. The frames are so jointed that the outer side of each harrow can be fixed at any angle required by the form of the ridges, and thus by careful management the surface may be disturbed close up to the turnips,—a point of great importance when, as frequently happens, the top-soil has been rendered crusty by heavy rain. Each harrow works widest in front. These harrows will be found useful for working down potato-land after the crop has been planted and before it breaks through the surface. The price for medium soils is 4*l*. the set; for heavier soils the frame is made somewhat stronger, increasing the price 5*s*.

Article 240.—*Set of Steam-Cooking Apparatus, by* Amies and Barford. *Price* 75*l*.—This is a domestic steam cooking, boiling, and roasting range, suitable for large establishments, such as unions, gaols, asylums, hospitals, and similar institutions. The steam-generator is much like that employed in the portable steam-cooking apparatus, being of 1 horse-power and worked at low pressure, say from 6 to 8 lbs. to the square inch, provided with a simple self-acting water-supply, and is fed from a cistern placed about 8 feet above it, requiring no attention whatever, the water being admitted as fast as evaporation goes on. The two boiling-vessels, for meat, soups, water, tea, &c., are made of strong galvanised wrought-iron, and are double cased or jacketed, the steam circulating between the cases. The contents are thus boiled by steam, yet without its admission into the pans,—a plan found to be very economical. These vessels hold 40 gallons each, and, together with the potato-closet (to which the steam has access), are placed on the right-hand side of the boiler.

Fig. 22.—*Amies and Barford's Set of Steam-cooking Apparatus, No.* 240.

On the left of the boiler is a large roasting oven, on the "Leamington" principle, capable of roasting 50 to 60 lbs. of meat at once; this is heated, without any extra cost, by the flues from the boiler being simply deviated to encompass the oven, and the unspent heat is thus utilised on its way to the chimney. The whole forms a complete range, 12 feet long, occupying a small space, yet capable of supplying the requirements of 500 people, with a consumption of coal of about $1\frac{1}{2}$ cwt. per day. This apparatus was used to prepare food for the Bath and West of England Meetings at Southampton and Taunton, and was highly commended.

William Smith, of Foston Lowthorpe, West Driffield, exhibits a novel sheep rack, in which the rack is shut off from the trough by patent moveable slides. The food, of whatever kind, is put into the rack, the sheep drawing it through the bars and below the slides, which can be set at any height. The object is to economise the food by preventing its being pulled out and wasted; also the sheep, whilst eating, do not breathe on the fodder, and everything is kept perfectly dry. The rack is 14 feet long, accommodates about 30 sheep, and costs 6*l*. It was highly commended.

J. P. Barford, of Wantage, was commended for an improved carriage lifting-jack. In this the old pin and chain is done away with. The lift is perpendicular, and alteratious of height are easily effected. Price 12*s.* 6*d.*

Messrs. H. J. and C. Major were commended for specimens of Bridgewater tiles, which are well known, as excellent roofing; the price varies from 9*s.* to 15*s.* a square. These tiles are larely used in the West of England, and are much liked.

I cannot conclude this report without expressing my grateful sense of the hearty assistance rendered by the Judges in their different departments, to which I am in no limited measure indebted for the material of the report.

XXVI.—*Report on the Exhibition of Live Stock at Oxford.* By D. Reynolds Davies, Senior Steward.

More than ordinary interest has probably prevailed regarding the Royal Agricultural Society's exhibition this year, from the fact that it was held at Oxford, where the first-born efforts of the Society were welcomed thirty years ago; and there are happily still living not a few who were able, from their own personal observation, to note the extraordinary and rapid progress that has been made in the appliances of agriculture since the Society's first gathering in the same city. Then about seven acres of ground more than sufficed for its requirements, whilst on the present occasion the space occupied was tenfold the area, with its many miles of shedding.

It is gratifying to know that the exhibition has been thought a successful one in many respects, but financially it is feared the Society's resources may be taxed to supply a deficit of not less than two thousand pounds. Such results as those of the previous year could not be looked for at Oxford. The Manchester meeting was altogether exceptional, having been held in the midst of the most densely populated manufacturing districts, and under the presidency of his Royal Highness the Prince of Wales, accompanied as he was by the Princess of Wales, whose presence so greatly charmed the honest hearts of Lancashire. A fairer comparison would probably be that of the Leicester meeting two years ago, where the total money receipts were but little over Oxford's second meeting.

A system of season tickets was inaugurated at the Manchester Show, and as it has again worked well this year it is probable the Council may see fit to make it an established rule for the encouragement and convenience of the public to visit the show-ground at their pleasure.

The labours of the Society at Oxford were heartily seconded by his Worship the Mayor, to whose personal efforts, aided by the Local Committee, much of the success was due; and the recollection of agreeable and warm hospitality and kindness will remain in the minds of many in time to come. These good offices were recognized at the annual meeting held in the member's tent on the ground, his Grace the Duke of Devonshire in the chair, when Lord Vernon (President elect) moved, and Lord Kesteven seconded, a vote of thanks to the Mayor and Corporation of Oxford for their exertions in promoting the success of the Show. The vote was carried by acclamation, and acknowledged, in the absence of the mayor, by the senior member of the corporation present, Alderman R. J. Spiers.

A new and interesting feature preceded this vote, viz. the declaration of the awards made by the Judges for the best managed farm in the Oxford district. The first prize of 100*l.* was offered through the liberality of the High Sheriff of the county, James Mason, Esq.. The cup or vase, designed by Mr. Owen Jones, and executed by Messrs. Hancock and Co. of London, was of exquisite form and workmanship, and, whether for its intrinsic value or artistic beauty, might well have been coveted by landlord or tenant. The name of the successful competitor, Mrs. Mary Elizabeth Millington, Ash Grove Farm, Ardley, Bicester, a tenant of his Grace the Duke of Marlborough, was received with much applause. Mr. John Treadwell, of Upper Winchendon, also a tenant of the same noble Duke, took the Second Prize of 50*l.*; and Mr. Robert Craddock, of Lyneham, Chipping Norton, the Third Prize of 25*l.* The lists were entered by twenty-one competitors, and it may be hoped that, under such peculiar circumstances, the gallantry of the unsuccessful ones would in some degree tend to soften their disappointment in being vanquished by a lady. The reports on these farms will be perused with much interest, and their value to the agricultural world will be recognized, both, on account of their giving prominence to that system of culture and management most desirable to emulate and to follow, as well as directing attention to that of an opposite character and tendency.

Divine service was, as usual, held in the showyard on the Sunday preceding the opening of the show. Both in the morning, when the sermon was preached by the Bishop of Oxford, and in the afternoon, when the Rev. Canon King officiated, the attendance of yardmen and servants in charge of the stock was numerous in proportion to the increased size of the exhibition; and it was computed that no less than 600 persons formed the congregation on each occasion. The evident desire of the eminent divines who so kindly officiated, to make themselves understood by the least educated of their audience, leads us to believe that these services are as effective as they are interesting.

To the breeders and exhibitors of stock the Oxford meeting must have proved abundantly satisfactory from the numbers and importance of the sales effected on the ground. Probably at no previous exhibition have buyer and seller been brought together so frequently with success, and the prices realized for many of the animals at once bespeak their superiority, and indicate the liberal spirit of the purchasers, of whom there were some of the most enterprising present, from the United States, Canada, and Australia. Shorthorns and Herefords seemed most to take their favour, and if they carry with them across the seas, as they will do, some of our choicest specimens in form and blood—Bates as well as Booth, and other kinds—they are surely entitled to possess them, with our best wishes for their success in distant climes, for the weighty considerations left in exchange. The enormous or almost fabulous prices realized of late for shorthorns are beyond all precedent. Two thousand guineas for a seven year-old cow is surely a startling if not a tempting price. That such an offer was made and declined, the writer has it from the best authority. This priceless treasure is "Lady Fragrant" ("Extract of Gold," or "The Nugget," would have been equally appropriate names), owned by that well-known breeder, Mr. T. C. Booth of Warlaby. Selections were made from the same herd at 1500 and 1000 guineas each. Duchess blood, too, now so rare, has not escaped the compass of these spirited visitors, as Mr. Cochrane of Montreal has charmed away two of Captain Gunter's gems, both yearling heifers—"Duchess 101st," and "Duchess 103rd" —the consideration being no less a sum than 2500 guineas. The first and second prize yearling heifers at Oxford also found buyers at 500 guineas each. The first, an undeniably good one, owned and bred by Mr. D. McIntosh of Havering Park, Essex, goes to Australia, and her second competitor, bred by Mr. Dudding, follows suit to America. All this, and much more that cannot here be given in detail, should be highly encouraging to breeders, and in the absence of Continental buyers the vast amount of business done is the more astonishing.

The entries of stock, like those of implements, have a progressive annual increase, as will be seen in the following summary:—

	Cattle.	Horses.	Sheep.	Pigs.
Stock at Leicester	291	167	418	119
,, Manchester	336	384	461	132
,, Oxford	441	203	550	192

In cattle, sheep, and pigs, it will be noticed the numbers are considerably in excess of former years, whilst there is a notable falling off in horses, in the aggregate, as well as in the quality and character of some of the classes. Last year, however, there were unusual attractions in the way of hunters, hackneys, and other classes, by reason of the largely augmented prize lists offered through the liberality of the local committee, for in no district, rural or otherwise, could superior horse-flesh be exhibited before a more discriminating public.

The reports of the Judges will be given *in extenso* in their respective places. Some of them will be found copious and full, for which reason they are the more valuable and interesting, whilst it is to be regretted that others are brief and scanty. It is at all times desirable that gentlemen of experience and competent authority should, in the interests of breeders and the public, offer full and free remarks on the classes brought before them for adjudication.

Commencing with the agricultural class, as arranged in the catalogue, the Judges, Messrs. Biddell, Woolhouse, and Turnbull, in their joint names, report as follows, and that their opinions are in accord, save that the last-named gentleman is a less enthusiastic admirer of the Suffolk horse. This divergence in taste is surely pardonable between northern and southern men.

Report of the Judges on the Agricultural Horses shown at Oxford, 1870.

At the request of the Secretary, I send this Report on the horses brought before myself and colleagues at the late meeting at Oxford. Commencing with the agricultural stallions, not Clydesdale or Suffolks, the Society may be congratulated on having produced one of the best exhibitions I have looked over for many years—a remark as applicable to numbers as to merit in the individual animals exhibited. As regards what are generally known as the "shire-bred horses," a little more quality, without sacrificing power or substance, would be an improvement, but I can but remark the progress made by the breeders of these horses since the first meeting of the Society thirty-one years since. For my own part, accustomed to the uniformity and decided character of the Suffolk horse, a class of this kind must always appear a mixed lot, and one rather difficult to judge when brought into the ring as agricultural horses—a term presumed to include the breed of large heavy dray-horses, animals suited to the common work of a light land farm, as well as specimens of all grades between the two. The question has been asked, on what principle we could award the first prize to Mr. Welcher's No. 4, or the Reserved Number to Lord Norreys's "Black Prince," when such an animal as Mr. Statter's mare, No. 94, came in for a first prize—all being in classes for agricultural purposes. In this decision we were unanimous, but as No. 4 and No. 94 are widely diversified in style and form, we explain an award by stating that we considered the respective animals were adapted to the different purposes that various circumstances suggest for the requirements of agriculture. In such a class we were guided in our selections by merit, either for the slow heavy work on the stiffest soil, or the more active labour upon lighter land.

Taking the whole class of aged horses, we found a large proportion of soft, boggy-looking hocks, not amounting to actual unsoundness, but still an indication of weakness not to be disregarded. This, with flat feet, appeared to be the prevailing faults. On some we noticed a short coarse hair upon the leg, with gummy matter round the fetlock, invariably denoting a tendency to cracked heels, and grease in its worst form. This was always accompanied by knots and unsightly excrescences upon the legs. If the breeders of "shire breds" hold the rough leg an indispensable point (I, as a Suffolk breeder, hold it to be worse than useless), by all means let it be retained, but take care that the hair is fine and long rather than short and bristly.

In the class for stallions foaled before January 1, 1868, nineteen in number, we had some little doubt in deciding between the first and second prize horses, but finally placed Mr. Welcher's first—a bay horse, we believe, first at Bury St. Edmunds as a two-year-old, and first again at Manchester last year. We thought him a remarkably good animal, though certainly worn rather too much for a horse of only five years old. Whether this is the effect of forced feeding, or general weakness of constitution, is a question not easily answered—capped hocks, bad splints, and small feet may be the result of either. The second prize horse, Mr. Manning's curiously whited three-year-old chesnut is a colt of great promise, has the best of clean legs, with plenty of hair, and very active on them. I fully expect to hear of him again in the show yard. The third prize went to Mr. Hunt's horse, a very useful hardy animal, and now in his thirteenth year appearing fresh and sound. His loins and hind quarters may be taken as a model of what a cart horse should be, of *all sorts*. The reserved number we gave to Lord Norreys's No. 8.—a magnificent black, with a faulty middle, and coarse, rather long legs, but with all his faults, will always find many admirers. No. 5, ticketed "A 1," we were obliged to pass over on account of a blemished hock from some cause, and, worse still, a contracted hind foot; otherwise, he would have had a place in our list of awards.

The young stallions were represented by a class eight in number, two of which were rejected by the Veterinary Inspector. Those placed first and second were very good colts; both have action, and bid fair to grow into first-class horses. The third prize went to a colt of fair pretensions, and the reserved number to the best of a very middling lot remaining.

The aged mares, in or with foal, were strong in numbers—nineteen, eleven of which were quickly dismissed as being quite out of the race. The best of the lot, we decided, was Mr. Statter's, No. 94, a smart, clean-legged, active chesnut, a little disfigured by capped hocks, probably the result of accident; otherwise they were hard and sound. The second prize went to Mr. Coldicott's catching-looking grey, with only a middling loin and not the best of feet. The third prize, Mr. Thursby's "Nelly," another grey—a level, hard-fleshed four-year-old of good promise—Lord Norreys's, No. 83, and another, were of apparent equal merit, but the latter failing in the veterinary test, Lord Norreys's had the barren honour of the reserved number.

Of the six three-year-old fillies we selected Mr. Lister's, No. 45, for the first prize; Mr. Howard's, No. 140, for the second prize; and Mr. Druce's, No. 139, for the third; but neither of these, or those not placed, call for any particular notice.

In the two-year-old class fillies the first and second prize animals were a long way above the others—Mr. Davies getting the first and Mr. Denchfield the second. The third prize, No. 152, has weak hocks, and stands high on the leg—a fault the reserved number, a hearse-like-looking black, shares with her.

The Clydesdale horses as a breed have always stood high in repute, and one is at a loss to account for the short and poor appearance they made at this meeting. We are obliged to record their number as small and their quality bad. We have always looked upon these animals as good on the land, and superior to most for heavy work on the road, but if the specimens brought before us are a fair sample of the breed, their reputation is not likely to be increased in their favour by this exhibition. At any rate I must express my disappointment at finding so many unsound inferior animals in the short entries which composed the class. For the aged stallions only three competed. Lord Beauchamp's, No. 33, to which we awarded the first prize, has most curiously formed feet—the heels forming quite a study for those interested in unique formation. However, the Veterinary Inspector, on examination, came to the just conclusion that, as they had carried the animal 9 years without producing lameness, the queer form did not amount to unsoundness. Our selection for the second prize was disqualified by the Inspector, and the remaining horse we rejected as not worthy of a prize.

In the two-year-old class there were but two entries, both belonging to the Duke of Richmond. The best of the pair was a small-girted, light-flanked bay, and the second prize colt had ordinary feet—neither of the two likely to make anything beyond common van horses.

For the three prizes offered for the Clydesdale mares five were entered. The first prize we awarded to Mr. Waugh's No. 103. I thought her the best animal in any of the Clydesdale classes. The second prize, Colonel Lindsay's mare, had bad coarse fetlocks, with a little weakness about the loin, and the third prize had bad feet, was light in girth, and wanted power all over—an appearance her age (16 years), with foal at foot, helped to produce. The three-year-old fillies in Class 17 called for no particular notice. The two-year-olds, Class 20, were represented by three entries, not one of which could claim a prize. The one selected for the first prize, as she stood, looked worth the other two, but being lame, she was pronounced unsound at the time. The next was disqualified on account of her feet, and the third was too bad for us to award a prize to.

As regards the Suffolk horses, we thought them well represented by remarkably sound animals; indeed, we had only one case to call in question that point. Years ago the feet of the Suffolk horses were considered their weak place; they will now bear comparison with any other breed exhibited, and certainly the Clydesdales and "shire-breds," at this meeting, were far worse in this respect than the Suffolks. My note-book shows many marked as having indifferent fore-legs, light in substance and with a retreating cannon-bone, a formation weak and unsightly. This appears to be a prevailing fault; some few others had bent hind-legs and coarse hocks.

In Class 5 the first prize was awarded to Mr. Rist's No. 38, a very grand horse of 9-years-old, with flat sides, and perhaps hardly bone enough in proportion to his immense quarters, back, and shoulders. This horse is directly descended from Royal prize-winners, and, if anything is required as additional evidence of the value of pedigree, we have it in the fact that this horse is the sire of the first prize Two-year-old Stallion, the third prize in the Old Stallion Class, the second prize Aged Mare, the second Two-year-old Filly, and the reserve number in the Three-year-old Filly, all being in the Suffolk classes at this meeting. The second prize we awarded to Mr. Boby's No. 36, a little too dark in his colour to please Suffolk breeders, with hardly so handsome an outline or correct a form as the first prize horse; the third prize went to Colonel Tomline's 41, a rather small horse, but having much Suffolk character about him.

The two-year-old stallion class comprised six animals. The best we considered to be Mr. Rist's No. 47, a very good colt of the true Suffolk stamp, but having the prevailing fault of small and weak fore-legs. The second prize we gave to Mr. Capon's No. 50, a colt of great promise, and but for his suspicious looking hocks would have run the winner very closely. The third prize we looked upon as wanting in style and Suffolk character, and, although a sound powerful colt of his age, he is too short in the rib and too long on the leg for our idea of a Suffolk two-year-old.

Among the mares in or with foal, we found the best animal in all the Cart-horse Classes, possessing all the favourable points of her breed, and without doubt a very superior mare in all respects. This was No. 108, Mr. Capon's "Matchet," a mare well known in the prize-ring in her own district, and well able to hold her own at any Royal meeting. Colonel Wilson's "Bury Empress," justly claiming second honours, is too light in bone, and would be better with more substance all over. Both the reserve number and No. 105 were good mares, and had a highly-commended card handed to them; the other, No. 104, being commended.

Class 18 comprised the three-year-old fillies—three in number—and all good, Mr. Wolton taking the first and second prizes, but having very little to spare to beat Colonel Tomline's entry.

The two-year-old fillies called for little notice, the four there being all useful well-bred animals.

In reference to the Suffolk Classes there were two marked points for notice; the first was the short entries; and the next, the uniformity of character in the individuals exhibited. The first is in some measure to be accounted for by the fact that all the animals come from a district where every breeder knows each individual animal likely to be formidable in the showyard; with competent judges to decide, winning is a question confined to a well-known few, and the Suffolk breeders know too well the uselessness of sending an ordinary animal to compete for a Royal prize. The Suffolk has long been a recognized and distinct breed, and perhaps, with the exception of race-horses, none have been bred with more care and attention. Every distinguishing point for which the breed has long been valued has been preserved and cultivated, and the prevailing characteristics of colour, quality, and compactness of form, with activity and strength, have never been lost sight of. Distinctive feature at first sight gives the breed a great advantage in attracting the attention of a casual admirer, but has little or no weight with those accustomed to sift the merits and balance advantages in individual specimens of various breeds. Competition beyond their own immediate district has brought about vast improvement in this breed. Want of action, bad feet, and bent hind-legs are no longer noticeable in the Suffolk entries, and no meeting has given better proof of this than the one just held. We hear the breeders of Clydesdales, Shirebreds, and Suffolks holding to their own with unflinching pertinacity; as agricultural horses each are subject to criticism from the best of judges at these meetings; and, unless the listener is bigoted to his favourite breed, he will quickly throw aside his prejudice and admit that no one kind of horse is suited for every locality, and he will probably begin to realize the fact that, where distinct breeds have for ages been associated with certain duties or certain districts, they have not been selected for the work without a substantial reason. Of what use would the immense weight and slow heavy action of the shire-bred be on the soils of Suffolk? and no one would recommend the farmer, whose soil is of the stiffest clay, and who breeds for the railway, the dock, or the brewer's dray, to hire a "Harwich Emperor" for his mares, or purchase a "Bury Empress" to fill a vacant stall in his plough stable; and the very weight of the shire-bred would distance him with the quick action of the Suffolk in his own county; while the Midland Counties man would talk of the tenacious soil, and ask if the Suffolk horse, hardy and active as he is, could stand the work required for the cultivation of such a district? The Clydesdale breeder would point to the quays and streets of Glasgow, and call for an animal better suited for the work he would there find. These are questions safer left to those whose experience should best teach them what their own requirements are. As breeders our business is to eradicate unsoundness, perfect the form and preserve the characteristics which should denote the breed we adopt; as judges we felt our duty was to point out the individual specimens which give the best evidence of the breeder's success, as tested by such a principle.

In concluding this Report we beg to acknowledge the services of Mr. Varnell, the Veterinary Inspector, whom we found of great assistance during the day. We heartily approve the practice of inspection as at present adopted by the

Society—viz., of appointing a veterinarian to give his opinion of the soundness of the horses only at the request of the judges; believing that if an animal is sound enough to satisfy three competent judges, whatever unsoundness he may have, it can hardly be of sufficient importance to disqualify him for breeding purposes.

MANFRED BIDDELL.

Playford, Ipswich, July 30, 1870.

I concur generally in the above Report,

GEORGE C. WOOLHOUSE.

While agreeing generally with the above Report, I may mention that I am not quite such an admirer of the Suffolk horse as Mr. Biddell. I think them too heavy for their legs, and for choice prefer such animals, for all kinds of work, as are now shown in Class 10, amongst agricultural mares.

ALEXANDER TURNBULL.

Following this admirable Report, any remarks from me may fairly be deemed of little value, but in accordance with the practice of those who have preceded me in the office of senior steward of stock, I append some notes and observations on the classes brought under my supervision:—

Class 1. Agricultural Stallions foaled before 1st July, 1868.—There were twenty entries, and nineteen brought into the ring. Taken as a whole they have rarely been excelled in merit, Mr. Welcher's "Honest Tom," No. 4, still holding his ground and proving his title to first honours the third year in succession. Mr. Manning's "Young Champion," No. 17 (chesnut, but too gaily marked), a capital young horse, taking second place. Third position was given to "Nugget of Gold," No. 16, an animal of more mature years, powerful and useful looking. Reserve Number and High Commendation went to Lord Norreys's "Black Prince," No. 8, also a useful stamp.

Class 2. Agricultural Stallions foaled in the year 1868.—Ten entries, eight of which were present. Unsoundness displaced some of them, but there were others good and useful, possessing more than average merit. "Nonpareil," No. 23, being first; "Prince," No. 29, second; and "Crown Prince" third. Reserve Number going to "Warrener," No. 25.

Classes 3 and 4. Clydesdale Stallions, foaled before and in the year 1868.—The entries were short in number and disappointing in quality. In the former class Earl Beauchamp's good-looking "Young Lofty" stood alone as the only prize taken. In class 4 the Duke of Richmond had a clear field, and with two entries took first and second prizes.

Class 5. Suffolk Stallions, foaled before 1st January, 1868.—Eight entries, five present. This, although a small class as to numbers, was an attractive one; here as elsewhere the lively pony-like action of this breed of powerful horse usually commands the admiration of the crowd. "Harwich Emperor," No. 38, a grand horse of the orthodox chesnut shade, was awarded First Prize; the second place being assigned to No. 36, "Royal Prince," a 4-year old darker chesnut, whose colour might be taken exception to by the fastidious admirers or breeders of this class. No 41, an exceedingly compact and good-looking 3-year old, owned by Colonel Tomline, took Third Prize, the Reserve Number going to "Hercules," No. 43.

Class 6. Suffolk Stallions foaled in the year 1868.—Five animals here went before the Judges, good-looking and powerful, but not of equal merit. First Prize was given to "Young Emperor," a good type of the Suffolk horse; No. 50, also a good-looking colt, taking second place, and No. 48 third; while the Reserve Number and High Commendation was awarded to Wolton's colt, No. 49.

Class 10. Agricultural Mare in foal, or with foal at foot.—This was a large and full entry of twenty, of which nineteen went into the ring; but few of them could be pronounced first-class animals, Mr. Statter's active chesnut being decidedly the best.

Class 11. Clydesdale Mares in foal, or with foal at foot.—A short and indifferent entry, but the First Prize animal, No. 103, "Isabel," owned by Mr. Waugh, was an uncommonly good one, and her owner was fortunate in selling her, as it was said, for the sum of 280*l.*

Class 12. Suffolk Mares in foal, or with foal at foot.—Although few in number they were more uniformly good than any other class, and excited deserved admiration, all being commended. The First Prize went to a magnificent chesnut, "Pride," owned by the executors of the late Mr. Capon; the Second Prize and High Commendation were awarded to two grand animals owned by Lieutenant-Colonel Fuller Maitland Wilson.

Class 16. Agricultural Filly, 3 years, not Clydesdale or Suffolk.

Class 17. Clydesdale Filly, 3 years.

Class 18. Suffolk Filly, 3 years.

Class 19. Agricultural Filly, 2 years, not Clydesdale or Suffolk.

Class 20. Clydesdale Filly, 2 years.

Class 21. Suffolk filly, 2 years.

All these were more or less weak in numbers, and without any remarkable points in quality to comment upon. In class 20 the three animals shown, though owned in high quarters, were so wanting in merit that the Judges withheld the prizes. In concluding this report on the agricultural classes, it will be noticed that the Judges express their approval of the practice that veterinary inspection shall be necessary only when required by themselves.

Thoroughbred Stallions suitable for getting Hunters, Brood Mares, Hackneys, &c.

This division of the show of horses, usually the most attractive and interesting, can scarcely be said to have been a good one at Oxford, with the exception of one or two classes, which were certainly superior in merit, as whole classes, to any that have been shown for some years, and in *them* was found some recompense for the inferiority generally prevailing.

Class 7. *Thoroughbred Stallions for getting Hunters.*—Twelve were paraded in the ring, and, taken together, seldom has a better lot been seen. First honours were by common consent awarded to General Peel's superb horse "Knowsley," almost faultless in appearance and perfect in action. "Laughing Stock," a horse now well known in the ring, came second; but out of his usual form, overloaded with flesh and carcase, which impeded the light and airy action natural to him. Third place was given to Mr. Casson's "Sincerity," a horse of great bone and substance, with not the best of shoulders, still a likely looking hunting sire; his performances in Ireland as a steeple-chaser, proving pluck and endurance, should give him a character, but he lacks the elegant form of the perfect gentleman "Knowsley." "General Peel," No. 61, was placed next in order of merit, taking the reserve number. This horse attracted a good deal of attention in the ring from his known performance as the winner of the Two Thousand; he is of great size and power, growing somewhat coarse, but it was remarked of him by a distinguished master of hounds, that he would make a grand 16-stone hunter. There were others which might be favourably commented upon: No. 60, "Chevalier d'Industrie," also a horse of great bone and power, "a fiery steed," as he went round the ring, but light in his middle.

Looking to the object and purpose of the prizes offered for this class, it may be asked, Are these horses, as sires, within the reach of the ordinary breeders of hunting stock, or do not the fees generally demanded amount to a prohibition, except to a favoured few? On this point a suggestion is offered in the report of one of the Judges (Mr. Calder), which may be worth the consideration of the Council another year, when arranging their schedule of prizes.

Class 8. *Stallions suitable for getting Hackneys.*—This was a small class of five, the first and second prize horses being tolerably good-looking and useful, with good action, the first however showing more quality.

Class 9. *Pony Stallions.*—This again was a short entry of indifferent merit, save the first and second selected, both being handsome and capital movers. Mr. J. A. Ransome's "Perfection" was truly a pony in point of size.

Class 13. *Mares in or with Foal suitable for breeding Hunters.*—Here was a tolerably large entry, eighteen coming under the Judges' eyes. They were of varied order in size and substance, and but few of them calculated to breed the valuable weight-carrying hunter. The first prize mare, "Go-ahead," is, however, a rare specimen in her class. Merit was confined to but few others, scarcely going beyond the selected numbers.

Class 14. *Mares suitable for breeding Hackneys.*—Although an entry of nine animals, they were but a moderate lot, the first and second prizes only being worthy of notice.

Class 15.—Out of respect for age (25 years) this single entry must have obtained a prize.

Class 22. *Hunters, 4 years old. Mares and Geldings.*—This and the next class of hunters usually attract the attention of the public at all shows, but at the Oxford Meeting they were not worthily represented, from some cause or other. In the Four-year-old Class 12 animals were placed before the Judges. First prize was awarded to Mr. Berridge's black gelding "General," a very good looking gentlemanlike horse, with nice action; the second prize went to Mr. Grant's chesnut horse "Ace of Clubs," but little inferior to his competitor; both, however, rather too leggy for a long day. The third prize horse was wanting in quality.

Class 23. *Hunters, 6 and 7 years old.*—Although fewer in number, they were a better lot, and among them were three or four useful looking weight-carriers, more or less wanting in quality.

Class 24. *Hackneys, &c.*—Among the lot of twelve taken into the ring there was not a shining light. The first prize chesnut mare, "Ada," owned by Mr. Woodcock, was a quick and active mover, with good looks. The second prize mare, Mr. Moffat's "Fanny," was also smart and active on her legs, but light in substance.

The Judges have not on these classes made their report a collective one, they therefore appear subjoined, under their individual signatures:—

Class 7. A fair good lot—first three extra, particularly "Knowsley"—but fancy that *his* covering fee won't make him "suitable for getting hunters." Should horses competing for this prize not be bound to serve hunting mares at a limited price—say 5*l.* or 10*l.*?

Class 8. The first a nice long gentlemanly horse, with good action,—as had the second, but with heavy neck and "coachy,"—others bad.

Class 9. The two places very good. The first scarcely coming under the

"Pony" class; but he was under the stipulated height, 14 hands 2 inches. Should this class not be limited to 13 hands 2 inches or 14 hands?

CLASS 13. First three good, No. 1 being a very superior mare—the rest far from a bright lot.

CLASS 14. Nothing very grand in this lot.

CLASS 15. Only one shown, and not bad of her class, and considering her age "over 25."

CLASS 22. A fair average lot, and well grown, without any *perfect*—the first two being on the *big* side, and No. 3 rather "Harness." The reserved number also was a useful looking mare, and some might just have put her third.

CLASS 23. The four placed, a very good lot of weight-carriers, though they might all have been improved a little in *quality*.

CLASS 25. A very sorry lot—the first two having very good action when going *fast*, though otherwise far from perfect.

Kelloe Mains, Edrom, N.B., 2nd August, 1870.

DEAR SIR,—I prefix my Report of Oxford. Until I received Mr. Jenkins' letter of the 29th, I thought the Judges collectively would make their report. The prefixed is entirely *my own*, and for which the other Judges are in no way responsible.

I am, dear Sir, yours respectfully,

D. R. Davies, Esq. ROBERT CALDER.

Westgate, South Lincolnshire, 1st August, 1870.

DEAR SIR,—I am desired by Mr. Jenkins to forward to you my Report of the classes judged by me at Oxford. It was agreed by my colleagues and myself that Mr. Calder should send our report; however, I do not hesitate to make a few brief remarks, but think that you had better not make use of them before you see what our joint report is. Class 7. was a large muster of horses of very high order and great merit. Class 8, Nos. 66 and 70 were both fine movers; 70 is a gentleman's horse, with rather too much neck and too short in his ribs. Class 9, Nos. 74 and 75 were two very handsome ponies, with perfect trotting action, such as are rarely to be met with. Class 13, Nos. 109 and 111, stout average mares; No. 113, a nice even-made mare of medium substance, with quality, and a good mover. Class 14, No. 129, a strong built mare, with fine action; No. 131, a very nice mare, full of quality and action, too small. Class 24, No. 192, a stout mare, with quick stout action; No. 194, a rare sort, and if she has got good manners, what any judge would select for his own riding; No. 199, a pretty light mare, with taking action, unfortunately has weak hind legs. The remaining classes I would rather not comment upon. The Show was a great success, and admirably conducted.

I am, dear Sir, yours faithfully,

D. R. Davies, Esq. SAMUEL ROBSON.

We commenced our duties with the Thoroughbred Stallions for getting Hunters. At the first glance it appeared to be a great class, but after a careful inspection there were not many suitable for the purpose for which they were shown, though there were many that ranked high so far as regards pedigree and racing performances. We had not much difficulty, and were, I think, from the first quite unanimous in awarding the first prize to "Knowsley," one of the most beautiful and well-proportioned horses I ever remember seeing: his action is very near perfection for a hunter, not showy, but quick and easy, moving his hind-legs beautifully. "Laughing Stock" we gave the second prize; he is a very handsome horse, and a fine mover, perhaps a little long on the leg, but his greatest defect is, that his hocks are rather small, and too far from the ground. "Sincerity," the third prize horse, was amiss and under the care of the veterinary inspector, consequently did not look as well as he probably would have done had he been well; he is a good brown, stands on short legs, has immense bone and sinews, and his action is smooth, moving his hind-legs well and like a hunter; he is, however, not quite so nice about his shoulders and back as he ought to be. The reserve number, the celebrated "General Peel," looks very different now to what he did in the year when he won the Two Thousand, and ran second for the Derby and St. Leger, having the appearance now of an over-sized harness-horse. The remaining horses in this class were not adapted to getting hunters.

Roadster Stallions came next—a very bad class. The first prize we awarded to rather a fashionable looking brown horse; the second prize to a roan, good a goer, but of a very common appearance, the remaining competitors were so inferior, we could not find one worthy of the reserved number.

Pony Stallions.—The first prize pony is very handsome, with beautiful action, perhaps more of a horse than a pony; but as he is well under the height specified (14 hands 2 inches), we thought him entitled to the prize. The second prize was also a remarkably nice pony, really more of a pony than the other; but though a very good mover, not so good as the first prize. Two prettier ponies are seldom seen.

Mares for breeding Hunters.—This was one of the strongest class, but upon examination there were many inferior animals. We had not much difficulty in arriving at the first prize, a nice fashionable hunting mare, that looks like carrying a man well across country. The second we gave to a chesnut mare, is of good substance, and goes well, but her shoulders are rather too upright. The third is a nice-looking mare, but her fore-legs and knees might have been better, as also her action.

Mares for breeding Hackneys we had some trouble with, as we could not find a good one amongst them. The one we selected as the first is just a useful mare; the second a nice looking one, with bad action; and the third is very pretty and a nice goer, but very light of bone for a brood mare.

In the Pony Brood Mare Class there was no competition.

Hunters, 4-years-old.—I was in hopes that when we got to this class we should have something worth looking at; but was greatly disappointed. We were obliged to give the prize to a horse much too high for a four-year-old, and the second to a horse with little fore-legs and that cannot gallop, and the third to a useful looking kind of horse with bad action. The reserve number was far the best mover in the lot, but saddled close on the shoulder, with a short neck, and carried her head in the air.

Hunters 5 and 6 years.—We had not the slightest difficulty in awarding the prizes in this class, as the chesnut horse was decidedly superior; he is a good looking horse of great substance, moves well, and looks like carrying 16-stone well across any country. The second prize is a useful horse, but not a show horse, wanting quality. The third prize horse is a big horse, with bad hing-leg action. The reserve number a nice dog-cart horse.

Hackneys were a sad finish to the day's exhibition, as a worse class I think I never had to judge. The chesnut mare we gave the prize is, I have no doubt, a fair hack and a good little mare; but she would not walk in the ring. The second mare has nice manners, and moves well; but has the worst hocks I ever saw get a prize. The reserve number was a very common looking animal. This concluded our day's work, and I am sure we should have done our work easier and more satisfactory to ourselves, had we had in many of the classes better animals to select from.

JACOB SMITH.

Shorthorns.

Class 25. *Aged Bulls.*—These were weaker in point of number, and probably as a class inferior in merit to those of last year, but there were some unquestionably grand and good specimens among them; "Bolivar," for the third time at the Royal, took first prize; his perfect form and symmetrical proportions justly entitling him to the foremost place. How great will be the public interest in seeing the stock of so notable a bull in the Royal ring. "Edgar," another grand bull of different character, took second place; he has distinguished himself as the sire of the 2-year-old bull "Man's Estate," No. 224 in Class XXVI., winner of the third prize. "Baron Killerby" and "Sovereign" were also bulls of merit, obtaining third place, and reserve number with high commendation respectively; whilst "Shuttlecock" and "Royal Butterfly" followed in a lesser degree of merit, being highly-commended and commended.

Class 26. *Two-years-old Bulls.*—The entries in this class, numbering twenty, were but a moderate lot; "Scotsman" being first, "Baron Hubback" second, and "Man's Estate" third; "Duke of Babraham" following with the reserve number and high commendation, and a commendation falling to the lot of "Ironmaster."

Class 27. *Yearling Bulls.*—These were also strong in number and superior in merit; Lady Emily Pigot's "Bythis" being placed first, "British Hope" second, and Lord Braybrooke's beautiful "Hendon Duke" third; Lord Aylesford's "Magdala" taking the reserve number and a high commendation. The announcement of these awards, it was whispered, was not entirely endorsed by those outside the ring; but whether agreeing or differing, submission to constituted authority is the duty of every loyal subject.

Class 28. *Bull Calves.*—These came in strong force. Mr. Dudding's "Robin Hood," a well-grown, deep and heavy, eight-months' calf coming first, and Mr. Stratton's "Master Glanville," with good quality and appearance, taking second place. "Maid of Oxford's Baronet," from under Calshaw's tuition at Towneley, and others made up a good class of 18 younsters favourably commented on by the Judges, who felt justified in distributing several high and ordinary marks of their approbation. Their report is, however, a very meagre one for so important a section of the Show, commanding as it always has done such extreme and universal interest.

MALES.

CLASS 25. *Bulls, 3-years old and upwards.*—About an average class.

CLASS 26. *Bulls above 2-years old.*—A large class; but nothing extraordinary amongst them.

CLASS 27. *Yearling Bulls.*—A very good class, and some very superior young bulls.

CLASS 28. *Bull Calves.*—Some very good and useful bulls in the classes.

H. AYLMER,
W. BOWSTEAD,
J. N. SINGLETON.

CLASS 29. *Cows above 3-years old.*—Fifteen in number, which, with the exception of the chosen few, would scarcely warrant high praise in comparison with the same class in former years; nor did the judgment of the "Bench" in the disposition of the awards go unchallenged, for doctors even of high repute not unfrequently differ in matters so subtle: Mr. Garne's "Lady Lavinia" wresting from the beautiful "Queene of Rosalea" the first position and placing her second, whilst Mr. How's fine cow, "Lady Anne," was placed third. Mr. Garne being further successful in obtaining the reserve number with a high commendation for his cow, "Pride of the Heath." "Lady Lavinia" a heavy-fleshed and square-looking animal, has improved since her appearance at Leicester, where as a yearling she scored no honours.

CLASS 30. *Heifers in milk or in calf.*—These also numbered 15, but there were none of remarkable superiority, Mr. Mumford's "Camilla" being placed first, and Mr. Eastwood's very nice heifer, "Double Butterfly 3rd," second; and Mr. Stratton's "Peeress" following in the third place. The reserve number and high commendation went to Mr. How's "Windsor's Butterfly."

CLASS 31. *Yearling Heifers.*—These were the pride of the Show and in large force, numbering 31 animals, presenting a charming and interesting sight to all lovers of this favourite tribe. Here the Judges had their work cut out for them, and with much patience and care they performed their arduous duty. Mr. McIntosh's grand heifer, "Lady Knightley 2nd," a rich and beautiful roan by "Third Duke of Geneva," unquestionably commanded the first place; Mr. Dudding's "Countess of Yarborough" coming second, Mr. How's "Vesper Queen" third; the reserve number and high commendation fell to Mr. Stratton's "Flower Girl," the next degree of merit falling equally to three others.

CLASS 32. *Heifer Calves.*—These formed but a somewhat indifferent class, although 19 made their appearance in the ring. Merit was limited to but few, Colonel Towneley's smart and richly coated "Baron Oxford's Duchess" being placed first, and Mr. March's "Blossom" second; the reserve number and high commendation going to a very nice and promising calf of Mr. Statter's.

The Judges' Report on the Female Shorthorns is not a very flattering one, the Yearling Class only meriting their high approbation, being important in number and superior in quality; whilst the other classes are prononnced inferior to the groups shown in former years, but they at the same time make honourable mention of a few of the most distinguished in their respective classes. This falling off may be in some degree attributable to the very numerous and important sales made for exportation, whole cargoes of our choicest animals having recently left our shores for other countries, to which allusion has already been made in the opening remarks of this Report.

The Judges, Messrs. Marshall Stephenson, Stiles Rich, and Charles Howard, report as follows:—

Female Classes.

We do not consider this department of the Show at all equal to that of several previous meetings. The Cow Class, with the exception of a few animals, we consider a moderate one. Class 30, for Heifers not exceeding three-years-old, comprises several meritorious animals. The Yearling Heifer Class consists of 31 animals, and is far the best class in this department. There are very many first-rate animals, which occupied our attention for a considerable time. The Heifer Calf Class is not strongly represented by any large number of good animals; we experienced but little difficulty in coming to a decision, as two or three of the calves are considerably in advance of their companions.

In conclusion we congratulate the Society upon the fair breeding state in which the generality of the animals are exhibited; with a few exceptions, there are none in a patchy or overfed state.

Marshall Stephenson,
Stiles Rich,
Charles Howard.

July 18*th*, 1870.

Herefords.

This popular and interesting tribe was displayed in great richness at Oxford. In number they almost doubled those at the Leicester and Manchester Shows, and, in point of excellence, they never had been surpassed or probably equalled on any former occasion. Their appearance in the ring was a grand and taking feature, and it is satisfactory to know also that important sales were negotiated to home and foreign buyers. In no other department did such general superiority prevail, much to the credit of the breeders and exhibitors of this valuable sort. The Judges' Reports have been received in their individual names, and as they are detailed and interesting, especially that from Mr. Yeomans, it is deemed best to let them speak for themselves, without enlarging thereon.

Sir,—Having been requested to report on the merits of the "Herefords" exhibited at Oxford, I beg to make the following remarks:—

The Aged Bulls were a grand class. So many fine animals are rarely seen together. Sir J. R. Bailey's "Stanway" is a very thick heavy-fleshed bull, girthing 5 inches more than the far-famed Shorthorn "Bolivar." "Stanway" was never before exhibited at the "Royal," but when he appeared in the arena at Oxford, he thoroughly eclipsed all rivals. He is completely furnished, without being gaudy, and is of beautiful quality. In fact, his only fault was being a little effeminate about his head and horn.

Next on the prize list was Her Majesty's "Prince Leopold," which is a very noble-looking beast, with exceedingly good hind-quarters, though a little plain before.

Mr. Thomas's "Sir John" takes the third prize; he is a very lengthy animal, and possesses good quality.

Dr. Morris's "Stow" is placed in the reserve. This bull suffers from the over-generous tendency that afflicts many high-bred animals: an excessive determination of muscle to certain quarters of the frame.

"Longhorn," the property of Mr. Thomas Rogers, is also a good stock bull.

The Two-year-old Bulls were headed by Her Majesty's "Prince Albert Edward," a very straight level animal, and one likely to grow into one of the best sires of his day.

Mr. Warran Evans's "Monaughty 3rd" takes second honours; he is a useful bull, and goes back on his dam's side to the celebrated herd of Mr. Rea, of Monaughty.

Mr. Edward's "Leominster 3rd" is a big upstanding animal, though a little coarse in the bone.

Mr. Baldwin's "Lord Ashford" shows a deal of breeding.

Mr. Turner's "Trojan" headed the prize list of Yearling Bulls. He is level, handsome, but effeminate.

Mr. Harding is placed next with "Count Fosco," a rather stylish young bull, but is a little defective behind the shoulder.

The third prize is given to Mr. Hill's "President," which is very big for his age, but very plain.

Dr. Morris's "Cambridge," a neat compact young bull, being placed on the reserve list. This was a large class in number, though not first-rate as to quality.

In a large and good Class of Bull Calves, Mr. W. Taylor's "Oxford Lad" is placed before all competitors; he is a straight level calf.

Mr. Hills's "Milton 2nd" is next on the list, which is a deep-sided useful young beast; but he is not sufficiently covered along his back, and has not that quality of skin and hair so essential to a prize-taker.

"Student," the property of Mr. Thomas Rogers, by the most celebrated of Hereford prize-takers, "Battenhall," was placed in the reserve; but bids fair some day to be placed in a higher position than at Oxford.

Her Majesty's "Prince George Frederic" is very handsome.

The Cow Class was one of the best in the Yard, in point of numbers and quality. Mr. Thomas Rogers distanced all rivals with "Silk," a perfect model of a Hereford cow.

Mr. George Pitt's beautiful young cow, "High Lass 4th," with her handsome heifer calf at her side, takes second honours.

The third prize is taken by Mr. Tanner, with his "Queen," which certainly looked very majestic.

There were only three animals entered in the In-calf Heifer Class. Mr. Tudge's "Silver Star" again beats her rival "Silvia," from Mr. Turner's herd.

Such a remarkably grand Class of Yearling Heifers is rarely seen. But the

Judges had little difficulty in awarding the first prize to Mr. Fenn, for his long symmetrical heifer "Leonora 2nd."

Mr. Tudge's "Lady Brandon" comes next, and with a better head and neck would be a good heifer.

Mr. Thomas's "Sunbeam" is a very level and compact heifer, with good fore-quarters, and very good quality. Whole class commended.

In a well-filled Class of Heifer Calves, Mr. R. H. Evans is head of the poll with a very handsome calf which does great credit to her breeder.

Mr. Thomas's "Sunflower" is a very pretty calf. This herd has very much distinguished itself lately through the success of Mr. Thomas's animals at Taunton this year, and he holds a very good position at the Royal.

HENRY YEOMANS.

SIR,—In reply to your letter, I beg to say that I have seen Mr. Yeomans, and he informed me he had sent you a short report. I have nothing farther to add.

I think the Herefords were never better represented at the Royal, and the Yearling Heifer Class was exceedingly good.

I remain, Sir, yours obediently,

GEORGE MORGAN.

CLASS 33. Some good animals beside the first and second; upon the whole a very good class.

CLASS 34. The first prize was a first-class beast; a nice lot altogether.

CLASS 35. The first prize beast was a very good one, far before his competitors; there were some inferior animals in this class.

CLASS 36. The first prize was a nice level animal; the others below an average.

CLASS 37. The first, second, third, and two highly commended ones, were grand specimens of the breed; in fact, the whole class was a very large and good one.

CLASS 38. The first and second beautiful specimens.

CLASS 39. The first prize heifer was a large level heavy-fleshed one, the second running her close; the whole class commended, as it deserved to be, as it was a most creditable one.

CLASS 40. A very good heifer for first prize, and four other nice ones.

The Herefords at Oxford came out in great form, as it was a very large and good show of them, although there were a few inferior bulls exhibited; but the cows and heifers, very strongly represented, were a grand lot.

S. W. URWICK.

OTHER ESTABLISHED BREEDS.

Commencing with Class 55, were adjudicated upon by the above-named gentlemen; but the classes comprised so wide a range, from the old-fashioned Longhorn to the diminutive Kerry, that any exact comparison of individual merit became a matter of great difficulty. Suffice it therefore to say, there were admirable specimens of their kind shown.

DEVONS.

The Devons were shown at Oxford in stronger force numerically than at either the Leicester or Manchester Shows, and most of the classes were of full average merit, whilst there were individual examples of extraordinary worth and beauty, and notably so the first prize yearling heifer "Temptress 2nd." owned by Mr. Davey. This gentleman was also successful in the Bull Classes, having been placed first with his yearling bull "Duke of Flitton 5th." as also in the same position in the next class with his bull calf, having the same rank and title in succession. Lord Falmouth and Mr. Walter Farthing—names frequently associated with winning animals—were again in the front with their two-year old and three-year old bulls. In the Cow and Heifer ranks there was also a commendable proportion of excellence throughout. The Devons, unlike most other tribes, continue from year to year much in the same hands, without any very perceptible change in the list of exhibitors. The Judges, Messrs. Thomas Pope, R. B. Warren, and John Overman, have supplied but a very scant and bare Report, as follows :—

Class 41. *Bulls above Three Years-old.*—No. 451, first prize; 449, second; 453, reserve number and commended.

Class 42. *Bulls above Two Years-old.*—No. 456, first prize; 459, second; 454, reserve and commended.

Class 43. *Bull Yearling above Twelve Months.*—No. 461, first prize; 462, second; 463, third; 465, reserve and highly commended; 466, commended.

We consider the first prize animal in this class a particularly good bull. We also consider the second prize bull well worthy of notice.

Class 44. *Bull Calf above Six Months.*—No. 468, first prize; 473, second; 469, reserve and highly commended; 471, commended; commended all the class.

We think this show of young bulls very good indeed, and most certainly the Devon breeders are, we consider, holding their position.

Class 45. *Cows above Three Years-old.*—No. 476, first prize; 479, second; 480, third; 476, reserve and highly commended; 481, commended highly; 482, commended.

A very meritorious class: quite equal, if not superior, to former years.

Class 46. *Heifers not above Three Years-old.*—No. 487, first prize; 486, second; 485, third; 484, reserve and commended.

This class combined some very good animals, but not so well contested as the Judges would like to have seen.

Class 47. *Yearling Heifers above Twelve Months.*—No. 491, first prize; 495, second; 493, third; 492, reserve and highly commended; 490, highly commended; commended all the class.

We think the first prize animal as good a heifer as we have ever seen, and a good class altogether.

Class 48. *Heifer Calf above Six Months.*—No. 497, first prize; 502, second; 505, reserve and highly commended; 501, highly commended; 503, highly commended; commended all the class.

We consider this class well deserves the awards received.

Thomas Pope,
R. B. Warren, } Judges.
John Overman,

Norfolk and Suffolk Polled.

These classes, comprising bulls, cows, and heifers, were not numerous, as they counted but 24 animals, all told. They were, however, a pleasing feature in the Show-yard, and are, doubtless, a useful breed of cattle. The Judges, as in the case with the Devons, have cut short their Report to the briefest dimensions, as follows:—

Class 52. *Bulls above One Year-old.*—No. 569, first prize; 568, second; 567, reserve and highly commended; 565, commended.

The first prize bull a large, fine animal.

Class 53. *Cows above Three Years-old.*—No. 572, first prize; 576, second; 579, reserve and highly commended; 575, commended; 578, commended.

A very meritorious class.

Class 54. *Heifers not exceeding Three Years.*—No. 580, first prize; 582, second; 588, reserve and highly commended; 587, commended.

Altogether we think this class well represented.

Thomas Pope,
R. B. Warren, } Judges.
John Overman,

Channel Islands.

The Channel Islands Classes made a great and interesting display, far exceeding in importance the exhibitions of late years. The beauty and docility of these animals win them new admirers each year, until it has become the desire of every owner of a paddock to possess a pet of the kind, and so provide himself and household refreshing daily luxuries not to be despised.

Hitherto the Jersey and Guernsey breeds have been classed together in competition, thus rendering the duty of the Judges a most onerous and difficult task in weighing their respective merits. Their characteristics are, however, marked and distinct, sufficiently so that they should be placed apart for adjudication in the ring; and, as their popularity is so greatly on the increase, it may be hoped that on future occasions they will be entered in such numbers as to justify the Council in giving them separate classes. The Judges, in their admirable Report, suggest this course, and their recommendation will assuredly have due attention when such matters are considered.

Already we have been told of the great trade in Shorthorns and Herefords, &c. Other tastes also prevailed in favour of the gentle and milk-giving Alderney, and at prices, too, which some thought extravagant when it became known that Mr. Middleton's heifers had changed owners for 70 guineas each.

The Judges, Messrs. Charles P. Le Cornu and G. Morgan, report as follows:—

The three classes comprising the Channel Islands cattle numbered in total 58 entries.

In Class 49, *i. e.*, bulls above one year-old, 15 animals competed, some of which were very creditable. No. 522, to which was awarded the first prize, was particularly good in his fore-hand; the head, neck, and shoulders well proportioned and well put together; the crest beautifully arched; the throat clean; and the horns small, well curved, and of that yellow tint which is so indicative of richness. In the rump there was a slight deficiency, but on the whole this bull was decidedly good. No. 519, which carried the second prize, was a younger animal than the former; though somewhat flat, he stood well, with a good back, head, and horns, the latter fine, tapering, and of good colour. Nos. 508 and 512 were very close together in merit. The horns of the former, which were unusually strong, marred considerably the general appearance of his head; but the rest of his frame, especially the neck and shoulders, were well formed. No. 514 was also highly commended on his unmistakable signs of good blood. The general absence of coarseness in this aged animal was particularly striking.

In Class 50, *i. e.*, cows in-milk or in-calf above three years of age, 17 competed. Here the same difficulty was experienced in judging the cattle that has been felt on former occasions when animals of totally different breeds have been mixed in the same class. It is obvious that the thorough distinction existing between the Jersey and the Guernsey breeds of cattle is such that it must render the task of judging on their respective merits, when in the same class and in direct competition for the same prizes, one of very great difficulty, and alike unsatisfactory to the Judges as it must be to the exhibitors. In this instance, therefore, when a goodly number of cattle of each breed competed together, it became a point of serious consideration as to what course to adopt in the selection for prizes. The great point, and that which seemed to the Judges should be principally borne in mind, was to remember that the cattle exhibited in this class were essentially for dairy purposes and for the reproduction of stock calculated for that same purpose, and maintaining with that special quality good and characteristic symmetry of form. In other words, to discard altogether such animals as were the most defective, to bring together such as had claim for closer investigation, and finally to select from these those which appeared to combine the points recognised as necessary and relative to the production of milk, with, as has been before observed, good symmetry of form. To arrive at this it was necessary to throw aside all those exceptional considerations which are known to be entertained for special fanciful colours, which have really no other value than that of peculiar fancy, and solely to embrace the question of general merit without regard to any fanciful considerations. The first prize was awarded to No. 529, a cow of great depth; frame beautifully formed, fine in the bone, good, capacious udder, particularly well up behind, and with teats squarely placed. The second prize was taken by No. 523. To the inexperienced observer, or the fancier of, perhaps, the more fashionable self-coloured beast, this animal may not have seemed to possess merit approaching to the taking of this prize; but in reality this cow showed more positive evidence of good milking qualities than any other in the class. Her udder was perfect, the fore part full in form and well in line with the belly and hanging also well behind; the teats well formed and squarely placed on each quarter; the hide thin, and the colour of the skin indicating richness of produce; the horns small; in every respect the true type of a good and rich milker. With this she combined (although very poor in flesh, as is commonly the case with the majority of good cows when in-milk) a well-shaped form, which when moving in the ring she showed to considerable advantage. Few, if any, surpassed her carriage and gait. The reserve number went to 528, which was also highly commended for her merits and general appearance. Among the other commendations, No. 531 was good as regards form of body and of udder, but she signally failed in richness of pigment; whereas Nos. 534, 535, and 536 were particularly rich in this respect. No. 534, a large and very well formed animal, with the exception of her udder, which lost for her a position better than that which she obtained. No. 536, also a well-framed cow and in fine condition, was deficient, though to a less degree than the former, in the placement of her teats.

Class 51. The number shown in this class was 24, which also comprised heifers of both breeds. The prizes were offered for the best heifers, in-milk or in-calf, not exceeding three years old. Here the same difficulty was experienced in judging as in the Class 50, and, if possible, in a more intricate form, for this reason,—that not only were the two breeds again competing together, but here were animals in the form of cows giving milk, others simply heifers in-calf, and, lastly, others only fourteen months old, which, if in-calf, showed insufficient development to ensure a reliable opinion being returned on their udders. In judging this class, the basis before explained was adopted and followed as closely as practicable, that is, due respect to the dairy properties and milking forms, combined with general symmetry of body. After clearing out the weakest, the remaining animals were closely and minutely examined, and again drawn into two lots for prizes and for commendations. Before making the final awards, Nos. 542, 548, 550, and 561 stood in the first category, and Nos. 544, 547, 557, 559, 562, and 564 in the second. The first prize was awarded to No. 542, a heifer in-milk, which, with a well developed and well shaped udder combined a good and well shaped frame. The second was taken by No. 548, a large and promising heifer in-calf. No. 561, only fourteen months old, was placed for the reserve. Her excellent lines and pretty head made her at once deserving of special notice, but it is questionable whether she will ever possess a well-shaped udder, the present appearance and position of her teats making the question doubtful.

In closing this Report, the Judges beg respectfully to submit to the consideration of the Council the advisability of making a thorough distinction for the future in the classes hitherto denominated "Channel Islands Cattle;" inasmuch as the Jersey and the Guernsey breeds, for which the classes are intended, are entirely distinct, and have not the slightest degree of affinity. It becomes an impossibility on the part of the Judges, with the greatest possible care and attention, to give the rival breeders and exhibitors in these mixed classes that amount of fair satisfaction to which they consider themselves entitled. The numbers exhibited in these classes on the present occasion, and under the peculiar circumstances referred to, show clearly that a very considerable interest is taken by breeders and amateurs of the Jersey and of the Guernsey stock; and it is justly to be supposed that, once the hitherto amalgamated classes were made separate and totally distinct, there would be added to this portion of the Exhibition a still greater degree of interest than that which already exists.

George Morgan,
Chas. Ph. Le Cornu.

The Sheep department of the Show at Oxford will probably, more than any other, distinguish this year's exhibition above all that have preceded it. The display was a wondrous one; with few exceptions, the various classes have never been equalled in number or quality. The local or "Shire" breeders certainly surpassed themselves, and did battle in tremendous force on their native soil. All honour be to them for having so worthily done their part.

Leicesters.

This fine old standard breed, going back to the days of Bakewell, is always pleasant to look on. Leicesters unmistakably show pure breeding and high quality, in a degree to make them "landmarks" whereby to correct the deformities resulting from injudicious crossing in other directions. Indeed, the owners of pure-bred flocks, of whatever kind, should, in this respect, be regarded as public benefactors, without whose care and help all would become chaos and confusion. The Judges report that the Shearling Rams, Class 59, forty-two entries, were very good, and they had great difficulty in arriving at a decision. The first prize went to Mr. Borton, who has in many previous contests come off victorious. The second and third prizes went in a well-deserved quarter to the flock so carefully bred by the late Colonel Inge—true types of the pure Leicester,—the reserve number and high commendation falling to the lot of Mr. Hutchinson, of Manor House, Catterick, whilst high and ordinary commendations were again allotted to Mr. Borton and Mr. Sanday, the latter gentleman not being this year so much to the fore as usual. Class 60. Ram of any other age—there were eighteen entries. Here Mr. Borton took first and second prizes, whilst Mr. Sanday followed him closely with a third, the reserve number and high commendation going to Mr. George Turner, jun. Class 61. Shearling Ewes—seven pens were entered. Here the awards were distributed more generally. The beautiful pen of the late Colonel Inge took first prize, Mr. Hutchinson second, and Mr. Borton third; reserve number and high commendation going to Mr. Sanday.

Judges' Report.

Class 59. Shearling Rams.—We think this class, considering the number, very good; and had great difficulty in coming to a decision.

Class 60. Aged Rams.—We consider better than the Shearlings, and superior to any we have seen before.

Class 61. On the whole we do not consider them quite up to former years.

George Walmsley,
Charles Clarke,
Skelton Jefferson.

Cotswolds.

Cotswolds were shown in unusual numbers this year, and it may be presumed the breeders of this class are taking fresh courage, for in the Shearling Ram Class alone there were no less than forty entries, many of them well representing their kind. The "Hill men" were, however, worsted; as a Norfolk breeder, Mr. Brown, of Marham Hall Farm, Downham Market, carried off first and third prizes, as well as the reserve number and high commendation, Mr. Robert Lane, of Cottage Farm, Eartington, Northleach, obtaining the second prize. Class 63. Ram of any other age.—Here were twenty-four entries, comprising sheep of considerable merit. Mr. T. Beale Browne, of Salperton Park, took the first prize with a remarkably good two-year-old sheep, well grown and active. Mr. John Goodwin, of Troy Farm, had the second and third prizes allotted to him, the reserve number and high commendation again going to the Norfolk breeder, Mr. Brown. Shearling Ewes, Class 64, thirteen pens were entered; Mr. Gillett, of Minster Lovell, received first and second prizes, and the reserve number; whilst Mr. Robert Garne's pen obtained the third prize. Class 65. Ewes having suckled lambs to June 1st.—There were three entries for one prize, given by the Oxfordshire and Banbury Agricultural Societies. This fell to the lot of the Executors of the late Mr. Thomas Gillett. Class 66. For the best Ten Ram Lambs—This was also a prize given by the same Societies, for which there were five entries; Mr. Gillett, of Oaklands, being the winner. Class 67. For the best Ram of any age, a Local Prize of 5*l*, was won by Mr. George Goodwin, of Troy Farm.

The reports on Cotswolds from two of the Judges—Messrs. Attwater and Porter—will be read with much interest. The former gentleman remarks on the want of uniformity observable in some of the classes, the type and character being deficient, with other indications betraying injudicious breeding. The third Judge, Mr. Ruck, has not sent any report.

Report on Cotswold Sheep

Exhibited at Oxford, and judged by Mr. Ruck, Mr. Porter, and myself.

A good number competed for the Society's prizes; not so for the specials. Several first-class animals were amongst them; but, on the whole, I did not consider them possessed of superior excellence.

The Shearling Rams—39 in number—lacked uniformity; some dark faces and close coats looked unlike purity of blood; still there were some few good specimens of the breed. No. 729 is a shearling of good form and coat. No. 739 showed true hill character, and is a tup calculated to get some paying stock.

Class 63, of 23 entries, included some sheep of considerable merit and good breeding. No. 760 handled well, was active, and with a smartness about him valuable in a sheep of his size.

Thirteen entries of Theaves included some neat compact pens of nice breeding; but, like the yearling tups, many were without the gay carriage and open coat of the home-bred Cotswold Hill sheep.

Class 65, I consider, calls for no special remark beyond that the entries were few, and that they included one good pen.

Class 66, of 5 pens, included No. 790, ten lambs of size, coat, and character; but there were in this class also lambs wanting size, and light in the fleece.

Class 67, five entries made up with sheep of all ages; prize awarded to 796, a thrifty animal, rather soft under hand.

John Gay Attwater.

The Cotswolds were well represented, not only from their native district, but also from Norfolk. Wales also showed some very good specimens.

In Class 62, there were about 40 entries, amongst which were very many good sheep, particularly the one belonging to Mr. Brown, which took the first prize.

Class 63 was on the whole well represented, but not any particular specimen.

Class 64 was very good, the first and second prize of shearling ewes were of very superior quality and symmetry; also many more good specimens.

Classes 65 and 66, very few entries, neither calling for any special remark.

Class 67, only four entries. The prize sheep in this class was very good.

Thomas Porter.

Lincolns, Rylands, and other Long-wools.

Lincolns have, in former years, been classed with "other Long-wools not qualified to compete as Leicesters or Cotswolds," but at Oxford, for the first time, they stood on their own merits as a separate class. The entries were not so numerous as in some of the other classes, still there was a fair show. In the Shearling Ram class there were sixteen entries tolerably well representing their kind. Mr. Gunnell of Milton took the first prize, whilst Mr. Robert Wright of Nocton Heath monopolised the remaining honours, comprising second and third, as well as the reserve number and high commendation. Ram of any Age, Class 69—There were eleven entries, comprising several sheep of high character, Mr. Henry Dudding of Panton House carrying off first and second prizes, also the reserve number and high commendation—the third prize falling to Mr. W. F. Marshall of Branston, Lincoln. In Shearling Ewes, Class 70, there were but five entries, all of merit. Mr. Cartwright of Dunston Pillar took first and second prizes —the reserve number and commendation being awarded to Mr. John Pears of Mere-Branston, Lincoln.

Ryland and other Longwools not qualified to compete as Leicesters, Cotswolds, or Lincolns, furnished no entry in the Shearling Ram class. Ram of any other Age, Class 72—there were four entries; Mr. John Lynn of Church Farm, Stroxton, took first prize, and Mr. J. T. Pinchey of Hardwick-Pembridge, Herefordshire, second prize. In the Shearling Ewe class there was but one entry, and that pronounced well worthy of a prize.

Report on Lincoln, Ryland, and other Long-wool Sheep.

Class 68. This class fairly represents Lincoln sheep; but there is nothing shown in it to call for particular remark.

Class 69. The first four sheep placed in this class are very superior specimens of Lincoln sheep. Their size and form, as well as wool, being of a high character.

Class 70. Lincoln Ewes.—This class is a very fair one, the prize sheep showing considerable quality.

Class 72. Ryland and other Long-woolled Sheep.—An odd lot.

Class 73. But one pen shown, which is well worthy a prize.

William Bartholomew,
John Henry Casswell,
Harwood Mackinder.

Oxfordshire Downs.

We now come to the division comprising the class of Shortwools, and beyond all question "The Downs" one and all presented a most imposing sight, for in *them* lay the strength of the sheep department. It was not without reason that the efforts of the Oxford Down breeders should be looked to here, on their own ground, with special interest; nor can any impartial critic deny the meed of praise due to them for such a display, both as regards numbers and quality. In the Shearling Ram class there were sixty entries, twenty of which were contributed by that well-known breeder, Mr. George Wallis of Old Shifford, who took first and second prizes, with a high commendation. The third prize went to Mr. Charles Hobbs of Maisey-Hampton. The reserve number and two high commendations went to Mr. Frederick Strut of Harrowden House, and commendations to Sir Henry Dashwood, Bart., of Kirklington Park, Mr. John Treadwell, and Mr. A. F. Milton Druce. Class 75, Ram of any other Age. There were nineteen entries. Mr. George Wallis again took first and second prizes; Mr. Milton Druce third; Mr. James Longland of Crendon, Northampton, the reserve number and high commendation; Mr. John Treadwell two commendations; and Mr. Charles Gillitt of Cote House one. Both these classes of rams are highly spoken of by the Judges for their uniformity of character and general excellence.

Class 76, Shearling Ewes.—There were twenty-one entries, Mr. George Wallis still claiming the first prize; the second went to Mr. A. F. Milton Druce of Burghfield, Reading, Berkshire; the third to Mr. Francis Gillett of Upton Downs; the reserve number and high commendation to Mr. Charles Gillett of Cote House; Sir Henry Dashwood, Bart., also gaining a high commendation, and commendations were awarded to Mr. John Treadwell, Mr. Charles Howard of Biddenham, and Mr. Charles Gillett.

The Judges remarked that the ewe classes were grand and did immense credit to the breeders.

Oxford Downs.

The Judges are of opinion that the rams in both classes are very superior, and of very uniform character, and feel they cannot speak too highly of them. The classes of ewes are grand, and do immense credit to the breeders.

Henry Overman,
Zach. W. Stilgoe,
Albert Edmonds.

South Downs.

Next in order come the beautiful South Downs, the perfect type in form and character, at once arresting the attention of every lover of beauty. Throughout this high-bred class could be observed a uniformity so much wanting in the kindred classes of Oxfordshire Down Sheep, the breeders of which may well take example here for their edification. Unvarying characteristics must assuredly be the result of intelligent care and skill for many generations, and they afford the clearest evidence of pure and high breeding. In the Shearling Ram Class, No. 80, there were forty entries, and among them Lord Walsingham's name appeared as a very giant in strength, sweeping clear the decks, and taking all the prizes, first, second, and third, the reserve number, and two high commendations; having, in fact, a good mark for every animal entered in the class, whilst his competitors gained some consolation by the allotment of ordinary commendations to five of their number. The Judges report the Shearling Rams fairly represented, but not over the average.

Class 81.—Ram of any other age, thirty entries. Here Lord Walsingham again claimed first and third prizes, whilst Sir William Throckmorton, Bart., took the second, and a commendation. Mr. William Rigden secured the reserve number with a commendation. The Duke of Richmond claimed two high commendations, and Lord Sondes and Messrs. H. and A. Heasman each one. The Judges say there were in this class many remarkably good animals, and that with few exceptions the whole class was far above the average.

Class 82.—Shearling Ewes, eleven entries. Here we had keen competition in high places. His Royal Highness the Prince of Wales scoring one high and one ordinary commendation. Lord Walsingham, the invincible, again took first prize; the Duke of Richmond, second prize and commendation; Mr. William Rigden, third prize; Lord Sondes, the reserve number and high commendation; and Colonel Tomline, an ordinary commendation.

The Judges report the Shearling Ewes as one of the best of classes, and of extraordinary merit.

Southdown Sheep.

In Class 80, Shearling Rams we consider fairly represented, and some good animals were shown, but not over an average. In Class 81, Sheep of any other age, we consider there were many remarkably good animals, and the whole class, with few exceptions, far above an average. Class 82, Shearling Ewes, was one of the best, and we consider it of extraordinary merit.

Thomas Cooper,
Henry Fookes,
Henry Lingar.

Shropshire Downs.

This very useful class of sheep is fast gaining in popularity, and it is not surprising that it is so, for, in outline, they closely resemble the more aristocratic Southdown. They are hardy, sound, and prolific, and appear to flourish in all districts where they have been introduced. Numerically they were superior to any class exhibited, and this position they have held for some years at the Society's shows. Their value will, however, be much enhanced in public estimation when their breeders shall have accomplished the removal of that stain which has been so frequently and so forcibly pointed out of late years, viz., the want of uniformity in type and character; for black, light, and speckled faces and legs are seen side by side, with close and open fleeces; thus marring their otherwise good appearance. This should not be; and if their breeders, as a class, desire to hold, as they may do, a foremost position, a "local parliament" of the most intelligent breeders should be called, to determine among themselves some standard or true type to aim at, and, once agreed, let no other be recognised; then, and not until then, will the Shropshire Down hold its proper place as a distinctive and high-bred sheep. I entirely concur in the able and interesting report sent in by the Judges, and I would commend its careful perusal and consideration to all breeders of the class.

Shearling Ram, Class 83.—Twenty-two entries. Mr. John Coxon, of Freeford, took first prize; Mr. Mansell, of Adcott Hall, second prize, and commendation; Mrs. Sarah Beach, of the Hattons, third prize and commendation; Lord Chesham claimed the reserve number and two commendations; Mr. R. Fenn, of Stonebrook House, Ludlow, was highly commended, and Mr. John Evans, of Uffington, got one high and two ordinary commendations. In this class the Judges report many sheep of great merit, possessing the attributes of the true Shropshire.

Class 84, Ram of any other age.—Eighteen entries. Mr. John Evans, of Uffington, took first prize, Mrs. Beach second and third, Mr. Mansell and Mr. Baker each being highly commended, and Mr. W. G. Bruce commended. The Judges report well of this class.

Class 85, Shearling Ewes, seventeen entries. Lord Chesham took first prize, with a beautiful and well matched pen. Mr. J. H. Bradburn, of Pipe Place, Lichfield, took second prize and the reserve number, with high commendation; Lord Sudely took third prize; and Mr. Mock, of Sutton House, Shifnal, was commended. The awards in this class did not pass unchallenged, as the Kirtlington Sheep were thought by many not to have deserved a place above the commended pen.

The Judges report in less favourable terms on the Shearling Ewes, as not exhibiting the improvment discernible in the Ram Classes.

Shropshire Sheep.

We have been much pleased by the inspection of the various classes brought under our notice this day.

In the Shearling Ram Class were many sheep of great merit, possessing the attributes of a "true Shropshire," with points of excellence that could not fail to attract the attention of the public generally. We also consider the aged rams well support the commendation due to the former class. We do not consider the shearling ewes on the whole equal to the rams, and, although numerically strong, do not present the marked improvement discernible in the Ram Classes.

In making our awards we determined to select such sheep only as represented the type of a true Shropshire, we, therefore, rejected some sheep of merit, believing that they would have been more at home in other classes, as not tending to support that character which we think it essential for the breeders of Shropshires to determine and endeavour to perpetuate.

We conclude our remarks by suggesting to the breeders the extreme importance of endeavouring to establish more uniformity of character, by aiming each at the production of animals possessing the *same qualities*, which all should endeavour to perpetuate, viz.:—

1st. That a Shropshire sheep should possess great depth of firm flesh, indicated by a good muscular neck, straight and wide back, with ribs well sprung, and a heavy leg of mutton.

2nd. That the face and legs should be of a uniformly dark colour and well-covered head; the fleece thick set and free from grey.

Signed { W. Kemp Bourne, R. H. Masfen, Benjamin Bond.

Hampshire and other Short Wools not qualified to compete as Southdowns or Shropshire.

Class 86.—Shearling Ram. Nineteen entries, but twelve of which were present. Mr. Alfred Morrison, of Fonthill House, Tisbury, Wilts, took first prize and the reserve number. Mr.

James Rawlence, of Bulbridge, Wilton, Salisbury, took second and third prizes.

Class 87.—Ram of any other age. There were but seven of these in their pens. Mr. James Rawlence was again successful, and took the first prize; Messrs. John and Matthew Arnold took second prize; Mr. Stephen King, third; and Mr. John Robson the reserve number.

Class 88.—Shearling Ewes: but six entries. Mr. James Rawlence here again took first and second prizes; Mr. John Barton, third prize; and Mr. John Pittman the reserve number.

Dorset.

Class 89.—Shearling Rams. Eight entries. Mr. Henry Mayo took first prize; Mr. James William James, second prize; and Mr. Herbert Farthing, the reserve number.

Class 90.—Shearling Ewes. Five entries. Mr. Herbert Farthing took first prize; Mr. Abraham Bond, second prize; and Mr. Henry Mayo the reserve number.

This group of Hampshire and others were not numerically important, but they were, nevertheless, interesting as a whole, in giving completeness to the variety in the Sheep classes. The Cheviots, also a most useful class, were here quite out of place in competition, as is well remarked by the Judges in their Report, and it may be hoped in future years they may be classed in a position more in accordance with their character.

Report on Hampshire, Dorset, and Short-wool Sheep.

The class of Hampshire Shearling Rams was short in number, and in our opinion the first prize sheep was not equal to the winner in the same class last year. There were still fewer old sheep exhibited, and we did not consider these equal to the shearlings. The Hampshire ewes were not numerous, but the first prize pen were excellent specimens of the class.

There were some good Cheviots, but we must consider that they were entirely out of place in competition with Hampshires.

The Dorsets were few in number, but generally good in quality; the first prize ram, and the first prize pen of ewes being especially meritorious.

William Browne Canning.
Henry Thurnall.
R. J. Newton.

In concluding my remarks on the Sheep classes it may not be out of place if I record my sense of the value of the services rendered to the Society by the Inspectors of Shearing, whose duties were most onerous and unpleasant, for in the exercise of their conscientious judgment they must of necessity incur the odium and displeasure of those who suffer from their keen observation. The practice of inspection has, however, worked well and effected great good. There were eight instances of disqualification reported: one in the class of Cotswolds, three in the Oxford Downs, and four in the Shropshire Downs,—the latter all belonging to one breeder.

Pigs.

Like the other sections of the Show at Oxford, the Pig Classes were very well represented; they were numerous and good in quality, exceeding the two previous years' shows at Leicester and Manchester, where the entries numbered 120 and 132 respectively, whilst they this year reached 186. The Judges' Reports are so detailed and ample, especially that from Mr. Fisher, that I would commend their perusal as far more interesting and instructive than any remarks from me. Mr. Fisher very justly comments upon the improper use of oil and blacking in some cases, in contravention of the Society's rules. As all competition should be based on fair and honourable conditions, such practices cannot be too strongly deprecated, and, if repeated, the Council should be asked to visit the offenders with some mark of their displeasure.

Pigs.

Class 91. Boars of a Large White Breed.—First prize awarded for No. 1190, a large and well formed animal with nice hair and rare quality. Second Prize No. 1192, a good old pig with grand hair and capital flesh, rather coarse bone and heavy offal. Reserve number, being No. 1187, as next in merit. Seven entries.

Class 92. Young Boars of the Large White Breed.—First Prize for No. 1198, the seven behind him being only a moderate lot.

Class 93. Boars of a Small White Breed.—First Prize for No. 1210, being closely followed by Nos. 1205 and 1211, in a class of ten entries of average merit.

Class 96. Young Boars of a Small White Breed.—Ten entries of a very varied character. First Prize for No. 1214, an almost perfect specimen of the kind, having every point in perfection, with the exception of being (perhaps) slightly narrow along the back, and we considered him well deserving of 98 points out of the 100 given for the highest standard of excellence; the second prize going to 1218, a very promising pig of nearly equal merit.

Class 95. Boars of a Small Black Breed.—First Prize for 1228, being the best of a very poor Class, Nos. 1224, 1225, and 1226, being overlaid with a thick coat of oil and blacking, in defiance of the Society's rule to the contrary.

Class 96. Boars of the Berkshire Breed.—A large and good Class of twenty entries, of which No. 1232 was the best; the Second Prize going to No. 1237, a young boar of great promise.

Class 97. Boars of any other Breed.—First Prize for No. 1253, a very useful pig, in a short and very unsatisfactory class of only four entries.

Class 98. Sows of a Large White Breed.—Thirteen entries. First Prize awarded for No. 1262, a very grand sow. Second Prize for 1259, not of so large a stamp as her rival, but like her of rare form and quality. Reserve Number being 1267. A very useful sort, the whole Class being Highly Commended. No. 1264, a very fine sow, was suffering so much from her journey and the great heat that she could not be got upon her legs for our inspection, and consequently had to be passed over.

Class 99. Sows of a Small White Breed.—Sixteen entries. First Prize for No. 1281, a very neat sow of excellent quality, suckling her litter of six good healthy pigs of very even character. Second Prize for No. 1272, a fine sow, which also had a litter with her. Reserve, No. 1282. Highly Commended, No. 1284. Commended, Nos. 1271, 1273, and 1277.

Class 100. Sows of a Small Black Breed.—Six entries, only three of which were present, all moderate. Oil and blacking here again.

Class 101. Sows of the Berkshire Breed.—Thirty-four entries. First Prize for 1304. Second for 1309. Reserve, No. 1303. Commended, Nos. 1296, 1297, 1303, 1305, 1314 and 1320. A large and useful Class, which, however, did not contain anything of very extraordinary excellence.

Class 102. Sows of any other Breed.—Eleven entries of only average quality.

Class 103. Pen of Three Sows of the Large White Breed, above 4 and under 8 months old.—Six entries. First Prize for No. 1341, a moderate pen, wanting in quality. Second Prize for 1339, which, like the Reserve No. 1340, were uneven and badly matched.

Class 104. Pen of Three Sows of the Small White Breed.—Four entries, all very much inferior to the other classes of this breed.

Class 105. Pen of Three Sows of the Small Black Breed.—Only one entry, No. 1346, a well matched pen of good quality and much promise, which fairly earned the prize which was awarded for them, and by their activity just saved this breed from the charge of loss of all power of locomotion so apparent in the preceding classes of Small Blacks.

Class 106. Pen of Three Sows of the Berkshire Breed.—Twelve entries. First Prize for No. 1354. Second, No. 1351. Reserve, No. 1352. Highly Commended, No. 1348. Commended, Nos. 1355 and 1358. A good Class.

Class 107. Pen of Three Sows of any other Breed.—Four entries, First Prize for 1360. Second for 1362.

Class 108. Berkshire Boar, Sow, and their Litter under 12 weeks old.—Three entries, First Prize for No. 1365. Reserve, No. being 1362.

Class 109.—Pair of young Berkshire Boars. Eleven entries, First Prize for No. 1373. No. 1366 being the Reserve in a very fair class.

John Fisher.

The Judges of the Pigs beg to state in their Report that the Exhibition in the several Classes were above an average of years, viz.: In Class 91 we had some splendid animals. Class 92 we consider scarcely up to the standard. Class 93 quite an average class; but Class 94, with the exception of the First and Second Prize, we did think were up to the mark. Class 95 not so well represented as usual, in Class 96 the Berkshires were numerously and well represented, and Judges in making their return commended this class generally. Class 97 was very unsatisfactorily represented. In Class 98, the Large White Breed were very good, showing some most extraordinary animals, the whole being highly commended. In Class 99 we find an equally good Class, in the next we did not find it up to the mark, when we come to Class 101 we find it especially good as well as numerous, and the Judges had great difficulty in making their award, there being so many good ones, and they consider this beyond an average of former years. In Class 101, Breeding Sows, the First Prize animal was an extraordinary good one, as were also several others; but in Classes 103, 104, and 105 we cannot report as being first rate. Class 106 we consider was a fair average. Class 107 was not a good Class. 108 and 109 we have no especial remark to make upon.

Signed by J. S. Turner.
J. Smith.

In concluding this Report, and retiring from my stewardship, it becomes my duty, as it is my pleasure, to acknowledge the valuable and willing help given to me by my colleagues on all occasions, whereby the performance of my duties has been rendered comparatively easy and light. I desire also to tender my warm thanks to all the officers of the Society for their uniform courtesy and kindness during my term of office.

Mere Old House, Knutsford, 8th September, 1870.

Royal Agricultural Society of England.

1870.

President.

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Clayden, John, *Littlebury, Saffron Walden, Essex.*
*Clive, George, *Perrystone, Ross, Herefordshire.*

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* Those Members of Council whose names are prefixed by an asterisk retire by rotation in July, but are eligible for re-election in May.

*Davies, David Reynolds, *Mere Old Hall, Knutsford, Cheshire.*
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*Edmonds, William John, *Southrop, Lechlade, Gloucestershire.*
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*Hassall, William, *Bubney, Whitchurch, Salop.*
*Hesketh, Sir Thomas, Bart., M.P., *Rufford Hall, Ormskirk.*
*Holland, Edward, *Dumbleton Hall, Evesham, Gloucestershire.*
*Hornsby, Richard, *Spittle Gate, Grantham, Lincolnshire.*
*Hoskyns, Chandos Wren, M.P., *Harewood, Ross, Herefordshire.*
*Hutton, William, *Gate Burton, Gainsboro', Lincolnshire.*
*Kesteven, Lord, *Caswick, Stamford, Lincolnshire.*
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Veterinary Inspector—James Beart Simonds, *Royal Veterinary College,* N.W.
Consulting Engineer—James Easton, or C. E. Amos, *Grove, Southwark,* S.E.
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Publisher—John Murray, 50, *Albemarle Street,* W.
Bankers—The London and Westminster Bank, *St. James's Square Branch,* S.W.

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* 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 1870.

Finance Committee.

Bridport, Viscount (Chairman).
Davies, D. R.
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Randell, Charles.
Torr, William.

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Dent, J. D., M.P.
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Kesteven, Lord.
Walsingham, Lord.
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Barnett, Charles.
Barthropp, Nathaniel G.
Booth, T. C.
Bowly, Edward.
Clayden, John.
Davies, D. R.
Dent, J. D., M.P.
Druce, Joseph.
Gibbs, B. T. Brandreth.
Holland, Ed.
Jonas, Samuel.
Milward, Richard.
Pain, Thomas.
Randell, Chas.
Rigden, Wm.
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Webb, James.
Wilson, Jacob.
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Cantrell, Chas. S.
Challoner, Col.
Druce, Joseph.
Edmonds, W. J.
Gibbs, B. T. Brandreth.
Holland, Ed.
Hornsby, Richard.
Hoskyns, C. Wren, M.P.
Leeds, Robert.
Milward, Richard.
Randell, Charles.
Ransome, R. C.
Sanday, William.
Shuttleworth, Joseph.
Thompson, H. S.
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Lichfield, Earl of.
Powis, Earl of.
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Chesham, Lord.
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Hesketh, Sir T., Bt., M.P.
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Bowly, Edward.
Cantrell, Charles S.
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Druce, Joseph.
Edmonds, W. J.
Gibbs, B. T. Brandreth.
Hornsby, Richard.
Hoskyns, C. Wren, M.P.
Kingscote, Col., M.P.
Leeds, Robert.
Middleton, Henry.
Milward, Richard.
Neate, Charles.
Newton, R. J.
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Randell, Charles.
Ransome, R. C.
Ridley, M. W., M.P.
Sanday, William.
Shuttleworth, Joseph.
Statter, Thos.
Torr, William.
Webb, James.
Wells, William, M.P.
Wilson, Major.
Wilson, Jacob.
The Stewards.

Show-Yard Contracts Committee.

Vernon, Lord (Chairman).
Cathcart, Earl.
Bridport, Viscount.
Amos, C. E.
Gibbs, B. T. Brandreth.
Hornsby, Richard.
Milward, Richard.
Randell, Charles.
Sanday, William.
Shuttleworth, Joseph.
Thompson, H. S.
Torr, William.

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Powis, Earl of.
Bridport, Viscount.
Walsingham, Lord.
Lopes, Sir Massey, Bart., M.P.
Clayden, John.
Davies, D. R.
Dent, J. D., M.P.
Gibbs, B. T. Brandreth.
Holland Ed.
Kingscote, Col., M.P.
Milward, R.
Randell, Charles.
Thompson, H. S.
Torr, William.
Wells, William, M.P.

And the Chairmen of the Implement and Stock Prizes Committees.

Education Committee.

Holland, Ed. (Chairman).
Lichfield, Earl of.
Powis, Earl of.
Bridport, Viscount.
Acland, T. Dyke, M.P.
Dent, J. D., M.P.
Hoskyns, C. Wren, M.P.
Kingscote, Col., M.P.
Wells, William., M.P.
Voelcker, Dr.

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 9, 1869.

REPORT OF THE COUNCIL.

Since the last General Meeting in May, 2 Governors and 32 Members have died, and 4 Governors and 182 Members have been elected, so that the Society now consists of

75 Life Governors,
75 Annual Governors,
1469 Life Members,
3962 Annual Members, and
16 Honorary Members,

making a total of 5597, and showing an increase of 86 for the year 1869.

The half-yearly statement of accounts to the 30th June, 1869, has been examined and approved by the Auditors and Accountants of the Society, and has been furnished to all Members in the last number of the 'Journal.' Owing to the great financial success of the Manchester meeting, the funded capital of the Society has been raised to the sum of 20,000*l.* Stock in the New Three per Cents., while an additional sum of 4612*l.* 7*s.* 8*d.* New Three per Cents., has been invested as a Reserve Show Fund. The Council regret that owing to the continued difficulty experienced in collecting arrears of subscription they have been compelled to take legal proceedings against some members of the Society; but they have obtained the only satisfaction possible under such circumstances: the arrears have been paid, and the legality of the Society's claims has been most clearly established.

Under the Presidency of H.R.H. the Prince of Wales, the Manchester Meeting attained an unusual degree of success. Their Royal Highnesses the Prince and Princess of Wales honoured the Exhibition with their presence on two occasions. The expectations of the Council as to the magnitude of the Meeting were even surpassed by the result. The entries of Implements largely exceeded those at any previous meeting of the Society, and the Exhibition of Stock was on a still more extended scale. The crowd of members and visitors more than doubled in number those who were admitted to the Show-Yard at Leicester, and the amount received for admission was proportionately large. The interest created by the magnificent exhibition of Live Stock and Implements may be estimated by the fact that more than 1000*l.* was realized by the sale of Catalogues.

The Local Committee carried out the various arrangements which had been entrusted to them with remarkable zeal and liberality; and their Secretary (Mr. Whitworth), in particular, was untiring in his exertions to promote the success of the Meeting. Considering that during the six days of the show it was visited by more than two hundred thousand people, the Council believe that no slight praise is due to the arrangements by which so large a number of persons could obtain excellent refreshments without inconvenience, and at a moderate price—the more so as these arrangements were made by Mr. Whitworth with the advantage of a considerable profit to the Society. Mr. Whitworth's indefatigable efforts on behalf of the Society induced the Council to request his acceptance of the sum of one hundred and fifty guineas as an acknowledgment of his services.

The great agricultural feature of the Meeting was, no doubt, the careful and prolonged trials of reaping and mowing machines; and whether tested by the interest exhibited in them each day by crowds of intelligent spectators, or by the great increase in the extent to which reapers were reported to have been used during the following harvest, there can remain no question that the Society's trials of implements at Manchester have already yielded good results.

On the two Sundays during which the Stock was in the yard, Divine Service was performed by the Vicar of Stretford, before large and attentive congregations, chiefly composed of the servants in attendance on the animals.

The Council have fixed the commencement of the Oxford Meeting for Monday, the 18th of July. They have decided that the live stock shall all be in the yard by 4 o'clock in the afternoon of Saturday, the 16th of July, which will allow of the animals recovering from the fatigue of the journey to the Show (and thus place those which have travelled from distant counties more on an equality with others which have come only a short distance), before the Judges commence their inspection on the Monday morning following. The Show will close on Friday, the 22nd of July, at 4 o'clock, thus enabling most of the stock to commence their homeward journey the same evening, and to arrive at their destination before the following Sunday morning.

In addition to the usual classes contained in the Stock Prize-sheet, the Council have offered for competition at Oxford, prizes for Norfolk and Suffolk polled cattle, for Dorset sheep, and for Lincoln, as distinguished from other longwoolled sheep. The Oxfordshire Agricultural Society has offered special prizes for pairs of dairy-cows, for Oxfordshire down-sheep, and for hackneys; and the Local Committee have offered prizes for a class of four-year-old, and for another of old hunters.

The High Sheriff for Oxfordshire (James Mason, Esq.) has offered a piece of plate of the value of one hundred guineas as a prize for the best managed farm in the district included within a line drawn through the towns of Reading, Great Marlow, Aylesbury, Buckingham, Banbury, Stow-on-the-Wold, Lechlade, Wantage, and back to Reading. The Council have agreed to fix the conditions of competition; to appoint and to defray the expenses of the Judges and a reporter, and to arrange all other details. They have determined that an entrance-fee of 2*l.* be required from competitors who are members of the Society, and 3*l.* from all others; that the competition be confined to tenant-farmers; that no farm shall be entered which does not contain 200 acres; that a second prize (of 50*l.*) be given to the occupier of the second-best farm; that no entry be received later than Saturday, the 26th of February; and that every certificate of entry shall contain the name and address of the candidate, and of the proprietor of the farm, the kind of soil (light or heavy), the acreage of the farm, and its distance and bearing from the nearest town.

TheS chedule of Prizes for Implements and Machinery to be awarded at Oxford contains classes for fixed steam-engines, horse-gears, mills, crushers, chaff-cutters, oilcake-breakers, turnip-cutters, steaming-apparatus, dairy implements, bone-mills, guano-breakers, coprolite-mills, flax-breaking machines, tile-machinery, and draining tools.

The continually increasing number of implements exhibited at the country meetings of the Society has compelled the Council to consider by what method a sufficient number of Judges in each department could be appointed beforehand, and also by what means a large portion of the time of the Judges, hitherto devoted to a preliminary examination, and a selection of implements for trial, could be advantageously economised. The Council have, therefore, resolved that every implement intended by the exhibitor for competition shall be entered in its respective Section and Class, *for Trial*, at the time when the specification is sent in to the Secretary; but notwithstanding such entry, the discretion of trial will rest with the Judges; also, that no exhibitor may enter more than one implement of the same construction for competition in any one class. Further, in order to protect the interests of purchasers, it has been resolved, that although certain implements, belonging to the classes for which prizes are offered, are not entered for trial, the Stewards may, on the recommendation of the Judges, order any of them to be tried and their capabilities made public.

The attention of the Council having been drawn to the increasing adulteration of manures and feeding cakes, especially guano, nitrate of soda, ground bones, and linseed cakes, Dr. Voelcker has been requested to submit to the Monthly Council in March, June, and December, a report of the various samples forwarded to him by members of the Society, so that such report, together with the names of the dealers who supplied the substances analyzed, shall, if the Council think fit, be published in the Agricultural Journals.

The Society's educational examinations in April last were conducted on the same plan as those of the previous year, and the results were so satisfactory that the Council have renewed the grant (200*l.*) for the year 1870, with this alteration, however, viz:—that whereas, hitherto, it has been considered advisable not to fix any limit to the ages of candidates, in order that *all* comers might be admitted during the earlier stages of their proceedings, it has now been thought advisable to fix a maximum age for candidates; no one who has passed his twenty-first birthday before March 31st, can, in 1870, be admitted as a candidate for the Society's honours and prizes.

By order of the Council,

H. M. Jenkins,

Secretary.

Royal Agricultural Society of England.

FEBRUARY, 1870.

DISTRIBUTION OF MEMBERS OF THE SOCIETY AND OF MEMBERS OF COUNCIL.

DISTRICTS.	COUNTIES.	NUMBER OF MEMBERS.		NUMBER IN COUNCIL.		MEMBERS OF COUNCIL.
A.	DURHAM	100 ..		1		Hon. H. G. Liddell.
	NORTHUMBERLAND ..	165 ..		2		M. White Ridley; Jacob Wilson.
	YORKSHIRE — NORTH AND EAST RIDINGS	115 ..		2		Earl Cathcart, V.P.; T. C. Booth.
		—	380	—	5	
B.	CUMBERLAND	103 ..		1		Sir H. R. Vane.
	LANCASHIRE	203 ..		3		Duke of Devonshire, V.P.; Sir T. Hesketh; T. Statter.
	WESTMORELAND ..	28				
	YORKSHIRE — WEST RIDING	133 ..		2		H. S. Thompson, T.; J. D. Dent.
		—	467	—	6	
C	DERBYSHIRE	61 ..		1		Lord Vernon.
	LEICESTERSHIRE ..	138 ..		3		Lord Berners, T.; Duke of Rutland, T.; N. C. Stone.
	LINCOLNSHIRE	183 ..		5		R. Hornsby; W. Hutton; Lord Kesteven; J. Shuttleworth; W. Torr.
	NORTHAMPTONSHIRE	84 ..				
	NOTTINGHAMSHIRE ..	132 ..		3		The Speaker, T.; R. Milward; W. Sanday.
	RUTLANDSHIRE ..	16				
	WARWICKSHIRE ..	144 ..		1		J. Baldwin.
		—	758	—	13	
D.	BEDFORDSHIRE ..	47 ..		1		C. Barnett.
	CAMBRIDGESHIRE ..	55				
	ESSEX	129 ..		4		T. W. Bramston, T.; S. Jonas, V.P; J. Clayden; Sir T. Western.
	HERTFORDSHIRE ..	92 ..		1		J. B. Lawes.
	HUNTINGDONSHIRE ..	33 ..		1		W. Wells.
	NORFOLK	177 ..		2		Lord Walsingham, V.P.; Robert Leeds.
	SUFFOLK	192 ..		4		Sir E. Kerrison, V.P.; N. G. Barthropp; R. C. Ransome; Major Wilson.
		—	725	—	13	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts.	Counties.	Number of Members.	Number in Council.	Members of Council.
E.	Berkshire	117 ..	1	Viscount Bridport, V.P.
	Buckinghamshire ..	57 ..	2	Lord Chesham, T.; C. S. Cantrell.
	Hampshire	146 ..	2	Viscount Eversley, V.P.; Sir A. Macdonald.
	Kent	206	1	C. Whitehead.
	Middlesex	270 ..	1	B. T. Brandreth Gibbs.
	Oxfordshire	117 ..	2	Duke of Marlborough, T.; J. Druce.
	Surrey	132 ..	2	Colonel Challoner, T.; C. E. Amos.
	Sussex	134 ..	4	Earl of Chichester, V.P.; Earl of Egmont, V.P.; Duke of Richmond, V.P.; W. Rigden.
		—— 1179	— 15	
F.	Cornwall	47		
	Devonshire	119 ..	4	Sir T. Acland, T.; T. D. Acland; Sir M. Lopes; G. Turner.
	Dorsetshire	71 ..	1	Lord Portman, T.
	Somersetshire ..	115 ..	1	Sir W. Miles, V.P.
	Wiltshire	92 ..	1	T. Pain.
		—— 444	— 7	
G.	Gloucestershire ..	169 ..	4	E. Bowly; W. J. Edmonds, E. Holland; Col. Kingscote.
	Herefordshire ..	106 ..	2	G. Clive; C. Wren Hoskyns.
	Monmouthshire ..	34 ..	1	Lord Tredegar, T.
	Worcestershire ..	124 ..	2	C. Randell; James Webb.
	South Wales	82		
		—— 515	— 9	
H.	Cheshire...	121 ..	1	D. R. Davies.
	Shropshire	190 ..	2	Viscount Hill, V.P.; W. Hassall.
	Staffordshire ..	177 ..	1	Earl of Lichfield.
	North Wales ..	99 ..	2	Earl of Powis, T.; Sir W. Wynn.
		—— 587	— 6	
Scotland		73		
Ireland		80		
Channel Islands		10		
Foreign Countries		65		
Members without addresses ..		84		
		—— 312		

DR. HALF-YEARLY CASH ACCOUNT

	£.	s.	d.	£.	s.	d.	£.	s.	d.
To Balance in hand, 1st July, 1869:—									
Bankers				2,297	5	8			
Secretary				22	5	9			
							2,319	11	5
Deposit account with London and Westminster Bank				..	..		3,000	0	0
To Income:—									
Dividends on Stock				361	9	11			
Interest on Deposit account				54	0	8			
Subscriptions:—									
Governors' Life-Composition ..	50	0	0						
Governors' Annual	15	0	0						
Members' Life-Compositions ..	459	0	0						
Members' Annual	657	11	0						
				1,181	11	0			
Journal:—									
Sales by Mr. Murray				124	17	3			
Law Expenses repaid by Defaulting Members ..				3	3	0			
Total Income				..	..		1,725	1	10
To Manchester Meeting							19,689	4	9
							£26,733	18	0

BALANCE-SHEET,

LIABILITIES.	£	s.	d.	£.	s.	d.	£.	s.	d.
To Capital:—									
Surplus, 30th June, 1869				22,536	10	6			
Less Surplus of Expenditure over Income during the Half-year:—									
Expenditure	2,388	3	9						
Income	1,725	1	10						
				663	1	11			
				21,873	8	7			
To Manchester Meeting:— Difference between Receipts and Expenditure, the former exceeding the latter by				9,209	14	5			
							£31,083	3	0

NIGEL KINGSCOTE, *on behalf of the Finance Committee.*
QUILTER, BALL, & Co., *Accountants.*

FROM 1ST JULY, TO 31ST DECEMBER, 1869. Cr.

	£. s. d.	£. s. d.	£. s. d.
By Expenditure:—			
Establishment:—			
Official Salaries and Wages	444 18 0		
House Expenses, Rent, Taxes, &c.	394 0 4		
		838 18 4	
Journal:—			
Printing and Stitching	400 19 6		
Postage and Delivery	115 10 0		
Farm Reports	80 0 0		
Report on Belgium	150 0 0		
Essays	60 5 0		
Engraving	21 10 0		
Advertising	4 10 0		
Wrappers for 4 sets of Journals.	27 0 0		
		859 14 6	
Chemical:—			
Consulting Chemist's Salary		150 0 0	
Veterinary:—			
Grant to Royal Veterinary College (half-year)		100 0 0	
Education		27 7 6	
Postage and Carriage		17 9 7	
Advertising		12 3 0	
Sundries		6 6	
Subscriptions paid in error, returned		2 0 0	
Additions to Country Meeting Plant		380 4 4	
Total Expenditure	.. .. ..		2,388 3 9
By Stock:—			
Purchase of 3,972*l.* 0*s.* 5*d.* New Three Per Cents.		3,698 19 1	
" 4,612*l.* 7*s.* 8*d.* " "		4,301 0 11	
			8,000 0 0
By Country Meetings:—			
Manchester		13,442 6 10	
Oxford		90 17 8	
			13,533 4 6
			23,921 8 3
By Balance in hand, 31st Dec.:—			
Bankers		771 4 5	
Secretary		41 5 4	
			812 9 9
On Deposit with London and Westminster Bank		.. .. ..	2,000 0 0
			£26,733 18 0

31ST DECEMBER, 1869.

ASSETS.	£. s. d.
By Cash in hand	812 9 9
By New 3 per Cent. Stock 24,612*l.* 7*s.* 8*d.* cost *	23,379 15 7
By Deposit account	2,000 0 0
By Books and Furniture in Society's House	2,000 0 0
By Country Meeting Plant	2,800 0 0
By Oxford Meeting preliminary expenses	90 17 8
	£31,083 3 0

* *Value at* $92\frac{1}{8}$=£22,290 6*s.* 5*d.*

Mem.—The above Assets are exclusive of the amount of arrears of Subscription to 31st December, 1869, which at that date amounted to 1150*l.*

Examined, audited, and found correct, this 3rd day of February, 1870.

A. H. JOHNSON,
HENRY CANTRELL,
FRANCIS SHERBORN, } *Auditors on behalf of the Society.*

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Dr. — Yearly Cash Account, from 1st January to 31st December, 1869. — Cr.

Dr.	£. s. d.	£. s. d.	£. s. d.
To Balance in hand, 1st Jan. 1869:—			
Bankers	. .	1,006 16 10	
Secretary	. .	10 0 8	
			1,016 17 6
To Income, viz.:—			
Dividends on Stock	. .	595 18 1	
Interest on Deposit	. .	54 0 8	
Subscriptions:—			
Governors' Life-Compositions	150 0 0		
Governors' Annual	370 0 0		
Members' Life-Compositions	879 0 0		
Members' Annual	3,644 13 0		
		5,043 13 0	
Journal:—			
Sales	124 17 3		
Advertisements	25 5 9		
		150 3 0	
Law Expenses repaid by defaulting Members	. .	3 3 0	
			5,846 17 9
To Country Meetings:—			
Bury St. Edmund's	. .	2 2 0	
Leicester	. .	18 0	
Manchester	. .	25,459 10 9	
			25,462 10 9
			£ 32,326 6 0

Cr.	£. s. d.	£. s. d.	£. s. d.
By Expenditure:—			
Establishment—			
Official Salaries and Wages	889 16 0		
House Expenses, Rent, Taxes, &c.	1,032 18 5		
		1,922 14 5	
Journal:—			
Printing and Stitching	886 4 7		
Postage and Delivery	234 14 0		
Farm Reports	130 0 0		
Report on Belgium	150 0 0		
Prize Essays	75 0 0		
Literary Contributions	156 3 0		
Wood Engravings	21 10 0		
Advertising	4 10 0		
Mr. Goodwin for Editorship, 1868	100 0 0		
Wrappers	27 0 0		
		1,785 1 7	
Chemical:—			
Consulting Chemist's Salary	300 0 0		
Grant for Investigations	200 0 0		
		500 0 0	
Veterinary Grant to Royal Veterinary College (1½ year)	. .	300 0 0	
Education	. .	194 12 6	
Postage and Carriage	. .	61 0 8	
Advertisements	. .	20 18 6	
Sundries	. .	6 6	
Subscriptions (paid in error) returned	. .	7 0 0	
Additions to Country Meeting Plant	. .	380 4 4	
			5,171 18 6
By Stock:—			
Purchase of 8584*l.* 8*s.* 1*d.* New 3 per Cent.	. .	. .	8,000 0 0
By Country Meetings—			
Leicester	. .	75 0 0	
Manchester	. .	16,176 0 1	
Oxford	. .	90 17 8	
			16,341 17 9
			29,513 16 3
By Balance in hand, 31st Dec., 1869:—			
Bankers	771 4 5		
Secretary	41 5 4		
		812 9 9	
Deposit with London and Westminster Bank	. .	2,000 0 0	
			2,812 9 9
			£ 32,326 6 0

Receipts.

	£.	s.	d.
Subscription from Manchester	3,000	0	0
Admissions to Show Yard by Payment	15,626	5	4
Admissions by Weekly Tickets	1,432	2	0
Sale of Catalogues	1,099	7	4
Implement Exhibitors' Payments for Shedding	1,751	9	6
Non-Members' Fees for entry of Implements	130	10	0
Fees for entry of Live-Stock	693	15	0
Fees for Horse Boxes and Stalls	130	0	0
Fees for entry of Cheese and Butter	16	10	0
Premium for Supply of Refreshments	669	4	3
Cloak Room Receipts	37	0	0
Fines for Non-Exhibition of Live Stock	27	10	0
Fines for Non-Exhibition of Implements	17	15	0
Extra lines in Implement Catalogue	18	18	0
	£24,650	6	5

Expenditure.

	£.	s.	d.	£.	s.	d.
Show Yard Works*:—Carriage, Storeage, Repairs, taking to pieces, Packing and Insurance of the Permanent Buildings, and other Plant	316	17	6			
Implement Shedding, &c.	1689	13	4			
Stock, ditto, 550*l.* 15*s.*; Horse-boxes, 1185*l.* 9*s.* 1*d.*	1736	4	1			
Tents and Fittings	169	4	2			
Outside and other Fencing, Clock Towers, and General Works	1716	11	5			
Surveyor	172	12	6			
				5,801	3	0
Trial Fields Works				17	19	0
Judges: Implements, 302*l.*; Stock, 440*l.*; Butter and Cheese, 18*l.* 8*s.*				760	8	0
Consulting Engineer's Assistants				114	17	3
Veterinary-Inspectors, 77*l.*; Inspectors of Shearing, 30*l.*				107	0	0
Police: Metropolitan, 347*l.* 17*s.*; Lancaster County, 7*l.* 19*s.* 6*d.*				355	16	6
Clerks: Secretary, 67*l.* 0*s.* 6*d.*; Hon. Director, 57*l.* 4*s.* 4*d*; Bankers, 85*l.* 1*s.*				209	5	10
Assistant Stewards: Implements, 34*l.* 13*s.*; Stock, 12*l.* 17*s.* 6*d.*; Horses, 10*l.*				57	10	6
Foremen: Trial Fields, 35*l.* 0*s.* 2*d.*; Field Horses, 14*l.* 1*s.* 4*d.*; Implement-yard, 15*l.* 3*s.* 4*d.*; Stock-yard, 17*l.* 10*s.*; Horses, 19*l.*; Fodder-yard, 13*l.* 9*s.* 6*d.*				114	4	4
Yardmen, 211*l.* 13*s.* 6*d.*; Fieldmen, 25*l.* 6*s.*; Foragemen, 27*l.* 3*s.* 6*d.*				264	3	0
Index-Clerk and Money-takers, 124*l.*; Money-changers and Door-keepers, 59*l.* 17*s.*; Cloak-room Attendants, 16*l.* 10*s.*				200	7	0
Refreshments for Stewards, Judges, and other officials				215	3	2
Lodgings				74	17	0
Luncheon for the Prince of Wales				35	14	0
Catalogues: Implements, 492*l.* 19*s.*; Awards, 18*l.* 15*s.*: Stock, 167*l.* 10*s.*; Awards, 58*l.* 4*s.*: Sellers, 42*l.*; Packing Cases and Carriage, 37*l.*				816	8	0
Printing Prize-sheets, Certificates, Admission-Orders, Tickets, Railway Papers, Labels, Circulars, Programmes, &c.				340	9	0
Advertising and Bill-Posting				750	13	6
Hay, 313*l.* 12*s.*; Straw, 465*l.*; Green Food, 515*l.* 0*s.* 8*d.*				1,293	12	8
Postage, Carriage, Stationery, Telegrams, &c.				126	0	9
Repairs, Insurance and Carriage of Testing Machines, &c.				45	18	3
Horse Hire for Trials, 116*l.* 6*s.* 6*d.*; Cab Hire for Stewards and Judges, 37*l.* 8*s.*				153	14	6
Compensation to Man injured, 5*l.*; Gratuities to Post-office Clerk, Letter Carrier, &c., 7*l.* 6*s.*				12	6	0
Extra Land for Trials, 18*l.*; Surveyor in Trial Fields, 103*l.* 14*s.* 6*d.*; Dividing Plots for Trials, 26*l.* 5*s.*				147	19	6
Sundries: viz., Refreshments for Police, Tar'd Line, Milk and Cream, Barley, Hay Rakes, Baskets, Carting Iron, Road Scrapings, &c.				14	12	0
Other Petty Payments				7	18	9
Official Staff				28	16	8
Gratuity to Mr. Whitworth				157	10	0
Stock Prizes, 2,780*l.*; Implement, 460*l.*; Medals, 33*l.* 7*s.*				3,273	7	0
				15,497	15	2
By Balance				9,152	11	3
				£24,650	6	5

* The charge of 380*l.* 4*s.* 4*d.* for additions to plant is not included in this account, but is charged to the General Funds of the Society.

February 2, 1870,

NIGEL KINGSCOTE,

On behalf of the Finance Committee.

MEMORANDA.

Address of Letters.—The Society's office heing situated in the postal district designated by tbe letter W. members in tbeir correspondence with the Secretary, are requested to subjoin that letter to tbe usual address.

General Meeting in London, May 22nd, 1870, at 12 o'clock.

Meeting at Oxford, in July, 1870.

General Meeting ln London, in December, 1870.

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 tbe month; from tbe first Wednesday in August to the first Wednesday in November; and from tbe first Wednesday in December to the first Wednesday in Fehruary.

Diseases of Cattle, Sheep, and Pigs.—Memhers have the privilege of applying to tbe 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 the Appendix.

Chemical Analysis.—Tbe privileges of Cbemical Analysis enjoyed hy Memhers of the Society will be found stated in the Appendix to tbe present volume.

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 subscription during future life by paying at once tbe sum of £50, and Members by paying £10.

Payments.—Subscriptions may be paid to the Secretary, in tbe most direct and satisfactory manner, eitber at the office of tbe Society, No. 12, Hanover Square, London, W., between tbe hours of ten and four, or by means of post-office orders, to be obtained at any of tbe 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 otber 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 tbe postmaster the correct Cbristian name and surname (H. M. Jenkins) of the Secretary of tbe Society, otberwise tbe payment will be refused to him at the post-office on which sucb order has been obtained; aud when remitting the money-orders it sbould be stated by whom, and on whose account, tbey are sent. Cheques sbould be made payable as drafts on demand (not as bills only payable after sight or a certain number of days after date), and sbould 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 tbe Secretary should be advised by letter of such payment, in order that the entry in tbe 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.

New Members.—Every candidate for admission into tbe Society must he proposed by a Member; tbe proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, eitber at a Council meeting, or by letter addressed to the Secretary.

Packets by Post.—Packets not exceeding two feet in length, widtb, or depth, consisting of written or printed matter (but not containing letters sealed or open), if sent witbout envelopes, or enclosed in envelopes open at eacb end, may be forwarded by tbe inland post, if stamped, at tbe following rates:—One Penny for every quarter of a pound or fraction of a quarter of a pound.

*** Memhers may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-laws, of a Statement of tbe General Objects, &c., of the Society, of Cbemical and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Oxford Meeting, 1870:

ON MONDAY THE 18TH OF JULY, AND FOUR FOLLOWING DAYS.

SCHEDULE OF PRIZES.

I.—Live-Stock Prizes offered by the Society, the Oxford Local Committee, and the Oxfordshire Agricultural Society.

Special Prizes offered by the Oxford Local Committee are marked thus *.
Special Prizes offered by the Oxfordshire Agricultural Society are marked thus †.

Reference Number in Certificates.	HORSES.	First Prize.	Second Prize.	Third Prize.
Class.		£.	£.	£.
1	Agricultural Stallion, foaled before 1st Jan. 1868, *not qualified to compete as Clydesdale or Suffolk*	25	15	5
2	Agricultural Stallion, foaled in the year 1868, *not qualified to compete as Clydesdale or Suffolk*	20	10	5
3	Clydesdale Stallion, foaled before the 1st Jan. 1868	25	15	5
4	Clydesdale Stallion, foaled in the year 1868 ..	20	10	5
5	Suffolk Stallion, foaled before the 1st of Jan. 1868	25	15	5
6	Suffolk Stallion, foaled in the year 1868	20	10	5
7	Thorough-bred Stallion, suitable for getting hunters	50	25	10
8	Stallion, not less than 14 hands 2 inches, nor exceeding 15 hands 2 inches, suitable for getting Hackneys	20	10	5
9	Pony Stallion, under 14 hands 2 inches	15	10	5
10	Agricultural Mare, in foal, or with foal at foot, *not suitable to compete as Clydesdale or Suffolk* ..	20	10	5
11	Clydesdale Mare, in foal, or with foal at foot ..	20	10	5
12	Suffolk Mare, in foal, or with foal at foot	20	10	5
13	Mare, in foal, or with foal at foot, suitable for breeding Hunters	25	15	5
14	Mare, not less than 14 hands 1 inch, nor exceeding 15 hands 1 inch, in foal, or with foal at foot, suitable for breeding Hackneys	20	10	5
15	Pony Mare, not exceeding 14 hands	10	5	..
16	Agricultural Filly, three years old, *not qualified to to compete as Clydesdale or Suffolk*	15	10	5
17	Clydesdale Filly, three years old	15	10	..
18	Suffolk Filly, three years old	15	10	..
19	Agricultural Filly, two years old, *not qualified to compete as Clydesdale or Suffolk*	15	10	5
	No Third Prize will be given unless at least Six animals be exhibited, except on the special recommendation of the Judges.			

Reference Number in Certificates	HORSES—*continued.*	First Prize.	Second Prize.	Third Prize.
Class.		£.	£.	£.
20	Clydesdale Filly, two years old	15	10	5
21	Suffolk Filly, two years old	15	10	5
22	Hunters, four years old (Mare or Gelding)	*30	*15	*5
23	Hunters, five, six, or seven years old (Mare or Gelding)	*30	*15	*5
24	Hackney (Mare or Gelding) not exceeding 15 hands 1 inch, under 8 years old	*15	*5	..
	No Third Prize will be given unless at least Six animals be exhibited, except on the special recommendation of the Judges.			

CATTLE.

(All Ages calculated to July 1st, 1870).

Shorthorn.

25	Bull, above three years old	40	20	10
26	Bull, above two and not exceeding three years old	25	15	5
27	Yearling Bull, above one and not exceeding two years old	25	15	5
28	Bull-Calf, above six and not exceeding twelve months old	10	5	..
29	Cow, above three years old	20	10	5
30	Heifer, in-milk or in-calf, not exceeding three years old	15	10	5
31	Yearling Heifer, above one and not exceeding two years old	15	10	5
32	Heifer-Calf, above six and under twelve months old	10	5	..

Hereford.

33	Bull, above three years old	25	15	5
34	Bull, above two and not exceeding three years old	25	15	5
35	Yearling Bull, above one and not exceeding two years old	25	15	5
36	Bull-Calf, above six and not exceeding twelve months old	10	5	..
37	Cow, above three years old	20	10	5
38	Heifer, in-milk or in-calf, not exceeding three years old	15	10	5
39	Yearling Heifer, above one and not exceeding two years old	15	10	5
40	Heifer-Calf, above six and under twelve months old	10	5	..
	No Third Prize will be given unless at least Six animals be exhibited, except on the special recommendation of the Judges.			

Reference Number in Certificates. Class.	CATTLE—*continued.*	First Prize. £.	Second Prize. £.	Third Prize. £.
	DEVON.			
41	Bull, above three years old	25	15	5
42	Bull, above two and not exceeding three years old	25	15	5
43	Yearling Bull, above one and not exceeding two years old	25	15	5
44	Bull-Calf, above six and not exceeding twelve months old	10	5	..
45	Cow, above three years old	20	10	5
46	Heifer, in-milk or in-calf not exceeding three years old	15	10	5
47	Yearling Heifer, above one and not exceeding two years old	15	10	5
48	Heifer-Calf, above six and under twelve months old	10	5	..
	No third Prize will be given unless at least Six animals be exhibited, except on the special recommendation of the Judges.			
	CHANNEL ISLANDS.			
49	Bull, above one year old	15	10	..
50	Cow, above three years old	15	10	..
51	Heifer, in-milk or in-calf, not exceeding three years old	15	10	..
	NORFOLK AND SUFFOLK POLLED.			
52	Bull, above one year old	15	10	..
53	Cow, above three years old	15	10	..
54	Heifer, in-milk or in-calf, not exceeding three years old	15	10	..
	OTHER ESTABLISHED BREEDS.			
	Not including the Shorthorn, Hereford, Devon, or Channel Islands or Norfolk and Suffolk Polled Breeds.			
55	Bull, above one year old	15	10	..
56	Cow, above three years old	15	10	..
57	Heifer, in-milk or in-calf, not exceeding three years old	15	10	..
58	Pair of Cows, to be shown in full milk, specially adapted for Dairy purposes	†12	†8	..
	No Second Prize will be given in Classes 49 to 58 unless at least Six animals be exhibited, except on the special recommendation of the Judges.			

Reference Number in Certificates.	SHEEP.	First Prize.	Second Prize.	Third Prize.
Class.	LEICESTER.	£.	£.	£.
59	Shearling Ram	20	10	5
60	Ram of any other age	20	10	5
61	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	COTSWOLD.			
62	Shearling Ram	20	10	5
63	Ram of any other age	20	10	5
64	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
65	For the best Ten Ewes, without reference to age, who have suckled lambs to June 1st	†15	..	..
66	For the best Ten Ram Lambs	†10	..	..
67	For the best Ram of any age	‡5	..	..
	‡ [*Special Prize offered by the Rt. Hon.* J. W. HENLEY, M.P., *a Member of the Oxfordshire Agricultural Society.*]			
	LINCOLNS.			
68	Shearling Ram	20	10	5
69	Ram of any other age	20	10	5
70	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	RYLAND AND OTHER LONG-WOOLLED.			
	Not qualified to compete as Leicester, Cotswold or Lincoln.			
71	Shearling Ram	20	10	5
72	Ram of any other age	20	10	5
73	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	OXFORDSHIRE DOWN.			
74	Shearling Ram	20	10	5
75	Ram of any other age	20	10	5
76	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
77	For the best Ten Ewes, without reference to age, who have suckled lambs to June 1st	†15	..	..
78	For the best Ten Ram Lambs	†10	..	..
79	For the best Ten Ewe Lambs	†10	..	..
	SOUTHDOWN.			
80	Shearling Ram	20	10	5
81	Ram of any other age	20	10	5
82	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	No Third Prize will be given in the Ram Classes unless at least Six animals be exhibited, nor in the Ewe Classes unless Six Pens be exhibited, except on the special recommendation of the Judges.			

Reference Number in Certificates.	SHEEP—*continued.*	First Prize.	Second Prize.	Third Prize.
Class.		£.	£.	£.
	SHROPSHIRE.			
83	Shearling Ram	20	10	5
84	Ram of any other age	20	10	5
85	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	HAMPSHIRE AND OTHER SHORT-WOOLLED			
	Not qualified to compete as Southdown or Shropshire.			
86	Shearling Ram	20	10	5
87	Ram of any other age	20	10	5
88	Pen of Five Shearling Ewes, of the same flock ..	15	10	5
	DORSET.			
89	Shearling Ram	20	10	..
90	Pen of Five Shearling Ewes	15	5	..
	No Third Prize will be given in the Ram Classes unless at least Six animals be exhibited, nor in the Ewe Classes unless Six Pens be exhibited, except on the special recommendation of the Judges.			

PIGS.

91	Boar of a large white breed, above twelve months old	10	5	..
92	Boar of a large white breed, above six months and not exceeding twelve months old	10	5	..
93	Boar of a small white breed, above twelve months old	10	5	..
94	Boar of a small white breed, above six months and not exceeding twelve months old	10	5	..
95	Boar of a small black breed	10	5	..
96	Boar of the Berkshire breed	10	5	..
97	Boar of a breed not eligible for the preceding classes	10	5	..
98	Breeding Sow of a large white breed	10	5	..
99	Breeding Sow of a small white breed	10	5	..
100	Breeding Sow of a small black breed	10	5	..
101	Breeding Sow of the Berkshire breed	10	5	..
102	Breeding Sow of a breed not eligible for the preceding classes	10	5	..
103	Pen of three Breeding Sow-Pigs of a large white breed, of the same litter, above four and under eight months old	10	5	..

Reference Number in Certificates.	PIGS—*continued.*	First Prize.	Second Prize.	Third Prize.
Class.		£.	£.	£.
104	Pen of three Breeding Sow-Pigs of a small white breed, of the same litter, above four and under eight months old	10	5	..
105	Pen of three Breeding Sow-Pigs of a small black breed, of the same litter, above four and under eight months old	10	5	..
106	Pen of three Breeding Sow-Pigs of the Berkshire breed, of the same litter, above four and under eight months old	10	5	..
107	Pen of three Breeding Sow-Pigs of a breed not eligible for the preceding classes, of the same litter, above four and under eight months old ..	..	..	..
108	For the best Berkshire Boar, Sow, and their Offspring; the latter to be under twelve weeks old	10	..	..
109	For the best pair of Berkshire Boars, from one litter, under six months old	10	..	..

II.—Implement and Machinery Prizes offered by the Society.

I. Fixed Steam-Engines.

Class		£.
1.	For the Class of Fixed Steam-Engines of four-horse power, with boiler combined	20
2.	For the Class of Fixed Steam-Engines of above four-horse power, and not exceeding ten-horse power, to be worked by an independent boiler	30

II. Horse-Gears.

1.	For the Class of Gears for one horse	10
2.	For the Class of Gears for two horses	10

III. Mills.

1.	For the Class of Mills, with Stone Grinders, for grinding Agricultural produce into meal, by steam or horse-power	20
2.	For the Class of Mills, with Metal Grinders, for grinding Agricultural produce for feeding purposes, by steam or horse-power	20
3.	For the Class of Mills, with Metal Grinders, for grinding Agricultural produce for feeding purposes, by hand-power	10

IV. Crushers.

1.	For the Class of Corn-Crushers by steam or horse-power	15
2.	For the Class of Corn-Crushers by hand power	10
3.	For the Class of Linseed-Crushers by steam or horse-power	10
4.	For the Class of Linseed-Crushers by hand-power	10

V. Chaff-Cutters.	£.
1. For the Class of Chaff-Cutters to be worked by steam or horse-power	20
2. For the Class of Chaff-Cutters to be worked by hand-power	10
VI. Oilcake-Breakers.	
1. For the Class of Oilcake-Breakers, for large and small cake, to be worked by steam or horse-power	15
2. For the Class of Oilcake-Breakers, for large and small cake, to be worked by hand-power	10
VII. Turnip-Cutters.	
1. For the Class of Turnip and Root-Cutters	15
2. For the Class of Root-Pulpers	15
VIII. Steaming Apparatus.	
1. For the Class of Steaming-Apparatus for the preparation of food for Stock	20
IX. Dairy Implemenps.	
1. For the Class of Churns worked by hand power	10
2. For the Class of Churns worked by any other power	10
3. For the Class of Cheese Tubs	10
4. For the Class of Cheese Presses	10
5. For the Class of other Dairy Utensils	10
X. Bone-Mills.	
Class	
1. For the Class of Bone-Mills to be worked by steam or other power ..	20
XI. Guano-Breakers.	
1. For the Class of Guano-Breakers worked by hand-power	10
XII. Coprolite-Mills.	
1. For the Class of Coprolite Mills	10
XIII. Flax-breaking Machines.	
1. For the Class of Flax-Breaking Machines	10
XIV. Tile Machinery.	
1. For the Class of Machines for the manufacture of Draining Tiles ..	15
XV. Draining Tools.	
1. For the Class of Draining Tools	10
XVI. Miscellaneous.	
Awards to Agricultural articles, and essential improvements therein	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 live calf 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 that she produced a live calf before the 31st of January in the subsequent year.

HORSES.

5. All foals must be the offspring of the mare along with which they are exhibited.

6. No veterinary inspection of horses will be required except when considered necessary by the Judges, who will be accompanied by the Veterinary Inspectors.

7. A charge of 1*l.* for the accommodation of a horse-box will be made for each entry for stallions and mares in-foal, or with foals at foot, which includes hay, straw, and green fodder.

8. A charge of 10*s.* will be made for the accommodation of a stall for each entry in the other horse Classes, which includes hay, straw, and green fodder.

SHEEP.

9. All rams, except shearlings, must have been used in the present season.

10. 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. Three 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.*

Pigs.

11. The three sow-pigs in each pen must be of the same litter.

12. The breeding sows in Classes 98, 99, 100, 101, and 102, 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.

13. 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.

14. 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.

15. All pigs exhibited at the country meetings of the Society shall be subjected to an examinatiou 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.

16. 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.

17. All disqualifications will be published in the awards of the Judges.

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 cousideratiou.

CONDITIONS RELATING TO MACHINERY.

Section I., Class 1.—Fixed Steam-Engines of Four-Horse Power, with Boiler Combined.

1. No four-horse power Engine will be eligible to compete in Class 1 unless it be mounted on its own boiler, or together with a boiler on one foundation-plate.

2. The Cylinder of the Engine must not exceed 7¼ (that is, seven and a quarter) inches in diameter.

3. The Boiler must be fitted with a Steam Indicator, in addition to the ordinary Spring Balance.

Section I., Class 2.—Fixed Steam-Engines of above Four-Horse power and not exceeding Ten-Horse power, to be worked by an independent Boiler.

1. The steam-engine must not be more than 10-horse nominal power, and the diameter of the cylinder must not exceed 11½ (that is, eleven and a half) inches.

2. The Exhibitor will not be required to bring a boiler, as steam will be furnished by boilers supplied by the Society; but he will be required to *fix* the Engine in such a position in the Trial Yard as may be pointed out to him by the Director or Consulting Engineer, and to find the materials for doing so at his own expense.

3. The Engine exhibited must be supplied with a governor, and have a starting cock to regulate the supply of steam, and be fitted with a thread equal to the 2-inch gas-pipe.

N.B.—In adjudicating on the merits of the Fixed Engines, reference will be had to the price, simplicity of construction, probable durability of the whole and in detail, and the means provided for easy access to the working parts, and to economy of fuel.

Section III.—Mills.

Grinding Mills will be fairly set to work, and their production compared with a sample which the Judges shall cause to be produced by one mill, which sample shall, in their estimation, be adapted for the farmer's purposes of feeding. The mill under trial shall be "set" until it produces like meal; and the *time*, *power*, and *quantity of work* be noted.

Metal Mills for grinding will not be expected to produce "softened" meal, although any mill in combination, with rollers or otherwise, which would do so, will receive consideration from the Judges.

Section V.—Chaff-Cutters.

Chaff-Cutters will be required to cut chaff three-eighths of one inch in length, in the trial. The Exhibitor must provide means for cutting various lengths, to show the usefulness of his production. The Judges will be instructed to pay attention to the length of chaff cut; and if the deviation from the given length of three-eighths of an inch is, in their judgment, too much departed from, they may refrain taking any notice of the machine in question: and in estimating the *weight* of chaff cut, allowance must be made and taken according to length of chaff cut.

SPEED AND PRESSURE.

All implements turned by a winch or hand-crank shall not be worked at any trial beyond the following speed: namely, 42 revolutions per minute for 12-inch crank, 37 revolutions for 14-inch crank, 32 revolutions for 16-inch crank; and, in addition to the winch-handle which must be supplied with the machine for the purpose of trial, a pulley not less than four inches wide, of the same radius as the winch, must be fitted to each machine. The machine in its trial will be driven by the pulley of the testing machine, which pulley is 31 inches diameter, and will make 32½ revolutions per minute.

Chaff-Cutting and other small machines, worked usually by horses or by steam power, will be worked, when under trial, by a pulley not less than 5½ (that is, five and a half) inches wide, moving with a velocity of about 900 feet per minute.

Exhibitors are requested to pay particular attention to the instructions given for the speed and working of their machines, as the Judges may refuse to try any machines not fitted in accordance with these instructions.

The working pressure of steam is not to exceed 50 lbs. per square inch.

SPECIAL ARRANGEMENTS.

1. The Judges will be instructed to employ in the trial of the Steam-Engines as a test of power, an apparatus known as a Force-Register, such apparatus consisting of a friction-break, to supply and regulate the friction required to balance the power of the engine under trial.

2. At a distance of about thirty-four feet, or such other distance as the Society's Engineer may determine, a platform will be laid down, upon which the boiler of the Society may move in a direction perfectly parallel with the friction-break.

3. Each fixed Engine must be placed in such a position by the Exhibitor as to require a Driving-Strap of such a length as the Society's Engineer may determine.

4. Each Exhibitor must provide his own Driving-Strap, which shall be of the required length.

5. Each fixed Engine, of more than four-horse power, will have attached to it a Steam-Pipe, the end of which must be at a given distance from the centre line of the Boiler Platform, and be provided with a union of such dimensions as the Engineer to the Society may determine, each being cut with the same screw: and it must be at a given height from the Boiler Platform.

6. A short piece of flexible Pipe, capable of sustaining the temperature and pressure of fifty pounds of steam to the inch, for the purpose of forming a simple and ready communication between the Boiler and the Engines of more than four-horse power, will be provided by the Society.

7. To insure all these points being fully adhered to, a lithograph plan and section, showing the exact position of the Shaft, diameter of the Pulley, and a Friction-break, and also of the Boiler, with the end and height of the Steam-pipe figured with the exact dimensions, will be supplied to Exhibitors on application to the Secretary.

8. After the Exhibitors shall have complied with the conditions required of them by the Society to entitle them to exhibit, the order of trial will be fixed by Ballot, taken by order of the Stewards, and the ordinal number assigned for the trial of each Engine or Machine will be given to each Exhibitor. The Exhibitors will then place their respective Engines or Machines in the order thus assigned, beginning at one end with the Engine or Machine drawn by ballot No. 1. To enable this to be done effectually, each Exhibitor will be required to specify, *on entering his Engine or Machine for competition* (that is, not later than the First of June), the width or space which it will occupy for trial.

9. All the Engines and Machines intended to be tried must be fixed by a given time—namely, by five p.m. on Saturday, the 9th of July, and strictly in the position and under the conditions required; if not, the Judges will have the power of declining the trial, and of having the Engines or Machines removed from the yard.

10. The trials of the Steam-Engines will be made with Llangennech coal.

11. Any Engine or Machine, whether entered for competition or not, which, from defect in construction or any other cause, is in the opinion of the Judges and Consulting Engineer, *unsafe*, shall not be allowed to work on the Society's premises: and further, the word *unsafe* shall be attached to the Engine during the remainder of the Exhibition.

⁂ Forms of Certificate for entry, as well as Prize-Sheets for the Oxford 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.

Certificates for the entry of Implements for the Oxford 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 Oxford Local Committee, and the Oxfordshire Agricultural Society, are open to general competition.

CONDITIONS RELATING TO THE EDUCATIONAL EXAMINATIONS, 1870.

1. The next examination will take place at the Society's house in Hanover Square, during the week commencing Tuesday, April 26th, 1870.

2. Forms of entry duly filled up, together with a certificate of general education, must be returned to the Secretary, on or before the 31st of March, 1870.

3. No Candidate will be eligible for the Society's honours and prizes who has completed his twenty-first year previous to March 31st, 1870.

4. The examinations will be conducted by means of written papers, and by a *vivâ voce* examination at which any member of the Society may be present.

5. Every candidate will be required to satisfy the Examiners in the Science (Chemistry) and Practice of Agriculture, and in Book-keeping; and also in one of the two following subjects: Land Surveying, and Mechanics as applied to Agriculture.

6. The successful candidates will be placed in two classes, and arranged in order of merit.

7. Candidates, in order to be placed in the *first* class, must satisfy the Examiners in both the above-named subjects—Land Surveying and Mechanics as applied to Agriculture.

8. Any Candidate may offer himself for examination in one or more of the following subjects, viz.:—Botany, Geology, or Anatomy. Any knowledge which he may show of these subjects will be counted to his credit in the general classification, provided that he shall have fulfilled the foregoing conditions, and provided that the knowledge of these subjects do not fall below the standard fixed as a minimum in each of these *optional* subjects.

9. Each successful candidate obtaining a first-class certificate shall thereby become a life-member of the Society.

10. The following prizes will be awarded to successful candidates placed in the first class for aggregate merit:—First Prize, 30*l.*; Second Prize, 20*l.*; Third Prize, 10*l.*

11. The following additional Prizes will be awarded to the candidates who shall show the highest merit in each subject respectively:—

	Money or Books to the value of £
Science and Practice of Agriculture	10
Mechanics	10
Chemistry	10
Book-keeping	10
Botany and Vegetable Physiology	5
Geology	5
Anatomy and Animal Physiology	5
Land Surveying	5

12. Certificates, to be termed first and second-class certificates, will be granted to candidates placed in the first and second class; such certificates to specify the subjects in which the candidate shall have satisfied the examiners.

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 *boná-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, 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 sample 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 sample post. If the manure be very wet and lumpy, a larger boxful, weighing from 12 to 15 ozs., should be sent either by sample post or railway.

Samples not exceeding 4 ozs. in weight may be sent by sample post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 ozs., for 4 postage stamps.

Samples not exceeding 16 ozs., for 8 postage stamps.

Samples not exceeding 24 ozs., for 1*s.* in postage stamps.

There must be no writing or printing in the packet or its cover in addition to the address: DR. AUGUSTUS VOELCKER, 11, SALISBURY SQUARE, FLEET STREET, LONDON, E.C., and the address of the sender of the parcel, and the number or mark of the article sent.

These particulars must in all cases be given not on loose pieces of paper but on small labels attached to the samples or packages containing them.

The samples must be sent in covers, open at the ends or in boxes, bags of linen or other materials, which may be fastened by string, but must not be sealed, so as to be easily examined. No parcel sent by sample post must exceed $1\frac{1}{2}$ lb. in weight, or 2 feet in length, or 1 foot in width or 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 train 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, by sample post, 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 sample post. The piece should weigh from 12 to 15 ozs.; postage, 8*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 sample post.

On forwarding samples, separate letters should be sent by post to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

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.*

Royal Charter,

INCORPORATING THE

ENGLISH AGRICULTURAL SOCIETY

AS THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

March 26, 1840.

VICTORIA, by the Grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, to all to whom these presents shall come, greeting.

1. Whereas our right trusty and right entirely beloved cousin and counsellor, Charles Duke of Richmond, Knight of the most noble Order of the Garter, our right trusty and right entirely beloved cousin, George Henry Duke of Grafton, Knight of the most noble Order of the Garter, our right trusty and right entirely beloved cousin, John Henry Duke of Rutland, Knight of the most noble Order of the Garter, our right trusty and right entirely beloved cousin, George Granville Duke of Sutherland, our right trusty and entirely beloved cousin, Arthur Blundell Sandys Trumbal Marquess of Downshire, Knight of the most illustrious Order of Saint Patrick, our right trusty and right well beloved cousin and counsellor John Charles Earl Spencer, our trusty and well beloved Robert Henry Clive, Esquire, Sir Francis Lawley, Baronet, and Sir Thomas Dyke Acland, Baronet, our right trusty and well beloved counsellor Sir James Robert George Graham, Baronet, and our trusty and well beloved Henry

Handley and Joseph Neeld, Esquires, and others of our loving subjects, have formed themselves into a Society for the general advancement of English Agriculture, and for the purpose of prosecuting the following national Objects,
Objects— 1st. namely:—First, to embody such information contained in agricultural publications, and in other scientific works as has been proved by practical experience to be useful to the
2nd. cultivators of the soil; second, to correspond with Agricultural, Horticultural, and other Scientific Societies, both at home and abroad, and to select from such correspondence all information which, according to the opinion of the Society, may be likely to lead to practical benefit in the cultivation
3rd. of the soil; third, to pay to any occupier of land, or other person who shall undertake, at the request of the Society, to ascertain by any experiment how far such information leads to useful results in practice, a remuneration for any loss that
4th. he may incur by so doing; fourth, to encourage men of science in their attention to the improvement of agricultural implements, the construction of farm-buildings and cottages, the application of chemistry to the general purposes of agriculture, the destruction of insects injurious to vegetable life,
5th. and the eradication of weeds; fifth, to promote the discovery of new varieties of grain and other vegetables useful to man
6th. or for the food of domestic animals; sixth, to collect information with regard to the management of woods, plantations, and fences, and on every other subject connected with rural
7th. improvement; seventh, to take measures for the improvement of the education of those who depend upon the cultiva-
8th. tion of the soil for their support; eighth, to take measures for improving the veterinary art, as applied to cattle, sheep,
9th. and pigs; ninth, at the Meetings of the Society in the country, by the distribution of prizes, and by other means, to encourage the best mode of farm cultivation and the breed
10th. of live stock; tenth, to promote the comfort and welfare of labourers, and to encourage the improved management of

their cottages and gardens: And have subscribed and expended divers large sums of money in the prosecution of these their national and patriotic objects, being regulated in their purpose by the strictest exclusion from their councils of every question of discussion having a political tendency, or which shall refer to any matter to be brought forward, or at any time pending in either of our Houses of Parliament: And having such objects, and being regulated by such essential principle, they have humbly besought us to grant unto them, and such other persons as shall be approved and elected in manner hereinafter mentioned, our Royal Charter of Incorporation for the several purposes aforesaid.

2. Now, therefore, know ye, that we, being anxious of promoting and encouraging by our Royal protection and patronage a series of objects which, prosecuted under the regulating principle of the exclusion of all those questions of debate on which the people of every individual country entertain sentiments so much at variance with each other, cannot fail to lead to results, affecting in the highest degree the prosperity of our people and the national wealth of our kingdom, have, of our especial grace and favour, given and granted, and do by these presents for us, our heirs, and successors, give and grant that the said Charles Duke of Richmond, George Henry Duke of Grafton, John Henry Duke of Rutland, George Granville Duke of Sutherland, Arthur Blundell Sandys Trumbal Marquess of Downshire, John Charles Earl Spencer, Robert Henry Clive, Sir Francis Lawley, Sir Thomas Dyke Acland, Sir James Robert George Graham, Henry Handley, and Joseph Neeld, and such others of our loving subjects as have formed themselves into, and are now, subscribers of the said Society, or who shall at any time hereafter become subscribers thereof, according to such regulations or bye-laws as shall be hereafter framed or enacted, shall by virtue of these presents be, and for ever hereafter continue to be, one body politic and corporate for the purposes afore-

Name. said, by the name of the "Royal Agricultural Society of England," by which name they shall have perpetual succession and a common seal, with full power and authority to alter, vary, break, and renew the same at their own discretion, and by the same name shall sue and be sued, implead and be impleaded, answer and be answered unto in every Court of us, our heirs, and successors, and be for ever able and capable in the law to purchase, receive, possess, and enjoy to them and their successors any goods and chattels whatsoever, and also be able and capable in the law (notwithstanding the statutes of Mortmain) to take, purchase, possess, hold, and enjoy to them and their successors a hall, and any messuages, lands, tenements, or hereditaments whatsoever, the yearly value of which, including the site of the said hall, shall not exceed in the whole the sum of Three Thousand Pounds, computing the same respectively at the rack-rent which might have been had or gotten for the same respectively at the time of the purchase or acquisition thereof, and to act in all the concerns of the said body politic and corporate, for the purposes aforesaid, as fully and effectually to all intents, effects, constructions, and purposes whatsoever, as any other of our liege subjects, or any other body politic or corporate, in our United Kingdom of Great Britain and Ireland, not being under any disability, might do in their respective concerns.

Seal.

To sue and be sued.

Power to hold Lands, &c.

3. And we do hereby grant our especial licence and authority unto all and every person and persons, bodies politic and corporate (otherwise competent), to grant, sell, alien, and convey in mortmain unto, and to the use of, the said Society and their successors, any messuages, lands, tenements, or hereditaments, not exceeding such annual value as aforesaid.

4. And know ye further, that in granting this our Royal Charter to the said Royal Agricultural Society of England, we do hereby declare it to be our full and entire will and pleasure that we extend our Royal protection to its national

objects, under the condition that a principle of its constitution shall be the total exclusion of all questions at its meetings, or in its proceedings, of a political tendency, or having reference to measures pending, or to be brought forward, in either of our Houses of Parliament, which no resolution, bye-law, or other enactment of the said body politic and corporate, shall on any account or pretence whatever be at any time allowed to infringe. Exclusion of Politics.

5. We further declare, that the number of Subscribers of the said body politic and corporate shall be indefinite, but classed according to their election or rate of payment into governors and members, with such individual privileges as shall appertain respectively unto each, there being added to the Society such honorary, corresponding, and foreign members as may be found desirable for the promotion of its several objects. Number. Governors and Members.

6. It is also our will and pleasure, that there be three general meetings of such governors and members of the said Society held in each year, namely, two of these general meetings in London, in the months of May and December, and the other in such other part of England or Wales as shall be deemed most advantageous in time and place for the advancement of the objects of the Society. We further will and declare, that at such general meeting in London, to be held on the twenty-second or (should that date fall on a Sunday) on the twenty-third day of May, the governors and members shall have full power to elect a president and council, which president and council, although then duly elected, shall, nevertheless, not come into office until after the day of the annual country meeting next following, and shall then continue from that day in their respective offices and appointments for one year (more or less according to the date of the next annual country meeting); all vacancies occurring in such offices and appointments by resignation, death, or otherwise, to be filled up by election, and the General Meetings. Country Meeting. Date of General Meeting. President and Council. Vacancies.

majority of votes of the remaining members of such president and council. That the council shall consist of one president, twelve trustees, and twelve vice-presidents, to be elected from the class of governors only, and of fifty other members, to be elected indiscriminately from the governors and members of the Society: That the president shall be an annual officer of the Society, and not re-eligible to the office of president for three years. And further, that twenty-five of the fifty general members of the council shall go out by rotation each year, but may be re-elected.

Council to consist of

President.

Retirement by rotation.

Election of Officers and Council.

7. We further will, declare, and grant, that such general meeting in May shall have the full power and privilege of electing the president, trustees, vice-presidents, and other members of the council, from the governors and members as aforesaid; and that such president, trustees, vice-presidents, and council, shall be regulated in their proceedings by such bye-laws as may and shall from time to time be enacted by them conformably with the tenor of these letters patent, no established bye-law, however, being in any case altered, or new one proposed, without at least one month's notice of such intention being given to each member of the council. Further, that such president and council so elected shall have the power both to appoint, and, as they may think fit, to remove, one general secretary to the Society, who will be responsible to them for the execution and discharge of the various duties required of him, as defined from time to time by their bye-laws or special resolutions. And we further will and declare, that the said body politic and corporate may by him as their secretary sue or be sued, contract or discharge, in their name and on their behalf.

Bye-laws.

Notice of Alteration.

Secretary.

First President.

8. We further will and declare it as our Royal pleasure that the said Charles Duke of Richmond shall be the first president of the said Royal Agricultural Society of England, and that he, with the said George Henry Duke of Grafton, John Henry Duke of Rutland, George Granville Duke of

Council.

Sutherland, Arthur Blundell Sandys Trumbal Marquess of Downshire, John Charles Earl Spencer, Robert Henry Clive, Sir Francis Lawley, Sir Thomas Dyke Acland, Sir James Robert George Graham, Henry Handley, and Joseph Neeld, shall be members of the first council, any three or more of whom shall hereby be invested with full power, being first duly summoned to attend, to appoint, on or within ten days preceding or following the twenty-fifth day of the present month of March, such persons to be trustees, vice-presidents, council, governors, members, honorary members, corresponding members, and foreign members, as they shall respectively think fit.

9. And we further will, grant, and declare, that the president and council shall have the sole management of the income and funds of the said body politic and corporate, and also the entire management and superintendence of all the other affairs and concerns thereof, and shall, or may, but not inconsistently with, or contrary to, the provisions of this our Charter or any existing bye-law, or the laws or statutes of this our realm, do all such acts and deeds as shall appear to them necessary or essential to be done, for the purpose of carrying into effect the objects and views of the said Royal Agricultural Society of England. Management.

10. In witness whereof we have caused these our Letters to be made patent. Witness ourself at our palace at Westminster this twenty-sixth day of March, in the third year of our reign.

By Writ of Privy Seal.

(Signed) EDMUNDS.

I.—LAWS CONTAINED IN THE CHARTER, WHICH CANNOT AT ANY TIME BE ALTERED OR DEPARTED FROM.

Name.

1. The Society is a corporate body, by the name of the Royal Agricultural Society of England, and has a Common Seal.

Exclusion of Politics.

2. It is a condition of the Royal Charter that a principle of the constitution of the Society shall be the total exclusion of all questions, at its meetings or in its proceedings, of a political tendency, or having reference to measures pending or to be brought forward in either House of Parliament; which no resolution, bye-law, or other enactment of the said body politic and corporate shall, on any account or pretence whatever, be at any time allowed to infringe.

Number.

3. The number of subscribers is indefinite; and classed into Governors and Members.

4. Power is given to elect Honorary, Corresponding, and Foreign Members.

General Meetings.

5. Three General Meetings are to be held in each year: two of these in London, in the months of May and December; and the other in such part of England or Wales as shall be deemed most advantageous for the advancement of the objects of the Society. The General Meeting in London is to be held on the 22nd (or, should that date fall on a Sunday, on the 23rd) of May.

Election of President and Council.

6. The Governors and Members have full power to elect a President and Council at the general May Meeting; which President and Council, although then duly elected, shall nevertheless not come into office till the conclusion of the ensuing Annual Country Meeting to be held that year. All vacancies occurring in such officers and appointments, by resignation, death, or otherwise, are to be filled up by election and the majority of votes of the remaining Members of such President and Council.

Vacancies.

Council to consist of

7. The Council is to consist of one President, twelve Trustees, and twelve Vice-Presidents, to be elected from the class of

Governors only; and of fifty other Members to be elected indiscriminately from the Governors and Members of the Society.

8. The President is to be an annual officer of the Society, and not re-eligible to the office of President for three years.

9. Twenty-five of the fifty general Members of the Council are to go out each year by rotation, but may be re-elected. Retirement by rotation.

10. The General Meeting in May shall elect the President, Trustees, Vice-Presidents, and other Members of Council, from the Governors and Members.

11. The Council is to be regulated in their proceedings by such bye-laws as may and shall from time to time be enacted by them conformably with the tenor of the Charter: no established bye-law being in any case altered, or new one proposed, without at least one month's notice of such intention being given to each Member of the Council. Bye-laws.

12. The Council have power to appoint and remove one general Secretary to the Society; such Secretary to sue and be sued in their name and on their behalf. Appointment of Secretary.

13. The Council have the sole management of the income and the funds of the said body politic and corporate; and also the entire management and superintendence of all other affairs and concerns thereof; and can—but not inconsistently with or contrary to the provisions of the Charter, or any existing bye-law, or the laws of the land—do all such acts and deeds as shall appear to them necessary or essential to be done for the purpose of carrying into effect the objects and views of the said Royal Agricultural Society of England. Council Management.

II.—BYE-LAWS.

1. All existing Bye-Laws, Rules, and Regulations shall be rescinded, and the following be adopted in their places.

Governors and Members.

2. Every candidate for admission into the Society must be proposed by a Governor or Member, who must sign a certificate recommending him;* the proposer must specify in writing the Proposal of Governors and Members.

* Blank certificates of the form required may be had of the Secretary at the House of the Society.

name, rank, usual place of residence, and post-town, of the candidate, either at a Council-meeting, or by letter to the Secretary. Every such proposal shall be read at the Council-meeting at which it is made; or, in the case of the candidate being proposed by a letter to the Secretary, at the first meeting of the Council next after the receipt of such letter. The Secretary shall then forward to the Candidate a printed copy of the Form [No. I. in the Appendix], for his signature; and the election shall not take place until after the Candidate shall have returned it, signed by himself, and addressed to the Secretary at the House of the Society. At the next monthly Meeting of the Council, after the Form shall have been received duly signed, the election shall take place, when the decision shall be taken by a show of hands: the majority of the Members of Council present to elect or reject. The Secretary shall inform Governors and Members of their election by a letter [No. II. in the Appendix], in such form as the Council may from time to time direct.

Election of Governors and Members.

Commencement of Membership.

3. No person elected a Governor or Member shall be entitled to exercise any privilege as such, nor shall his name be printed in any list of the Society until he shall have paid his subscription, after which he shall be entitled to exercise all the privileges of a Governor or Member [as the case may be]; and his name shall be entered in the lists of the Society. Governors shall pay an annual subscription of 5*l*., and Members of 1*l*.; all subscriptions being due on the 1st of January in each year; but when the election takes place in December, the subscription paid in that month will be considered as the subscription of the following year. Governors may, at any time, compound for their subscription by a single payment of 50*l*.; Members, by one of 10*l*. If the subscription for the current year has already been paid, such payment shall be allowed in part of the composition. Governors or Members not resident in the United Kingdom are required on election to pay the life composition; in each case, equivalent to ten annual subscriptions. On and after the 1st of June, the subscriptions remaining unpaid at that date are in arrear. No Governor or Member whose subscription is in arrear shall enjoy any of the privileges of the Society; nor will any such Governor or Member be allowed to enter into a composition for his future payments until such arrear, excluding that for the current year, be paid. No Governor or Member shall be allowed to transfer his name from one class of Members to the other, respectively, without the express leave of the Council.

Subscription.

Composition.

Members not resident in the United Kingdom.

Arrears.

4. Any Governor or Member, whose subscription is not in arrear, may withdraw from the Society, by signifying his wish to do so, by letter under his own hand, addressed to the Secretary at the House of the Society: provided always that such Governor or Member shall pay his subscription for the year wherein he signifies his wish to withdraw: and that he shall continue liable to the annual subscription until he shall have discharged all sums, if any, due from him to the Society, and shall have returned all books or other property, if any, borrowed by him of the Society: or shall have made full compensation for the same, if lost or not forthcoming. Governors or Members withdrawing from the Society, shall be liable to the subscription for the current year, unless on or before the previous 31st December they shall have given notice, in writing, to the Secretary of their wish to withdraw.

Withdrawal of Governors and Members.

5. Governors have the privilege of attending and speaking at all Meetings of the Council, but not of voting, unless they are Members of the Council. All Governors and Members are entitled, gratuitously, to the numbers of the Journal belonging to the year for which their subscription is paid; and have the privilege of inspecting all models presented to the Society, and of referring to the books in the library. Governors and Members have the right to be present; to state their opinion, and to vote, at all General Meetings of the Society; they have also the right to propose candidates for admission into the Society, either as Governors or Members, to receive Chemical and Veterinary aid on such terms as the Council may from time to time determine; to have transmitted to them all official documents which the Council may cause to be printed for the use of the Society; to exhibit Stock and Implements at the Society's Country-meetings at such rates as the Council may deem expedient; and to have free admission to such Country-meetings as well as to all other General Meetings of the Society.

Privileges of Governors and Members.

6. An alphabetical Register shall be kept of all the Governors and Members, exhibiting the date of their election, and the subscriptions received or due from them, with the dates respectively of payment and arrear. Every Governor or Member shall, from time to time, communicate to the Secretary his address, or that of his banker or agent; and all notices or publications forwarded to such address, shall be considered as having been duly delivered to such Governor or Member.

Register.

Address of Governors and Members.

Honorary, Corresponding, and Foreign Members.

7. The Council, having the power of electing Honorary, Corresponding, and Foreign Members, may elect as such any eminent individuals who have distinguished themselves in promoting the objects for which the Society was established. Such Honorary, Corresponding, and Foreign Members shall not be called upon for the payment of any subscription; they shall have the privilege of attending and speaking at the Meetings of the Society and of the Council, but not of voting at either. The President shall sign, and the Secretary shall countersign the Diploma of every Honorary, Foreign, or Corresponding Member, as soon as may be after his election; and the Secretary shall, at the earliest opportunity, forward it to him, together with notice of his election.

Dismissal.

9. Governors and Members may be dismissed from the Society in the following manner:—Any ten Governors or Members of the Society may send, in writing, to the Council, a request, signed by them, that any Governor or Member shall be dismissed from the Society. Such request shall be placed in a conspicuous part of the Council-room, and a copy thereof signed by the Secretary shall be transmitted by post to the Member proposed to be dismissed. At the first monthly Meeting of Council at which twelve Members at the least shall be present, and not less than one month after such request shall have been placed in the Council-room, the Council shall take the matter into their consideration. If the Council shall unanimously agree to the dismissal of such Governor or Member, he shall be no longer a Governor or Member of the Society; but if they shall not unanimously agree to his dismissal, their decision shall be considered to have been made in his favour: Provided always, that his dismissal shall not relieve him from the payment of any debt previously due by him to the Society; and that if a Life Governor or Life Member, he shall not have any claim to any portion of the commutation he has paid.

10. Honorary, Foreign, and Corresponding Members may be removed in the manner prescribed for the removal of Governors and Members.

Inability to make Dividend.

11. The Society shall not and may not make any dividend, gift, division, or bonus in money unto or between any of its Governors or Members.

Effect of Charter and Bye-laws.

12. No Governor or Member shall be absolved from the effect of the provisions of the Charter, or of the Bye-laws, on the

plea of not being acquainted with them, or of not having received a copy of them.

13. No Governor or Member, not being a Member of the Council, shall have any right of interference or control in or over the management of the affairs, or of the hereditaments or effects of the Society, otherwise than at the General Meetings, as hereinafter specified. Affairs of the Society.

General Meetings.

14. Public notice of the two General Meetings of the Society which are annually held in London, shall be given in such newspapers as the Council may decide; and all elections (excepting that of the Council) and resolutions proposed at those meetings shall be determined by a show of hands. The General Meeting in December shall be held at such date in that month, and the Annual Meeting in the country at such time and place, as the Council may decide. The place of Meeting in the country shall be settled by the Council on the first Wednesday in May, and declared at the ensuing General Meeting in the year preceding such Meeting. At every General Meeting in London, a report and financial statement from the Council shall be read, and any Governor or Member present may propose any questions to the Council respecting the matters contained in such report, and comment thereon, and on such other matters relating to the Government of the Society, and the management of its affairs, as to him may seem proper. Governors and Members only, or individuals bearing the President's written order, will be allowed to be present at the General Meetings, each person giving his name in writing on being admitted. General Meetings. Country Meeting. Persons to be present.

15. At the General Meeting in May, the election of the President, Vice-Presidents, and Trustees shall take place, before the commencement of any other business, by a show of hands. The election of the twenty-five Members of the Council, who are to replace the twenty-five Members who retire by rotation, shall immediately afterwards take place in the following manner:— Mode of electing President and Council.

a. A list of the Members of the Council who retire by rotation, but who may be re-elected, shall be prepared on or before the 1st of May, for inspection by the Members at the rooms of the Society. Members of Council.

b. The Council shall prepare on the first Wednesday in May, a list of the twenty-five Governors or Members whom House list.

they propose for election or re-election (stating the number of attendances during the past two years at Meetings of the Council or of Committees, of each Governor or Member so proposed, which list so prepared shall be published immediately in such Agricultural papers as the Council may determine). A copy of this list shall be given to any Governor or Member who applies to the Secretary, either on the day of the General Meeting, or on any day of the week preceding (Sundays excepted), between the hours of ten and four.

Voting, modes of.

c. The voting shall take place by each Governor or Member who wishes to vote giving in one of these lists signed by himself, with such names struck out or added, as he thinks fit, to the President, at the General Meeting. When the lists have been given in, three scrutineers shall be appointed by the President, who shall retire into another room, and inspect the lists which have been given in, and report forthwith to the Meeting, in writing, the names of the twenty-five Governors or Members who shall have the majority of votes; after which, the papers shall be immediately destroyed by the scrutineers. If any list should contain the names of more than twenty-five Members, it will be rejected. No Governor or Member will be allowed to vote who does not personally deliver his list to the President. In the event of an equality of votes, the selection of the required numbers out of those candidates having such equality shall be made by the meeting on a show of hands.

The President.

The President.

16. The President shall not be re-eligible to the office of President for three years from the day of the election of his successor.

Precedence.

In all the official relations of the Society, he shall take precedence of all other Governors and Members, and shall have full power to summon at his pleasure meetings of the Council, and shall take the chair at every Council-meeting when present, he, and every other Chairman of the Council, having the privilege of a

Casting Vote.

casting vote, in addition to his own, in all cases of equality in the division on any question. He shall sign all such letters, votes of thanks, and other documents, as the Council may direct, in the name and on the behalf of the Council.

The Council.

17. The Council may adjourn from time to time, at their discretion: when not so adjourned, they shall hold a meeting on the first Wednesday in every month, at twelve o'clock, for the election of Members and for the transaction of the business of the Society; and shall also meet on one other Wednesday in each month during the session, unless otherwise specially ordered. *The Council. Adjournment. Monthly. Interim.*

18. Should the business of the Society require a Special Council to be held at any other time, the President shall have full power to direct such a Council to be summoned, at such time and place, and with such notice, as he may think fit: provided that, in case of necessity, the President may summon a special Council to be held forthwith; but any orders then made shall not remain valid unless confirmed by the next monthly Council. In the absence of the President, one Trustee, together with one Vice-President, and three other Members of the Council, shall have power to summon the Council in any case of emergency, on delivering to the Secretary an order signed by them for issuing the summonses, and allowing not less than seven days to elapse between the date of summons and the day appointed for the meeting of such Council. *Special Council. Power of Summoning.*

19. The Monthly Meeting of the Council shall have the full power of originating, discussing, and deciding, by the majority of votes, on a show of hands, all questions brought before it on the business of the Society. Should, however, any Member then present regard any proposition brought forward as too important for immediate decision, he will be at liberty to take the sense of the Meeting whether such proposition should be postponed, in order that it may be duly discussed at the next Monthly Meeting; and should one-third of the Members present agree with him on that point, such proposition shall be postponed, and due notice of such motion and postponement shall be given to all Members of the Council by the Secretary. *Monthly Council. Adjournment of important discussions.*

20. Minutes of the proceedings of every meeting of the Council shall be taken during their progress by the Secretary, or, in case of his absence, by some Member present, whom the Chairman shall appoint for the occasion. The minutes shall afterwards be copied fairly into a minute-book, to be kept for that purpose. *Minutes of the Proceedings.*

21. The Council shall, from time to time, draw up such regulations, not inconsistent with the Charter and Bye-Laws, as may appear to them expedient for conducting the proceedings of their *Council Regulations.*

own meetings; and the regulations so drawn up shall be binding on the Members of the Council.

Government of the Society. 22. The government of the Society and the management of its concerns are entrusted to the Council, subject to no other restrictions than are and may be imposed by the Charter and Bye-Laws, and to no other interference than may arise from the acts of the Governors and Members in General Meeting assembled.

Orders of the Council. 23. The Council may from time to time make such regulations, and issue such orders, not inconsistent with the Charter and Bye-Laws, as shall appear to them conducive to the good government of the Society, and to the proper management of its concerns: and all such regulations and orders shall be binding on all and every the Governors and Members, Honorary, Foreign, and Corresponding Members, Officers, and Servants of the Society.

Appointment of Committees. 24. The Council may appoint Committees to examine into, and report to them on any special matters relating to the objects or business of the Society, and may require such Committees to Report, and may dissolve such Committees, whensoever they shall think proper.

Disposal of Duplicates. 25. The Council may exchange for other property, or otherwise dispose of, any duplicate books, maps, or models belonging to the Society, in such manner as may in their opinion best conduce to the advancement of Agriculture and the interests of the Society.

Presentation of the Journal. 26. The Council may present copies of the Journal of the Society, to other agricultural and scientific bodies, and to the heads of public departments.

Resolutions of General Meetings. 27. The Council shall carry into effect, as far as in them lies, the resolutions of General Meetings.

Appointment of Bankers. 28. The Council shall appoint a Banker to the Society, for the time being, to whom all sums of money received by the Secretary or other person, for the use of the Society, shall be paid.

Signature of Drafts. 29. No money shall be drawn from the Society's Banker but by order of the Council, on the recommendation of the Finance Committee, and by cheques signed, at a meeting of the Council, by the President or Chairman, a Trustee, and the Secretary. A book shall be kept in which a consecutive entry shall be made of all such payments.

Alteration of Orders of Council. 30. No Order of Council shall be altered without one clear month's previous notice being given to each Member of the Council.

31. The Secretary shall notify to the Council on the printed agenda-paper, any vacancy which shall be declared in the list of Trustees, Vice-Presidents, or Members of Council, at the Meeting of the Council next after the happening of such vacancy, and such vacancy shall not be filled up until the Monthly Meeting of the Council which shall take place next after such notice, when the recommendation of the Committee of Selection shall be received and considered. Notification of vacancy.

32. In the absence of the President, the chair shall be taken by a Trustee or Vice-President; and should neither of such officers be present, then by such Member as the Council shall choose as their Chairman by the majority of votes. Chairman.

33. The Quorum of a Monthly or Special Council shall be five. Quorum.

34. At every Monthly Meeting of the Council the Minutes of the previous Monthly and other intervening Meetings shall be first read, and postponed matters shall take precedence in the order of business of new motions, excepting in the case of a Report from the Finance Committee, which shall always be taken first into consideration, immediately after the Minutes have been read and the election of Members and proposal of candidates have taken place. Order of business.

35. All Minutes or Reports read at the Council shall be signed by the Chairman. Signing Minutes.

36. The Common Seal of the Society shall be kept in a box with three different locks, the keys of which shall be respectively held by the President of the Society, the Chairman of the Finance Committee, and the Secretary. The Common Seal shall not be affixed to any instrument except in the Council-room during a Meeting of the Council, unless by their special order. Common Seal.

37. The Reports from the Council to the General Meetings in London, in May and December, shall be prepared at the Council-meetings, first in those months, or at some adjournment thereof. Reports to General Meetings.

38. The Charter of the Society, Lease of the House, Secretary's Bond of Security, and other important documents belonging to the Society, shall be kept in a box confided to the custody of the Society's Bankers, and this box shall not be delivered up by them, excepting on a written order signed by the President or Chairman of Council Meeting, a Trustee, and the Secretary. Custody of Charter.

Committees.

Committees. 39. The Standing Committees shall be appointed by the Monthly Council in December, but shall not enter on their respective duties until the first day of January, nor remain in office after the 31st of December of the ensuing year, unless re-appointed. Any other Committees may be appointed at a Monthly Council.

Enter on duties.

Chairman. 40. Each Committee, at its first Meeting, shall elect its own Chairman for the year, who shall always take the chair at the Committee, when present; the chair being taken in his absence by a Chairman to be elected by the Committee for the occasion: and all Committees shall meet by summons issued by direction of their respective Chairmen, or of the President, or of any three Members of the Committee, or by adjournment. The President, Trustees, and Vice-Presidents shall be Members *ex officio* of all Committees.

Summons.

Ex officio Members.

Reports of Committees. 41. All Committees during their sittings may report the progress of their proceedings to the Monthly Meetings of the Council, and shall sit till they have made their respective general reports; but in case such reports shall not have been made previously to the 31st of December next following their appointment, their powers shall then cease.

Secretary.

Duties of Secretary. 42. The Secretary shall devote the whole of his time to the affairs of the Society, and shall be immediately responsible to the Council for the discharge of the various duties they require him to perform. He shall attend the sittings of all Meetings of the Council. He shall also attend on any Committee requiring his presence, when not in attendance on the Council. He shall take the minutes of the Council; and also, when attending upon any Committee, the minutes of such Committee, if required to do so by the Chairman.

Correspondence. 43. He shall conduct the correspondence of the Society, preserving the letters he may receive in a classified arrangement, and shall keep a daily register of correspondence in a classified form. He shall keep letter-books, in which copies of all letters shall be entered which he writes by direction of the President, Council, or Committees.

Money. 44. Under the direction of the Finance Committee he shall be responsible for all moneys received at the rooms of the Society, paying such sums into the hands of the bankers, and producing at each meeting of the Finance Committee their receipts for the same; and, with the exception of the amount allowed him for petty cash, he shall not retain in his hands any money belonging to the Society, but shall pay it over forthwith to the Society's bankers. He shall have the charge of the expenditure of petty cash.

45. All receipts for money received on behalf of the Society shall be out of a book with counterpart. Receipts.

46. All moneys received and paid shall be entered daily in a general cash-book. Cash-book.

47. He shall have the custody of all books, models, and papers belonging to the Society. All books, pamphlets, &c., sent to the Society shall be stamped with the Society's stamp at once.

48. He shall have the immediate superintendence over the Clerks and Servants of the Society; and shall be required to report to the Council any instances of misconduct on their part which he thinks of such a nature as to require the consideration of the Council. Superintendence of Clerks, &c.

49. Agreeably with the Charter, the President and Council have the power by him, as their Secretary, of suing or being sued, and of contracting or discharging obligations, according to the special nature of the authority with which they may from time to time invest him, as their representative, for these several objects. Power to sue and be sued.

50. He shall be resident in the Society's house. Residence.

51. He shall find approved security to the amount of 1000*l*. Security.

52. The rooms of the Society shall not be underlet. Rooms.

53. He shall not be a Governor or Member of the Society.

54. The Council shall have the power of appointing and removing such clerks and servants as they may deem necessary, and of fixing their salaries. Clerks and Servants.

Finances.

55. The Finance Committee shall have the immediate care of the Society's accounts, and no payment of money shall be made excepting at a Monthly Council, and unless recommended by the Report of the Finance Committee, which shall always meet on the first Wednesday in every month, without summons, previously to the sitting of the Council, in order to prepare a Report Finances. Time of meeting.

on the state of the Society's funds, which they shall present to each Monthly Meeting, and lay before it the following account:—

Monthly Cash Account, ending

	£.	s.	d.		£.	s.	d.
Balance of petty cash in the hands of the Secretary last month . .				Payments by order of the Council . . .			
Balance at the bankers' .							
Amount of cash received during the past month by the Secretary, and paid into the London and Westminster Bank, as per bankers' receipts				Amount of expenditure of petty cash . . .			
Ditto, received by the London & Westminster Bank on account of the Society, as per bankers' book.				Balance in hand . . Bankers. . . . Secretary . . .			

and a statement of the payments recommended to be made, together with all the books in which entries of cash receipts or payments are made, and such documents as the business of the day may require. Should a sufficient number of Members of the Finance Committee to form a quorum not have assembled on the first Wednesday of any month, the Secretary shall report the state of the Society's funds to the Council.

Audit.

56. Twice in every year—namely, not later than the Friday-week preceding each of the London General Meetings—there shall be an audit of the accounts of the Society, when a balance-sheet shall be prepared and reported to the General Meeting, and such balance-sheet shall be published in the ensuing part of the Journal. The Auditors shall consist of the President, the Trustees, the Members of the Finance Committee, and of three Members not being Members of the Council or of any of the Committees (of whom two shall always be present) to be chosen at the London General Meeting in December. A complete balance-sheet of the Country Meeting of each year shall appear in the first number of the Journal of the Society for the ensuing year.

Auditors.

Balance-sheet of Country Meeting.

JOURNAL.

rnal.

57. The Journal Committee shall have the care of the publication of the Journal; of which two parts shall be published every

year, one in February, and one in August. They shall decide on the papers which shall be printed in the successive parts of the Journal, and shall also recommend, at their discretion, the disposal to be made of communications important or interesting in their nature, but of a character unsuitable for the immediate objects of the Journal. The Committee, though responsible for the selection of matter, and the importance of its bearings in an agricultural point of view, are not responsible for the accuracy of the facts stated in the several papers—a circumstance depending on the judgment, caution, and observation of the authors themselves. Responsibility of authors.

58. Each Member is entitled gratuitously to those parts of the Journal which belong to any year for which his subscription has been paid: but no Journals shall continue to be forwarded to any Member whose subscription is in arrear. Privileges of Members.

Editor.

59. The duties of Editorship shall be performed under the general superintendence of the Journal Committee, and subject to the regulations made by them from time to time. Duties of Editor.

60. An Editor shall be appointed of literary and scientific ability, competent to discharge such duties as the Journal Committee may entrust to him in a creditable and satisfactory manner. Qualifications.

61. The whole of the Editor's time shall be at the disposal of the Society.

Prize-Sheets.

62. The Prize Sheet for the Country Meeting shall be settled at a Special Council to be held in December. Date of settling Prize-Sheet.

Prize-Essays.

63. All information contained in Prize-Essays shall be founded on experience or observation, and not on simple reference to books or other writings. Information.

64. Drawings, specimens, or models, drawn or constructed to a stated scale, shall accompany writings requiring them. Illustrations.

65. All competitors shall enclose their names and addresses in a cover, on which only their motto, and the subject of their Essay, and the number of that subject in the Prize list of the Society, shall be written. Motto.

66. The President or Chairman of the Council, for the time being, shall open the cover on which the motto designating the Essay to Who to open.

which the Prize has been awarded is written, and shall declare the name of the author.

Unsuccessful Essays.

67. The Chairman of the Journal Committee shall alone be empowered to open the motto-paper of such Essays, not obtaining the Prize, as he may think likely to be useful for the Society's objects, with a view of consulting the writer confidentially as to his willingness to place such paper at the disposal of the Journal Committee.

Copyright.

68. The copyright of all Essays gaining prizes shall belong to the Society, who shall accordingly have the power to publish the whole or any part of such Essays; and the other Essays will be returned on the application of the writers; but the Society do not make themselves responsible for their loss.

Conditions.

69 (*a*). The Judges are not bound to award a prize unless they consider one of the Essays deserving of it.

(*b*). In all reports of experiments the expenses shall be accurately detailed.

(*c*). The imperial weights and measures only are those by which calculations are to be made.

(*d*). No prize shall be given for an Essay which has been already in print.

(*e*). Prizes may be taken in money or plate, at the option of the successful candidate.

(*f*). All Essays must be addressed to the Secretary, at the house of the Society.

Library.

Library.

70. There shall be a Library of the Society, of which a catalogue shall be kept; and all donations of books shall be referred to the Journal Committee to decide whether the books shall be accepted. A register shall be kept in which an entry shall be made of all presents of books which are so accepted, and of all seeds, implements, and models, together with the names of the donors.

71. No model, implement, or other object can be exhibited to the Society without leave from the Council.

Country Meetings.

Country Meetings.

72. The Council may adopt, at the Country Meetings, such arrangements as may seem most conducive to the general objects of the Society, without regard to the arrangements of previous years.

73. In all matters of compensation the responsibility rests with the local authorities, and not with the Council of the Royal Agricultural Society of England. And this condition shall always be inserted in the agreement entered into with the local authorities. Agreement.

74. No agreement which may be entered into with local authorities relative to the place of the Annual Country Meeting shall be held good unless the Corporate Seal, or where there is no corporation, the signature of the principal local authority, shall be affixed to such document. To be signed and sealed.

75. No person who shall have been shown, to the satisfaction of the Council, to have been excluded from exhibiting for prizes at the exhibition of any society, in consequence of having been convicted of an attempt to obtain a prize by giving a false certificate or any other fraud, shall be allowed to compete for any of the prizes offered by the Society at any of its meetings. Disqualification of Competitors.

BYE-LAWS.

76. No existing bye-law shall be altered, nor any new one made, except at the Meeting of the Council, on the first Wednesday in May, or the first Wednesday in December, one month's notice having been previously given in writing to the Council, and a copy of such notice having been sent by the Secretary to each of its Members: Provided always, that nothing in this bye-law shall prevent the bye-law proposed being altered or amended by the Council at the time it is under consideration. Alteration of Bye-laws.

77. All bye-laws shall be entered in a book to be kept for that purpose, and signed by the President and Secretary for the time being, and new bye-laws or alterations entered therein forthwith. Register of Bye-laws.

Passed at a Council held on the 8th of December, 1869.

(Signed) DEVONSHIRE, President.

H. M. JENKINS, Secretary.

III.—RESOLUTIONS OF COUNCIL.

General Meeting.

General Meeting.

1. Any Member of the Society, who may object to any of the Governors or Members proposed by the Council to fill the vacancies for the ensuing year, is at liberty to propose at the General Meeting any other Governor or Member to supply such vacancies, and is requested to give at least three days' notice of such intention to the Secretary. The Secretary shall make out a list of the names of Members so proposed by individuals, together with the names of the Members proposed by the Council, side by side, which list shall be placed in some conspicuous place in the Council Room till after the General Meeting.

Advertisements.

2. The advertisements calling the General Meetings of the Society shall give the heads of the Agenda of such Meetings; and the advertisements for the May Meeting shall specially announce that the President, Trustees, Vice-Presidents, and 25 Members of Council, will then be elected by the general body of the Governors and Members of the Society.

President.

Recommendation of President for the ensuing year.

3. On the day the first Council in May, or an adjournment thereof, meets to prepare its Report to the General Meeting of the Society, a recommendation as to the election of President for the ensuing year shall be made by the Committee of Selection and considered by the Council.

Council.

House List for Council.

4. Each Member of the Council shall be requested to nominate, in writing, to the Secretary, such Governors or Members of the Society as he wishes to propose to fill any of the vacancies in the Council, on the Wednesday prior to the printing of the list annually laid before the Council, he having previously ascertained that such Governors or Members would be willing to attend the Meetings of the Council, if elected. The Secretary shall add to the usual form of list, columns containing the name proposed, and stating by whom proposed; and also a column stating the number of Council-meetings and Committee-meetings

attended by each Member, who goes out by rotation, and is eligible for re-election.

5. The Secretary shall forward a copy of the draft half-yearly report to each Member of the Council with the Agenda-paper for the May and December Council-meetings. Half-yearly Report.

Committees.

6. The standing Committees of each year shall make a written Report to the Monthly Council-meeting, in December, stating the number of times they have met, and the number of Reports they have made to the Council during the year for which they were appointed. Annual Report of Committees.

7. The annual report of each Standing Committee shall contain a list of its Members, omitting those who have absented themselves during the whole year. It shall also contain the names of those proposed to be added to the list for the ensuing year. List of Members of Committees.

Finance.

8. A statement shall be made every half-year of the compositions for life paid therein. Life Compositions.

9. There shall be a professional accountant to the Society, appointed by the Finance Committee. He shall regularly examine the Society's accounts, and report thereon to the said Committee, as required by them. Accountant.

10. The Finance Committee shall cause to be prepared an account of the state of the Society's Finances, showing 1st, a quarterly balance-sheet of receipts and expenditure; 2nd, a quarterly statement of property; 3rd, a quarterly statement of subscriptions and arrears. Quarterly Statement.

11. The above accounts shall be made up to the last days of March, June, September, and December, and laid before the Council at the ensuing monthly meeting. When made up.

12. With the exception of any payment recommended, in the customary Report of the Finance Committee, no proposition involving the payment of money by the Society, if objected to, shall be entertained by the Council without a month's previous notice. Payments of money.

13. The Finance Committee shall make a special report of the Income and Expenditure of the Society to the Council at its meeting in December, to assist the Council in fixing the maxi- Report on Income and Expenditure.

mum amount to be devoted to prizes at the ensuing Country Meeting.

JOURNAL.

Implement Reports.

14. The Reports on the Implements exhibited at the Country Meetings shall appear in the Journal, which will in future be published, the first Number in February, and the second in August.

REPORTING.

I. *Council Meetings:—For Society's use.*

Reporting.

15. At Council Meetings it is not desirable that the speeches of Members should be reported at length, but the Secretary shall prepare notes of the business done, and record the numbers of the majority and minority in each case.

Attendance of Clerk.

16. In order to facilitate the preparation of such a Report the Secretary shall be assisted by one of his clerks, who shall attend the Council Meetings, and thus enable him to give his undivided attention to the business which is under consideration.

Motions and Amendments.

17. No motion or amendment shall be put to the Council unless it be written out at length, and signed by the Member proposing it.

II. *Monthly Councils:—For the Press.*

Report for the Press.

18. The Secretary shall, as soon as practicable after the rising of the Council, prepare a Report for the press, embodying all the decisions arrived at, stating the numbers by which each motion was affirmed or negatived, and giving the principal arguments used by the speakers.

Reports of Committees.

19. The substance of all Reports of Committees presented to the Council shall be published unless otherwise specially ordered by the Council.

Report of the Consulting Chemist.

20. The Consulting Chemist is required to submit to the Monthly Council, in March, June, and December, a report on the various samples of manures and feeding cakes, especially guano, nitrate of soda, ground bones, and linseed cakes, forwarded to him by Members of the Society; and such report, together with the names of the dealers who supplied the substances analysed, shall, if the Council think fit, be published in the Agricultural Journals.

III. *Interim Councils.*

21. The Secretary shall prepare a Report of the proceedings of each Interim Council, which shall be furnished to the newspapers as soon as practicable after the conclusion of the Meeting. A *précis* of this Report shall be entered in the Minute Book. In cases where any written paper is read or laid before the Council, which is of too great length for immediate insertion in the proceedings, it shall be referred to the Editor to report upon at the following Monthly Council. Report of Interim Councils.

Country Meeting.

22. The place of holding the Annual Country Meeting shall not be decided upon until a Committee (of which at least three Members shall have acted as Director or Stewards of the Yard at some previous meeting) shall have visited and inspected such towns and their localities as the Council shall think fit, and have reported upon their respective suitableness for the purposes of the Society. And after the Council has decided at what city or town the Country Meeting shall be held, the usual agreement shall not be signed until the Stewards of Implements, or some one authorised by the Council, shall have finally inspected and definitely selected the fields to be used for the trial of implements; and the decision of the Council at its May meeting, as to the place for the Country Meeting, shall be considered as subject to the above condition being satisfactorily arranged. Inspection Committee. Selection of Trial-fields.

23. There shall be at least four Stewards appointed for regulating the entrances to the Show Yard at the Country Meeting, whose duties shall be to inspect from time to time the Register of the Telltales, and to see that the money taken out of the boxes corresponds with the sum indicated on the Register, making a note on a tabular form of card of the *time* at which such examination took place, and distinguishing whether there is any excess or deficiency in the amount shown on the Register. Stewards of Finance.

24. At the Country Meeting of the Society there shall be three Stewards for each department, viz.: three for the implements and three for the stock; one of whom only, in each department, shall go out of office at the end of the year, and another be appointed; so that two experienced Stewards may remain in office. Stewards.

25. It shall be an instruction to the Stewards to endeavour, Protests.

if possible, to decide all protests against the awards of the Judges at the Country Meeting, before the conclusion of the Meeting. Such protests shall be delivered to the Stewards at the Director's Office, in the Show-yard, before six o'clock on the Thursday evening of the Show-week; and no protest shall be *subsequently* received unless satisfactory reasons be assigned for the delay.

Expulsion of Implements or Stock.

26. The Stewards shall have power to order any implement or animal out of the yard, the owner of which does not conform to the regulations of the Society or the directions of the Stewards.

Privileges of Entry.

27. No Member who has not paid his subscription for the current year is qualified to make an entry for the Country Meeting of the Society, or to exhibit as a non-subscriber.

Free Admission to Show Yard.

28. Governors and Members of the Society who have paid their subscriptions for the current year shall be admitted to the Show Yard, during the time it is open to the public, without payment, by tickets issued by the Secretary, which tickets shall not be transferable; and any Governor or Member who shall be found to transfer or lend his ticket shall be reported to the Council, and shall in future forfeit the privileges of Membership.

Signature.

29. Each Member shall sign his name, and write his address, with a declaration of his Membership, on the back of the official ticket, and shall also sign his name in the Gate-book at the Members' Entrance, if required to do so.

Tickets, application for.

30. Application for the Member's ticket shall be made in London, either by post or personally not later than the Friday preceding the week of the Show, and afterwards at the Secretary's office in the Show Yard.

Visits of distinguished personages.

31. Information of the intended visits of all distinguished personages to the Show Yard shall be sent to all Members of the Council.

Stallions taken out of the Showyard.

32. If any stallion is taken out for the night by the exhibitor and not brought back every day during the Show, the Stewards shall have power to impose a fine of 5*l.*, to be paid to the Society by the exhibitor.

Lodgings.

33. Lodgings may be provided at the cost of the Society, during the Country Meeting, for the Honorary Director and Stewards, as well as for the Judges of Implements, the Consulting Engineer and assistants; and the Veterinary Inspectors with their assistant; but Judges of Stock will receive 8*l.* for expenses and 2*l.* in lieu of lodgings. Judges who are Members

Payment of Judges.

of Council may be paid as other Judges, by special vote of Council after a Month's notice.

Dinner.

34. In future, if any Dinner be held at the Country Meetings, under the patronage of the Society, the entire management shall be vested in the Local Committee; but the Council shall have the option and power of reserving and taking such a number of tickets as they shall think fit; and this Society shall nominate the chairman and supply the list of toasts, but shall have no other liability connected with it. Dinner.

Judges.

35. Any Member of the Society who nominates a Judge shall be requested to certify that of his own personal knowledge he knows him to be qualified and willing to act as a Judge for whatever classes he may be proposed to be appointed; and that he is as far as he knows unconnected with any exhibitor of Stock or maker of Implements, and that he has no direct personal interest in the Stock exhibited, as the breeder of any particular animal upon which he might be called upon to adjudicate. The list of names so proposed (stating by whom proposed) shall be referred to the Judges' Selection Committee of the Council, whereof the Stewards of the Yard of the year preceding shall be *ex officio* Members. In case of a sufficient number of competent persons not being proposed, the Committee are ordered to add the names of such other persons as they may know to be competent and willing to act. Judges nominated by Governors or Members. Judges' Selection Committee.

36. A circular shall be sent in the first week of April to each Member of Council, requesting him to send to the Secretary, before the Monthly Meeting in May, the names of persons qualified and willing to act as Judges of Stock, to serve as an additional list to the names sent in by the Members of the Society. Judges nominated by Members of Council.

37. The list of names of persons recommended as Judges shall be placed in the Council-room, and a copy sent to each Member of Council two weeks before the Judges' Committee proceed to select the Judges; and any Member of the Society shall be at liberty to apply to the Secretary for a list of names, and to send in writing to the Secretary his objections to any name List of names recommended.

on the list, such objections to be laid before the Judges' Committee.

JUDGES' REPORTS.

Errors of style. 38. The Editor shall be instructed to correct any inaccuracies of style or clerical errors.

Errors in description. 39. The consulting engineer shall be requested to correct any inaccuracies in the description of the machinery, or the records of the working of the Implements; but any alteration in the Report of a Judge of implements which is not included under either of the foregoing heads shall be submitted to the acting Senior Steward of the Implements and the Chairman of the Journal Committee, and shall not be adopted without their approval.

PRIZE SHEET AND AWARDS.

Offer of Prize. 40. No offer of a Prize at the Country Meeting of any year shall be taken into consideration by the Council after the first Wednesday in the month of February of such year of Meeting.

Reserve Number. 41. A reserve number shall be given in by the Judges in each class of Live Stock; and a card notifying the reservation shall be affixed to the stall, in the same manner as the cards of prizes and commendations are affixed.

APPENDIX No. I.

I of
(Post Town) in the county of
am desirous of becoming a Member of the Royal Agricultural Society of England, and engage, when elected, to pay the Annual Subscription of 1*l*., or Life Composition of 10*l*.; and to conform to the rules and regulations of the Society until the termination of the year in which I shall withdraw from it by notice, in writing, to the Secretary.

(Signed) Candidate.

Date

Elected

Chairman.

Secretary.

APPENDIX No. II.

Sir,—I beg leave to inform you of your election as a of the Royal Agricultural Society of England, at a Monthly Council held on Wednesday, the 2nd of February, on the nomination of ; and of the Registration of your name under the official designation of , which, appended to your name, will at once form the key for immediate reference and identification, whether in your correspondence with the Society, or on the payment of your Subscription through the Bankers; and you are therefore requested to favour the Society by adding it to your signature in all official communications.

On the remittance of your Annual Subscription of 1*l*., or the Life Composition of 10*l*.—by means of a Money Order on *Vere Street, W.*, or of a cheque on a London Banker, made payable in either case to myself as Secretary of the Society (when an official receipt will be sent to you), or by payment into the St. James's Square Branch of the London and Westminster Bank, the Bankers of the Society (when due credit will be given to your account in the Society's books),—you will become entitled to the privileges of a Member of the Society, as established under the authority of the Charter and Bye-laws. By the Rules of the Society the Annual Subscription for the current year is payable on election, and afterwards becomes due in advance on the 1st of January of each succeeding year, until due notice of your resignation shall have been given me in writing, and all payments due from you at that time shall have been made; and the Journals will not be forwarded until either the Annual Subscription or the amount of Life Composition shall have been received. The First Part of the Journal, to which you will be entitled after making one or other of those payments, is that published in .

Should any correction be required in your own designation, or in the address of this present letter, you will much oblige the Society by pointing it out.

I have the honour to be, Sir,

Your obedient servant,

H. M. JENKINS,

SECRETARY.

Royal Agricultural Society of England.

1870–71.

Davies, David Reynolds, *Mere Old Hall, Knutsford, Cheshire.*
Dent, J. D., M.P., *Ribston Hall, Wetherby, Yorkshire.*
Druce, Joseph, *Eynsham, Oxford.*
Edmonds, William John, *Southrop, Lechlade, Gloucestershire.*
Gibbs, B. T. Brandreth, *Halfmoon Street, Piccadilly, London,* W.
Hassall, William, *Bubney, Whitchurch, Salop.*
Hesketh, Sir Thomas, Bart., M.P., *Rufford Hall, Ormskirk.*
Holland, Edward, *Dumbleton Hall, Evesham, Gloucestershire.*
Hornsby, Richard, *Spittle Gate, Grantham, Lincolnshire.*
Hoskyns, Chandos Wren, M.P., *Harewood, Ross, Herefordshire.*
Hutton, William, *Gate Burton, Gainsboro', Lincolnshire.*
Kesteven, Lord, *Caswick, Stamford, Lincolnshire.*
Kingscote, Colonel, M.P., *Kingscote, Wootton-under-Edge, Gloucestershire.*
Lawes, John Bennet, *Rothamsted, St. Albans, Herts.*
Leeds, Robert, *Wicken Farm, Castleacre, Brandon, Norfolk.*
Lichfield, Earl of, *Shugborough, Staffordshire.*
Liddell, Hon. Henry George, M.P., *Ravensworth Castle, Durham.*
Lopes, Sir Massey, Bart., M.P., *Maristow, Roborough, Devon.*
Macdonald, Sir Archibald Keppel, Bart., *Woolmer Lodge, Liphook, Hants.*
Milward, Richard, *Thurgarton Priory, Southwell, Notts.*
Pain, Thomas, *Ugford Cottage, Salisbury, Wilts.*
Randell, Charles, *Chadbury, Evesham, Worcestershire.*
Ransome, Robert Charles, *Ipswich, Suffolk.*
Ridley, M. White, M.P., *Blagdon, Cramlington, Northumberland.*
Rigden, William, *Hove, Brighton, Sussex.*
Sanday, William, *Radcliffe-on-Trent, Notts.*
Shuttleworth, Joseph, *Hartsholme Hall, Lincoln.*
Statter, Thomas, *Stand Hill, Whitefield, Manchester.*
Stone, N. Chamberlain, *Aylestone Hall, Leicester.*
Torr, William, *Aylesby Manor, Great Grimsby, Lincolnshire.*
Turner, George, *Brampford Speke, Exeter, Devonshire.*
Vane, Sir Henry Ralph, Bart., *Hutton Hall, Penrith, Cumberland.*
Vernon, Lord, *Sudbury Hall, Derby.*
Webb, James, *Spring Hill, Fladbury, Pershore, Worcestershire.*
Welby, William Earle, M.P., *Newton House, Folkingham.*
Wells, William, M.P., *Holmewood, Peterborough, Northamptonshire.*
Western, Sir Thomas B., Bart., *Felix Hall, Kelvedon, Essex.*
Whitehead, Charles, *Barming House, Maidstone, Kent.*
Wilson, Lieut.-Col. Fuller Maitland, *Stowlangtoft Hall, Bury St. Edmund's, Suffolk.*
Wilson, Jacob, *Woodhorn Manor, Morpeth, Northumberland.*
Wynn, Sir Watkin Williams, Bart, M.P., *Wynnstay, Rhuabon, Denbighshire.*

Secretary and Editor.

H. M. JENKINS, 12, *Hanover Square, London,* W.

Consulting Chemist—Dr. Augustus Voelcker, 11, *Salisbury Square,* E.C.
Veterinary Inspector—James Beart Simonds, *Royal Veterinary College,* N.W.
Consulting Engineer—James Easton, or C. E. Amos, *Grove, Southwark,* 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 1870.

Finance Committee.

Bridport, Viscount (Chairman).
Davies, D. R.
Kingscote, Colonel, M.P.
Randell, Charles.
Torr, William.

House Committee.

The President.
Chairman of Finance Committee.
Chesham, Lord.
Bramston, T. W.
Challoner, Colonel.
Gibbs, B. T. Brandreth.
Torr, William.

Journal Committee.

Thompson, H. S. (Chairman).
Cathcart, Earl.
Speaker, The Rt. Hon. the.
Kerrison, Sir E. C., Bt.
Acland, T. Dyke, M.P.
Dent, J. D., M.P.
Holland, Ed.
Hoskyns, C. Wren, M.P.
Milward, Richard.
Ridley, M. White, M.P.
Wilson, Jacob.

Chemical Committee.

Wells, William, M.P. (Chairman).
Vernon, Lord.
Lopes, Sir Massey, Bt., M.P.
Vane, Sir H., Bt.
Acland, T. Dyke, M.P.
Davies, D. R.
Dent, J. D., M.P.
Holland, Ed.
Hoskyns, C. Wren, M.P.
Huxtable, Ven. Archdeacon.
Lawes, J. B.
Voelcker, Dr. A.
Wilson, Jacob.

Veterinary Committee.

Bridport, Viscount (Chairman).
Booth, T. C.
Challoner, Colonel.
Dent, J. D., M.P.
Gibbs, B. T. Brandreth.
Leeds, Robert.
Milward, Richard.
Simonds, Professor.
Spooner, Professor.
Varnell, Professor.
Wells, William, M.P.
Wilson, Jacob.

Stock-Prizes Committee.

Milward, Richard (Chairman).
Bridport, Viscount.
Chesham, Lord.
Kesteven, Lord.
Walsingham, Lord.
Liddell, Hon. H. G., M.P.
Baldwin, John.
Barnett, Charles.
Barthropp, Nathaniel G.
Booth, T. C.
Bowly, Edward.
Clayden, John.
Davies, D. R.
Dent, J. D., M.P.
Druce, Joseph.
Gibbs, B. T. Brandreth.
Holland, Ed.
Jonas, Samuel.
Pain, Thomas.
Randell, Chas.
Rigden, Wm.
Sanday, Wm.
Stone, N. C.
Torr, William.
Turner, George.
Webb, James.
Wilson, Jacob.
The Stewards of Live Stock.

Implement Committee.

CHALLONER, Col. (Chairman).
BRIDPORT, Viscount.
VERNON, Lord.
KERRISON, Sir E. C., Bt.
MACDONALD, Sir A. K., Bart.
AMOS, C. E.
BOOTH, T. C.
CANTRELL, CHAS. S.
DRUCE, JOSEPH.
EDMONDS, W. J.
GIBBS, B. T. BRANDRETH.
HOLLAND, ED.
HORNSBY, RICHARD.
HOSKYNS, C. WREN, M.P.
LEEDS, ROBERT.
MILWARD, RICHARD.
RANDELL, CHARLES.
RANSOME, R. C.
SANDAY, WILLIAM.
SHUTTLEWORTH, JOSEPH.
THOMPSON, H. S.
TORR, WILLIAM.
WILSON, JACOB.
The Stewards of Implements.

General Wolverhampton Committee.

DEVONSHIRE, Duke of, K.G. (Chairman).
LICHFIELD, Earl of.
POWIS, Earl of.
BRIDPORT, Viscount.
CHESHAM, Lord.
KESTEVEN, Lord.
VERNON, Lord.
WALSINGHAM, Lord
LOPES, Sir MASSEY, Bart., M.P.
MACDONALD, Sir A. K., Bart.
WYNN, SIR WATKIN W. Bart., M.P.
AMOS, C. E.
BOOTH, T. C.
BOWLY, EDWARD.
CANTRELL, CHARLES S.
CLAYDEN, JOHN.
DAVIES, D. R.
DRUCE, JOSEPH.
EDMONDS, W. J.
FRYER, W. F.
GIBBS, B. T. BRANDRETH.
HORNSBY, RICHARD.
HOSKYNS, C. WREN, M.P.
KINGSCOTE, Col., M.P.
LEEDS, ROBERT.
MASFEN, R. H.
MILWARD, RICHARD.
RANDELL, CHARLES.
RANSOME, R. C.
RIDLEY, M. W., M.P.
SANDAY, WILLIAM.
SHUTTLEWORTH, JOSEPH.
STATTER, THOMAS.
TORR, WILLIAM.
VANE, Sir H. R., Bart.
WALTON, F.
WEBB, JAMES.
WELLS, WILLIAM, M.P.
WHITEHEAD, CHARLES.
WILSON, Lieut.-Col.
WILSON, JACOB.
WOLVERHAMTON, Mayor of, for 1870 and 1871.
The STEWARDS.

Show-Yard Contracts Committee.

VERNON, Lord (Chairman).
CATHCART, Earl.
BRIDPORT, Viscount.
AMOS, C. E.
GIBBS, B. T. BRANDRETH.
HORNSBY, RICHARD.
MILWARD, RICHARD.
RANDELL, CHARLES.
SANDAY, WILLIAM.
SHUTTLEWORTH, JOSEPH.
THOMPSON, H. S.
TORR, WILLIAM.

Committee of Selection.

THOMPSON, H. S. (Chairman).
DEVONSHIRE, Duke of.
POWIS, Earl of.
BRIDPORT, Viscount.
WALSINGHAM, Lord.
LOPES, Sir MASSEY, Bart., M.P.
CLAYDEN, JOHN.
DAVIES, D. R.
DENT, J. D., M.P.
GIBBS, B. T. BRANDRETH.
HOLLAND ED.
KINGSCOTE, Col., M.P.
MILWARD, R.
RANDELL, CHARLES.
TORR, WILLIAM.
WELLS, WILLIAM, M.P.

And the Chairmen of the Implement and Stock Prizes Committees.

Education Committee.

HOLLAND, ED. (Chairman).
LICHFIELD, Earl of.
POWIS, Earl of.
BRIDPORT, Viscount.
ACLAND, T. DYKE, M.P.
DENT, J. D., M.P.
HOSKYNS, C. WREN, M.P.
KINGSCOTE, Col., M.P.
WELLS, WILLIAM., M.P.
VOELCKER, Dr.

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, Monday, May 23, 1870.

REPORT OF THE COUNCIL.

Since the last General Meeting in December, 4 Governors and 69 Members have died, and the names of 199 Members have been removed from the list; on the other hand, 1 Governor and 212 Members have been elected, so that the Society now consists of

74 Life Governors,
74 Annual Governors,
1511 Life Members,
3764 Annual Members,
15 Honorary Members,

making a total of 5438.

The half-yearly statement of accounts to the 31st December, 1869, has been examined and certified by the auditors and accountants of the Society. This statement was published in the last number of the 'Journal,' together with the Manchester Country Meeting account, and a balance-sheet for the whole year 1869. The last-mentioned document shows that independently of the financial results of the Country Meeting at Manchester, and, after charging on Income the cost of all additions to the permanent Country Meeting plant, the Receipts of the year exceeded the Expenditure by a sum of 675*l.*

The funded capital of the Society remains the same as at the last half-yearly meeting, namely, the permanent fund of 20,000*l.* New Three per Cents., and the Reserve Show Fund of 4612*l.* 7*s.* 8*d.* New Three per Cents. In addition, the sum of 3800*l.* lies on deposit with the Society's bankers, and the balance of the Current Account, on the 1st instant, was 3583*l.* 0*s.* 10*d.*

The Council have granted a sum of 500*l.* to the Manchester

Local Committee, in aid of the extra and exceptional expense occasioned by the compensation awarded to the tenant of the Trial-ground.

Mr. Charles Whitehead, of Barming House, Maidstone, Kent, has been elected a Member of Council to fill the vacancy caused by the election of His Grace the Duke of Devonshire, K.G., as a Vice-President.

At the first Anniversary Meeting of the English Agricultural Society, held thirty-one years ago, it was stated that the prizes offered for Stock to be shown at the then approaching Oxford Meeting would amount altogether to 740*l.*, besides 50*l.* for extra stock, implements, roots, and seeds, 50*l.* for a draining plough, and two prizes of 50 sovereigns each for the best specimens of white and of red seed wheat. At the forthcoming Oxford Meeting, the prizes to be competed for amount to 3130*l.* for Live Stock, and 395*l.* in addition to ten silver medals for Implements. A contrast of these figures will enable the Members to realise the growth of the Society's operations during the interval; and to estimate the nature and extent of their influence on the progress of British Agriculture.

The interest thus attaching to Oxford, where the first Country Meeting of the Society was held, promises to invest the forthcoming Show with unusual attractions. The Showyards for Implements and Live Stock comprise about 60 acres. The entries for Implements, Machinery, &c., which closed on the 1st instant, prove that in this respect the display will be quite as extensive as the remarkable collection exhibited last year; while it is confidently anticipated that certain classes of Live Stock will be extremely well represented. Another element of instruction and interest will be found in the competition for the prizes offered last year by the then High Sheriff of Oxfordshire and the Society for the two best managed farms in the district round Oxford. A list of the competitors (21 in number) and the names of the Judges appointed by the Council have already been published; and it is hoped that the awards of the prizes may be made known at the General Meeting of Members held in the Showyard.

The Council resolved last year, that the Society's Country Meeting for 1871 should be held in the division comprising North Wales, and the counties of Cheshire, Shropshire, and Staffordshire. Invitations having been received from the authorities of Shrewsbury, Stafford, and Wolverhampton, a Committee was appointed to inspect and report upon the various sites and other accommodation offered by the competing localities. After duly considering the report of this Committee, and after a conference with deputations from the three towns, the Council have decided that the Country Meeting for 1871 shall be held at Wolverhampton.

The Council have also to announce that the Country Meeting of 1872 will be held in the district comprising South Wales and the counties of Gloucester, Hereford, Monmouth, and Worcester.

The President and Council of the Société des Agriculture de France have invited the Royal Agricultural Society of England to take part in an International Agricultural Congress to be held next year in Paris, and to furnish a Report on British Agriculture. They have also requested suggestions as to any of the subjects of interest which should be discussed at the Congress. The Council have determined to accept this invitation, and have suggested the following as subjects worthy of discussion, and affording opportunities of illustrating the present position of English Agriculture:—(1) Drainage, (2) Implements and Machinery, (3) Manures, (4) Rotation of Crops, (5) Fattening of Cattle and Sheep, and (6) the Labourer.

In accordance with the resolution mentioned in the last half-yearly Report of the Council, the Society's Consulting Chemist has presented two quarterly reports on samples of guanos and bone manures forwarded to him for analysis by Members of the Society. The immense increase in the manufacture of artificial manures and feeding stuffs, and the competition amongst dealers and manufacturers, have introduced into the market low-priced and inferior articles, which often tempt purchasers by their apparent cheapness. It was hoped, therefore, that the publication of analyses of different manures and feeding stuffs submitted to the consulting chemist might render purchasers more cautious in their dealings, and prevent that disappointment which follows the purchase of inferior or adulterated articles, and the Council have reason to believe that the publication of these quarterly reports in the Agricultural Journals has already been productive of good results.

The Council have resolved that, in future, the annual grant of

200*l.* to the Royal Veterinary College shall be divided under two heads :—(1) That 150*l.* shall be paid to the Royal Veterinary College, for the general advancement of veterinary science in reference to cattle, sheep, and pigs, as heretofore ; and (2) That 50*l.* shall be retained under the control of the Council, for the purpose of being applied to experiments on the diseases of cattle, sheep, and pigs.

The Council have directed their attention to the desirability of improving the Society's Library, by the purchase of recent works bearing on the practice and science of agriculture, together with such Parliamentary papers and reports as refer to agricultural subjects ; and they confidently anticipate that a useful library of reference will shortly be at the command of the Members.

By order of the Council,

H. M. Jenkins,

Secretary.

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, in December, 1870.

GENERAL MEETING in London, May 22nd, 1871, at 12 o'clock.

MEETING at Wolverhampton, in July, 1871.

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. From the Council Meeting in August until the Council Meeting in April, on Saturdays, 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 the Appendix.)

CHEMICAL ANALYSIS.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in the Appendix to the present volume.

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.

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.

PACKETS BY POST.—Packets not exceeding two feet in length, width, or depth, consisting of written or printed matter (but not containing letters sealed or open) if sent without envelopes, or enclosed in envelopes open at each end, may be forwarded by the inland post, if stamped, at the following rates:—One Penny for every quarter of a pound or fraction of a quarter of a pound.

*** 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 and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Dr. HALF-YEARLY CASH ACCOUNT

	£.	s.	d.	£.	s.	d.	£.	s.	d.
To Balance in hand, 1st January, 1870:—									
Bankers	771	4	5						
Secretary	41	5	4						
				812	9	9			
At Deposit account with London and Westminster Bank				2,000	0	0			
							2812	9	9
To Income:—									
Dividends on Stock				361	9	11			
Subscriptions:—	£.	s.	d.						
Governor's Life-Composition ..	50	0	0						
Governors' Annual	285	0	0						
Members' Life-Compositions ..	600	0	0						
Members' Annual	2989	2	0						
				3,924	2	0			
Journal:—									
Advertisements, &c.				65	9	6			
Total Income				..	..		4,351	1	5
To Country Meetings:—									
Manchester				5	5	0			
Oxford				4,900	1	6			
							4,905	6	6
							£12,068	17	8

BALANCE-SHEET,

LIABILITIES.	£.	s.	d.	£.	s.	d.	£.	s.	d.
To Capital:—									
Surplus, 31st December, 1869				31,083	3	0			
Surplus of Income over Expenditure during the Half-year:—	£	s.	d.						
Income	4,351	1	5						
Expenditure	2,172	4	3						
				2,178	17	2			
				33,262	0	2			
Less difference between the New and Old valuation of the Books and Furniture in the Society's House, the latter exceeding the former by ..				548	2	6			
							32,713	17	8
To Manchester Meeting:—									
Difference between Receipts and Expenditure, during the Half-year, the latter exceeding the former by				..	..		586	15	0
							£32,127	2	8

QUILTER, BALL, & Co., *Accountants.*

FROM 1st January, to 30th June, 1870. Cr.

	£.	s.	d.	£.	s.	d.	£.	s.	d.
By Expenditure :—									
Establishment :—									
Salaries and Wages	450	14	0						
House Expenses, Rent, Taxes, &c.	576	3	11						
				1,026	17	11			
Journal :—									
Printing and Stitching	320	12	0						
Postage and Delivery	151	5	0						
Essays	87	7	0						
Map of Belgium	39	10	6						
Engraving	21	10	0						
Advertisements	6	17	6						
				627	2	0			
Chemical :—									
Consulting Chemist's Salary ..	150	0	0						
Grant for Investigations	200	0	0						
				350	0	0			
Veterinary :—									
Grant to Royal Veterinary College (half-year)				100	0	0			
Education				23	2	6			
Postage and Carriage				43	1	10			
Subscriptions paid in error, returned				2	0	0			
Total Expenditure				..	..	..	2,172	4	3
By Country Meetings :—									
Manchester				592	0	0			
Oxford				3,152	18	7			
							3,744	18	7
							5,917	2	10
By Balance in hand, 30th June :—									
Bankers	2,308	9	3						
Secretary	43	5	7						
				2,351	14	10			
On Deposit with London and Westminster Bank				3,800	0	0			
							6,151	14	10
							£12,068	17	8

30th June, 1870.

ASSETS.	£.	s.	d.
By Cash in hand	2,351	14	10
By Deposit account	3,800	0	0
By New 3 per Cent. Stock 24,612*l.* 7*s.* 8*d.* cost*	23,379	15	7
By Books and Furniture in Society's House	1,451	17	6
By Country Meeting Plant	2,800	0	0
	33,783	7	11
Less at Credit of Oxford Meeting	1,656	5	3
	£32,127	2	8

* *Value at* $92\frac{5}{8}$ = £22,411 5*s.* 7*d.*

Mem.—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscription to 30th June, 1870, which at that date amounted to 1642*l.*

Examined, audited, and found correct, this 15th day of August, 1870.

FRANCIS SHERBORN, HENRY CANTRELL, } *Auditors on behalf of the Society.*

SHOW AT OXFORD,

JULY, 1870.

STEWARDS OF THE YARD.

Stock.

David Reynolds Davies,
Jacob Wilson,
Sir Watkin W. Wynn, Bart., M.P.

Implements.

Sir A. K. Macdonald, Bart.
Lieut.-Col. Wilson.
C. Wren Hoskyns, M.P.

Forage.

Joseph Druce.

Honorary Director of the Show.

B. T. Brandreth Gibbs.

JUDGES OF STOCK.

HORSES.

M. Biddell,
Robert Calder,
S. Robson,
J. Smith,
A. Turnbull,
J. C. Woolhouse.

CATTLE.

Shorthorns.

H. Aylmer,
W. Bowstead,
C. Howard,
S. Rich,
J. R. Singleton,
M. Stephenson.

Herefords and other Established Breeds.

G. Morgan,
S. W. Urwick,
H. Yeomans.

Devons and Norfolk and Suffolk Polled.

J. Overman,
T. Pope,
R. B. Warren.

Channel Islands.

C. P. Le Cornu,
G. Morgan.

SHEEP.

Leicesters.

C. Clarke,
S. Jefferson,
G. Walmsley.

Cotswolds.

J. G. Attwater,
T. Porter,
E. Ruck.

Lincolns and Ryland and other Long-woolled.

W. Bartholomew,
J. H. Casswell,
H. Mackinder.

Oxfordshire Downs.

A. Edmonds,
H. Overman,
Z. W. Stilgoe.

JUDGES OF STOCK—*continued.*

Sheep—*continued.*

Southdowns.

T Cooper,
H. Fookes,
H. Lugar.

Shropshires.

B. Bond,
W. Kemp Bourne,
R. H. Masfen.

Hampshire and other Short-woolled, and Dorset.

W. B. Canning,
R. J. Newton,
H. Thurnall.

PIGS.

J. Fisher,
J. Smith,
J. S. Turner.

Inspectors of Shearing.

H. Bone, R. Brown, W. Jobson.

Veterinary Inspectors.

Professor Simonds, Professor Varnell.

Assistant—R. L. Hunt.

JUDGES OF IMPLEMENTS.

Fixed Steam Engines and Horse Gears.

F. J. Bramwell, C.E.
E. A. Cowper, C.E.

Mills, Crushers, and Coprolite Mills.

H. B. Caldwell,
H. Stephenson,
John Ogilvie.

Chaff Cutters, Oilcake Breakers, Turnip Cutters, and Guano Breakers.

John Hemsley,
Matthew Savidge,
Henry Cantrell.

Bone Mills, Flax-breaking Machines, Steaming Apparatus, and Tile Machinery.

John Thompson,
J. W. Kimber,
G. M. Hipwell.

Dairy Implements.

J. K. Fowler,
George Jackson,
Gilbert Murray.

Draining Tools, and Miscellaneous Awards.

F. Sherborn,
John Hicken,
John Wheatley.

AWARD OF PRIZES.

NOTE.—The Judges were instructed, besides 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.

ALL AGES CALCULATED TO 1ST JULY, 1870.

HORSES.

Special Prizes offered by the Oxford Local Committee are marked thus (*).

Agricultural Stallions foaled before the 1st *of January*, 1868.

WILLIAM WELCHER, Mouse Hall, West Tofts, Brandon, Norfolk: FIRST PRIZE, 25*l*.. for "Honest Tom," bay, 5 years-old; bred by exhibitor; sire, Mr. J. Tibbet's "Thumper;" dam, "Beauty;" sire of dam, "Emperor."

JOHN MANNING, Orlingbury, Wellingborough, Northamptonshire: SECOND PRIZE, 15*l*., for "Young Champion," chestnut, 3 years-old; bred by Mr. T. Stokes, Caldecote, Rockingham, Northamptonshire; sire, "Champion."

JOHN HUTT, Water Eaton, Oxford: THIRD PRIZE, 5*l*., for "Nugget of Gold," roan, 12 years-old; bred by the late Mr. R. Sanders, Water Eaton; sire, Mr. North's "Young Lion;" dam, "Diamond;" sire of dam, "Black Prince."

LORD NORREYS, Tetsworth, Oxford: the *Reserve Number*, to "Black Prince," black, 8 years-old; bred by A. A. Young, Esq., Orlingbury, Wellingborough; sire, "Sampson."

Agricultural Stallions foaled in the year 1868.

WILLIAM WYNN, Cranhill Lays, Grafton, Alcester, Redditch, Warwickshire: FIRST PRIZE, 20*l*., for "Nonpareil," bay; bred by G. Malin, Esq., Harrington, Evesham; sire, "A 1;" dam, "Matchless;" sire of dam, "King of the Valley."

THOMAS ANGER, Little Hinton (Wilts), Shrivenham: SECOND PRIZE, 10*l*., for "Prince," brown; bred by Mr. W. J. Large, Toothill, Swindon; sire, "Noble;" dam, "Diamond."

WILLIAM ENSTON, Claverdon, Warwick: THIRD PRIZE, 5*l*., for "Crown Prince," bay, bred by Mr. W. Whitehouse, Wootten Warren, Henley-in-Arden; sire, "Black Prince;" dam, "Flower;" sire of dam, "King George."

THOMAS CARTWRIGHT, Dunston Pillar, Lincoln: the *Reserve Number*, to "Warrener," blue roan; bred by Mr. T. Lill, Scamblesby, Horncastle; sire, "Master of Arts."

Clydesdale Stallion foaled before the 1st *of January*, 1867.

EARL BEAUCHAMP, Madresfield Court, Malvern, Worcestershire: FIRST PRIZE, 25*l*., for "Young Lofty," bay, 9 years-old; bred by Mr. S. Clarke, Manswrac, Kilbarchan, Scotland.

Clydesdale Stallions foaled in the year 1868.

The Duke of Richmond, K.G., Goodwood, Chichester, Sussex: First Prize, 20*l*., for "Britain," bay, 2 years-old; bred by exhibitor; sire, "Britain."

The Duke of Richmond, K.G., Goodwood: Second Prize, 10*l*., for "Lord Francis," bay, 2 years-old; bred by exhibitor; sire, "Britain."

Suffolk Stallions foaled before the 1st *January*, 1868.

Isaac Rist, Tattingstone, Ipswich, Suffolk: First Prize, 25*l*., for "Harwich Emperor," chestnut, 9 years-old; bred by exhibitor; sire, "Chester Emperor;" dam, "Scot."

Charles Boby, Alton Hall, Stutton, Ipswich, Suffolk: Second Prize, 15*l*., for "Royal Prince," chestnut, 4 years-old; bred by Mr. C. Frost, Brook Farm, Flowton, Ipswich; sire, C. Boby's "Conqueror."

Colonel Tomline, M.P., Orwell Park, Nacton, Ipswich, Suffolk: Third Prize, 5*l*., for "Earl," chestnut, 3 years-old; bred by exhibitor; sire, "Harwich Emperor;" dam, "Darby;" sire of dam, "Hero."

G. D. Badham, The Lawn, Bulmer, Sudbury, Suffolk: the *Reserve Number*, to "Hercules," chestnut, 5 years-old; bred by exhibitor; sire, "Royal George;" dam, "Duchess;" sire of dam, "Chester Emperor."

Suffolk Stallions foaled in the year 1868.

Isaac Rist, Tattingstone, Ipswich: First Prize, 20*l*., for "Young Emperor," chestnut; bred by the late W. King, East Bergholt, Colchester; sire, "Harwich Emperor;" dam, "Doughty;" sire of dam, "Newcastle Captain."

The Executors of the late Thomas Capon, Dennington, Wickham Market, Suffolk: Second Prize, 10*l*., for their chestnut; bred by exhibitors; sire, the late T. Crisp's "Cup-bearer;" dam, "Darby;" sire of dam, Mr. Barthropp's "Canterbury Pilgrim."

William Wilson, Baylham Hall, Ipswich, Suffolk: Third Prize, 5*l*., for his chestnut; bred by Mr. C. Cordy, Trimley St. Mary, Ipswich; sire, Mr. Wolton's "Monarch;" sire of dam, "Canterbury Pilgrim."

Samuel Wolton, Newbourn Hall, Woodbridge, Suffolk: the *Reserve Number*, to his chestnut; bred by exhibitor; sire, "Abbott;" dam, "Royal Moggy;" sire of dam, Catlin's "Royal Duke."

Thoroughbred Stallions, suitable for getting Hunters.

General Peel, Marble Hill, Twickenham: First Prize, 50*l*., for "Knowsley," bay, 11 years-old; bred by the late Earl Glasgow, Doncaster; sire, "Stockwell;" sire of dam, "Orlando."

Charles and James Moffat, Kirklinton Park, Carlisle, Cumberland: Second Prize, 25*l*., for "Laughing Stock," bay, 11 years-old; bred by the late Sir Charles Monk, Belsea Castle, Newcastle-on-Tyne; sire, "Stockwell;" dam, "Gaiety;" sire of dam, "Touchstone."

Joseph Casson, Burgh-by-Sands, Carlisle, Cumberland: Third Prize, 10*l*., for "Sincerity," brown, 12 years-old; bred by Lord Naas; sire, "Red Hart;" dam, "Integrity;" sire of dam, "Van Tromp."

William Gulliver, Swalcliffe Stud Farm, Baubury: the *Reserve Number*, to "General Peel," bay, 9 years-old; bred by the late Lord Glasgow; sire, "Young Melbourne;" sire of dam, "Orlando."

Stallions, not less than 14 hands 2 inches, nor exceeding 15 hands 2 inches, suitable for getting Hackneys.

John Grout, Woodbridge, Suffolk: First Prize, 20*l.*, for "Sportsman," brown, 8 years-old; bred by Mr. Durrant, Southtown, Great Yarmouth; sire "Sportsman;" sire of dam, "Oakley."

Charles Beart, Stow, Downham Market, Norfolk: Second Prize, 10*l.*, for "Ambition," red roan, 7 years-old; bred by exhibitor; sire, Mr. Bultitoft's "Phenomenon;" dam, "Romance;" sire of dam, Mr. Baxter's "Performer."

Pony Stallions under 14 hands 2 inches.

Henry Roundell, Queen's Head Hotel, Otley, Yorkshire: First Prize, 15*l.*, for "Sir George," brown, 3 years-old; bred by Mr. William Walker, Shadwell, Leeds; sire, "Sportsman;" dam, "Polly."

James Allen Ransome, Carr Street, Ipswich: Second Prize, 10*l.*, for "Perfection," black brown, 3 years-old; bred by Major Barlow, Hasketon, Woodbridge; sire, "Confidence."

John Andrew Doyle, Plas-dulas, Abergele, Denbighshire: the *Reserve Number*, to "Tramp," bay, 6 years-old; bred by exhibitor; sire, "Bantam;" dam, "Gipsy."

Agricultural Mares, in foal or with foal at foot.

Thomas Statter, Jun., Stand Hill, Whitefield, Manchester: First Prize, 20*l.*, for "Fanny," chestnut, 5 years-old, and foal; bred by Mr. Upton, Pallathorpe, Tadcaster; sire, "Lincolnshire;" dam, "Diamond."

Henry Garfield Coldicott, Lower Heyford, Banbury, Oxfordshire: Second Prize, 10*l.*, for "Star," grey, 6 years-old, and foal; bred by exhibitor; dam, "Whitefoot."

Arthur Harvey Thursby, Wormleighton, Leamington, Warwickshire: Third Prize, 5*l.*, for "Nelly," grey, 4 years-old (in foal); bred by Mr. Stackfield, Salgrave, Brackley; sire, Mr. Buller's "Old Lion;" sire of dam, Mr. Law's "Black Lion."

Lord Norreys, Tetsworth, Oxon: the *Reserve Number*, to his brown, 6 years-old (in foal); breeder unknown.

Clydesdale Mares, in foal or with foal at foot.

Richard Waugh, Seathill, Irthington, Carlisle, Cumberland: First Prize, 20*l.*, for "Isabel," brown, 4 years-old (in foal); bred by exhibitor; sire, "Champion;" dam, "Nancy;" sire of dam, "Byron."

Lieut.-Colonel R. Loyd Lindsay, M.P., Lockinge Park, Wantage, Berkshire: Second Prize, 10*l.*, for "Darling," bay, 6 years-old (in foal); bred by Mr. Mair, Udderstone, Mid Calder, Scotland.

Her Majesty the Queen, Windsor Castle, Berkshire: Third Prize, 5*l.*, for "Mary," bay, 16 years-old (and foal); bred by Mr. William Menzies, Tulliallan, Kincardine-on-Forth, Scotland; dam, "Bess."

Lieut.-Colonel R. Loyd Lindsay, M.P., Lockinge Park: the *Reserve Number*, to "Maggie," bay, 7 years-old (in foal); bred by Mr. Andrew Morton, Bickerton Hall, Whitburn, Scotland; dam, "Bell."

Suffolk Mares, in foal or with foal at foot.

The Executors of the late Thomas Capon, Dennington, Wickham Market, Suffolk: First Prize, 20*l.*, for "Matchett," chestnut, 6 years-old (and foal); bred by exhibitors; sire, the late T. Crisp's "Conqueror."

Lieut.-Colonel Fuller Maitland Wilson, Stowlangtoft Hall, Bury St. Edmunds, Suffolk: Second Prize, 10*l.*, for "Bury Empress," chestnut, 4 years-old (in foal); bred by Mr. Frost, Stoke, Colchester; sire, "Harwich Emperor;" dam, "Darby;" sire of dam, "Britton."

Samuel Wolton, Newbourn Hall, Woodbridge, Suffolk: the *Reserve Number*, to "Diamond," chestnut, 6 years-old (in foal); bred by exhibitor; sire, "Warrior;" dam, "Butley Abbey;" sire of dam, Catlin's "Royal "Duke."

Mares in foal, or with foal at foot, suitable for breeding Hunters.

John Thomas Robinson, Leckby Palace, Asenby, Thirsk, Yorkshire: First Prize, 25*l.*, for "Go-a-Head," dark bay, 12 years-old (and foal); breeder unknown; sire, Stephenson's "Sir William."

Robert Aldworth, West Agbourne, Didcot, Berkshire: Second Prize, 15*l.*, for "Marigold," chestnut, 12 years-old (and foal); breeder unknown.

Wheatley Tindall, Ashfield House, Lincoln: Third Prize, 5*l.*, for "Heliotrope," brown, 12 years-old (and foal); bred by Mr. Charles Ellis, Bentley, Doncaster; sire, "The Don."

John Charles Blake, Oxford: the *Reserve Number* to "Canary," bay, aged (in foal); breeder unknown.

Mares, not less than 14 *hands* 1 *inch, nor exceeding* 15 *hands* 1 *inch, in foal, or with foal at foot, suitable for breeding Hackneys.*

Lord Norreys, Tetsworth, Oxford: First Prize, 20*l.*, for "Kate," bay, 12 years-old (and foal); breeder unknown.

Alexander Sherratt, Oclepitchard, Hereford: Second Prize, 10*l.*, for "Polly," dark chestnut, 11 years-old (in foal); bred by the Rev. C. L. Eagles, Longton, Hereford; sire, "Hereford."

The Earl of Craven, Ashdown Park, Shrivenham, Berkshire: Third Prize, 5*l.*, for his chestnut, aged (and foal); breeder unknown.

Edwin and Alfred Stanford, of Eatons, Steyning, Sussex: the *Reserve Number* to "Christabel," dark brown, 17 years-old (and foal); bred by W. Stanford, Eatons; sire, "Mathematician;" sire of dam, "Gaberlunzie."

Pony Mares not exceeding 14 *hands.*

G. Bowes Morland, Abingdon, Berkshire: First Prize, 10*l.*, for "Topsy," black, over 25 years-old; breeder unknown.

Agricultural Fillies—Three Years old.

Charles Lister, Coleby Lodge, Lincoln; First Prize, 15*l.*, for "Royal Duchess," bay; bred by exhibitor; sire, "Champion;" dam, "Diamond."

James and Frederick Howard, Britannia Farm, Bedford: Second Prize, 10*l.*, for "Rosebud," bay; bred by exhibitors; dam, "Darby:" sire of dam, "Drayman."

JOSEPH DRUCE, Eynsham, Oxford: THIRD PRIZE, 5*l.*, for "Poppet," chestnut; bred by exhibitor; sire, "Glengarry;" dam, "Smiler;' sire of dam, "Sampson."

WILLIAM ROWLAND, of Shabbington, Thame, Oxfordshire: the *Reserve Number* to "Jewel," red roan; bred by exhibitor; dam, "Jewel."

Clydesdale Fillies—Three Years old.

GEORGE HEAD HEAD, Rickerby, Carlisle, Cumberland: FIRST PRIZE, 15*l.*, for "Deborah," brown or bay; bred by Mr. Sprout, Borness of Borgue, Kircudbright, Scotland; sire, "Champion."

The DUKE OF RICHMOND, K.G., Goodwood, Chichester, Sussex: SECOND PRIZE, 10*l.*, for "Darling," brown; bred by exhibitor; sire, "Britain."

GEORGE HAMPTON, Findon, Worthing, Sussex: the *Reserve Number* to "Thistle," brown; breeder unknown.

Suffolk Fillies—Three Years old.

SAMUEL WOLTON, Newbourn Hall, Woodbridge, Suffolk: FIRST PRIZE, 15*l.*, for "Duchess," chestnut; bred by exhibitor; sire, "Warrior;" dam, "Victory;" sire of dam, "Hero."

SAMUEL WOLTON, Newbourn Hall: SECOND PRIZE, 10*l.*, for "Princess," chestnut; bred by exhibitor; sire, "Warrior;" dam, "Royal Moggy;" sire of dam, Catlin's "Royal Duke."

COLONEL TOMLINE, M.P., Orwell Park, Nacton, Ipswich, Suffolk: the *Reserve Number* to "Smart," chestnut; bred by exhibitor: sire, "Harwich Emperor;" dam, "Pepper;" sire of dam, "Chester Emperor."

Agricultural Fillies—Two Years old.

STEPHEN DAVIS, Woolashill, Pershore, Worcestershire: FIRST PRIZE, 15*l.*, for "Pleasant," chestnut; bred by exhibitor; sire, Mr. Deakin's "Rowland;" dam, "Diament;" sire of dam, "Duke of Wellington."

JOHN DENCHFIELD, Burston House, Aston Abbots, Bucks: SECOND PRIZE, 10*l.*, for his brown; bred by exhibiter; sire, "Farmer's Glory;" dam, "Short;" sire of dam, "King George."

SIR HENRY W. DASHWOOD, Bart., Kirtlington Park, Oxford: THIRD PRIZE, 5*l.*, for "Lucy," brown; bred by exhibitor; sire, "Clyde;" dam, "Duchess;" sire of dam, "Glengarry."

The Rev. JOHN HITCHCOCK, Chitterne All Saints, Heytesbury, Wilts: the *Reserve Number* to his black; bred by the late Mr. H. Hitchcock, Chitterne; sire, "Britain;" dam, "Smiler;" sire of dam, "Champion."

Suffolk Fillies—Two Years old.

SAMUEL WOLTON, Newbourn Hall, Woodbridge: FIRST PRIZE, 15*l.*, for his chestnut; bred by exhibitor; sire, "Monarch;" dam, "Moggy;" sire of dam, "Warrior."

COLONEL TOMLINE, M.P., Orwell Park, Nacton, Ipswich, Suffolk: SECOND PRIZE, 10*l.*, for "Moggy," chestnut; bred by exhibitor; sire, "Emperor;" dam, "Darby:" sire of dam, "Hero."

JAMES PATMORE, Bishop Stortford, Hertfordshire: the *Reserve Number* to "Silver 2nd," chestnut; bred by exhibitor; dam, "Silver;" sire of dam, "Chester Emperor."

*Hunters—Four Years old (Mare or Gelding).

Samuel Berridge, Drayton Lodge, Banbury, Oxfordshire: First Prize, 30*l.*, for "General," black gelding; bred by W. Baker, Esq., Brailes, Shipston-on-Stour; sire, "Big Ben;" dam, "Coronation."

John Grout, Woodbridge, Suffolk: Second Prize, 15*l.*, for "Ace of Clubs," chestnut gelding; bred by J. Hempson, Esq., Ewarton Hall, Ipswich; sire, "Ace of Clubs;" dam, "Kitty."

Alexander Sherratt, Ocelepitchard, Hereford: Third Prize, 5*l.*, for "George," chestnut gelding; bred by exhibitor; sire, "Prescription" sire of dam, "Hereford."

Thomas Milburn, Grinsdale, Carlisle, Cumberland: the *Reserve Number* to "Merry Maid," chestnut mare; bred by exhibitor; sire, "British Monk;" dam, "Nancy;" sire of dam, "Napoleon le Grand."

*Hunters—Five, Six, or Seven Years old (Mare or Gelding).

John B. Booth, Killerby Hall, Catterick, Yorkshire: First Prize, 30*l.*, for "Brian Boru," chestnut gelding, 7 years-old; breeder unknown; sire, "Chieftain;" sire of dam, "Dr. O'Toole."

Lord Norreys, Tetsworth, Oxfordshire: Second Prize, 15*l.*, for "Strathnairn," bay gelding, 5 years-old; bred by Mr. P. Coghlan, South Lodge, Carrick-on-Suir, Tipperary; sire, "Warlike;" sire of dam, "Welcome."

Lieut.-Colonel Fuller Maitland Wilson, Stowlangtoft Hall, Bury St. Edmund's, Suffolk: Third Prize, 5*l.*, for "Fenian," bay gelding, 6 years-old; breeder unknown,

John Watson, Waresley, Hartlebury, Kidderminster, Worcestershire: the *Reserve Number* to "General Hood," chestnut gelding, 5 years-old; bred by F. L. Popham, Esq., Littlecote Park, Hungerford; sire, "Star of the West."

*Hackneys (Mare or Gelding) not exceeding 15 hands 1 inch, under Eight Years old.

Herbert S. Woodcock, The Elms, Wigan, Cumberland: First Prize, 15*l.*, for "Ada," chestnut mare, 8 years-old; bred by Mr. Massey, Kilkenny, Ireland.

Charles Moffat, Crosby-on-Eden, Carlisle, Cumberland: Second Prize, 5*l.*, for "Fanny," bay mare, 4 years-old; bred by Mr. R. Nixon, Dyke Head, Kirklinton, Carlisle; sire, "Laughing-stock."

John Charles Blake, Oxford: *Reserve Number* to "Leah," bay mare, 6 years-old; breeder unknown.

CATTLE.

Shorthorns—Bulls above Three Years old.

Charles W Brierley, Rhodes House, Middleton, Lancashire: First Prize, 40*l.*, for "Bolivar," roan, 3 years 2 months 3 weeks 5 days-old; bred by J. Meadows, Esq., Thornville, Co. Wexford; sire, "First Fiddle;" dam, "Blossom 5th;" sire of dam, "Duke of Bedford."

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Charles Richardson Saunders, Nunwick Hall, Penrith, Cumberland: Second Prize, 20*l.*, for "Edgar," roan, 7 years 6 months 1 week 2 days-old; bred by R. W. Saunders, Esq., Nunwick Hall; sire, "Prince Patrick" (11,633); dam, "Young Emma;" sire of dam, "McTurk." (14,782).

Thomas Edward Pawlett, Beeston, Sanday, Bedfordshire: Third Prize, 10*l.*, for "Baron Killerby" (33,364), red, 3 years 2 months 3 weeks 2 days-old; bred by exhibitor; sire, "Breastplate" (19,337); dam, "Pearl;" sire of dam, "Richard Cœur de Lion" (13,590).

Richard Chaloner, King's Fort, Kells, Co. Meath: the *Reserve Number* to "Sovereign," roan, 4 years 2 months 3 weeks-old; bred by exhibitor; sire, "Royal Sovereign" (22,802); dam, "Village Rose;" sire of dam, "Blood Royal" (14,169).

Shorthorns—Bulls above Two and not exceeding Three Years old.

Robert Bruce, Newton of Struther, Forres, Co. Elgin, Scotland; First Prize, 25*l.*, for "Scotsman" (27,435), roan, 2 years 4 months 3 days-old; bred by the Duke of Buccleuch, K.G., Dalkeith, Edinburgh.

Colonel Charles Towneley, Towneley, Burnley, Lancashire: Second Prize, 15*l.*, for "Baron Hubback," red, 2 years 3 months 1 week-old; bred by exhibitor; sire, "Baron Oxford" (23,373); dam, "Duchess 7th;" sire of dam, "Grand Duke of Lancaster."

John Wright, Green Gill Head, Penrith, Cumberland: Third Prize, 5*l.*, for "Man's Estate," white, 2 years 7 months 3 weeks-old; bred by Mr. T. Bowstead, Edenhall, Penrith; sire, "Edgar" (19,680); dam, "Light Roan Twin;" sire of dam, "Squire Stewart" (20,981).

James Christy, Jun., Boynton-Hall, Chelmsford, Essex: the *Reserve Number* to "Duke of Babraham," red, 2 years 9 months 3 weeks 4 days-old; bred by exhibitor; sire, "Duke of Grafton" (21,594); dam, "Babraham Duchess;" sire of dam, "Guilder Rose."

Shorthorns—Yearling Bulls above One and not exceeding Two Years old.

Emily Lady Pigot, Branches Park, Newmarket: First Prize, 25*l*, for "Bythis" (25,700), red and white, 1 year 10 months 1 day-old; bred by exhibitor; sire, "Victorious" (25,378); dam, "Bellona;" sire of dam, "Sir Roger" (16,991).

William Linton, Sheriff Hutton, York: Second Prize, 15*l.*, for "Lord Irwin," white, 1 year 5 months 1 week 1 day-old; bred by exhibitor; sire, "British Hope" (21,324); dam, "Handmaid;" sire of dam, "May Day (20,323).

Lord Braybrooke, Audley End, Saffron Walden, Essex: Third Prize, 5*l.*, for "Heyden Duke," roan, 1 year 5 months 4 days-old; bred by exhibitor; sire, "Duke of Geneva" (23,753); dam, "Heydon Rose;" sire of dam, "Englishman" (20,323).

The Earl of Aylesford, Packington Hall, Warwickshire: the *Reserve Number*, to "Magdala," roan, 1 year 9 months 3 weeks 6 days-old; bred by exhibitor; sire, "Grand Duke 9th" (19,879); dam, "Polly Gwynne 3rd;" sire of dam, "Duke of Cumberland" (21,584).

Shorthorns—Bull Calves above Six and not exceeding Twelve Months old.

Henry Dudding, Panton House, Wragby, Lincolnshire: First Prize, 10*l.*, for "Robin Hood," dark roan, 8 months 3 weeks-old; bred by Messrs. Dudding, Panton House; sire, "Robin" (24,968); dam, "Countess of Wragby;" sire of dam, "Sir Roger" (16,991).

Richard Stratton, Burderop, Swindon, Wilts: Second Prize, 5*l.*, for "Master Glanville," roan, 7 months 6 weeks 3 days-old; bred by exhibitor; sire, "James 1st" (24,202); dam, "Miss Glanville 3rd;" sire of dam, "Buckingham" (15,700).

Colonel Charles Towneley, Towneley, Burnley: the *Reserve Number*, to "Maid of Oxford's Baronet," roan, 8 months 6 days-old; bred by exhibitor; sire, "Baron Oxford" (23,375); dam, "Sixth Maid of Oxford;" sire of dam, "Imperial Oxford" (24,185).

Shorthorns—Cows above Three Years old.

George Garne, Churchill Heath, Chipping Norton: First Prize, 20*l.*, for "Lady Lavinia," red and white, in-milk, and in-calf 3 years 5 months 1 day-old; bred by exhibitor; sire, "Duke of Towneley" (21,615); dam, "Lady Lucy;" sire of dam, "Second Duke of Gloucester" (16,277).

Emily Lady Pigot, Branches Park, Newmarket, Cambridgeshire: Second Prize, 10*l.*, for "Queene of Rosalea," roan, in-milk, and in-calf, 5years 11 months 3 weeks 5 days-old; bred by exhibitor; sire, "Ravenspur" (20,628); dam, "White Ladye;" sire of dam, "Valasco" (15,443).

James How, Broughton, Huntingdon: Third Prize, 5*l.*, for "Lady Anne," red and white, in-calf, 3 years 10 months 2 weeks 2 days-old; bred by Mr. Logan, Maindee, Newport, Monmouthshire; sire, "Prince of the Empire (20,578);" dam, "Ladye Elinor;" sire of dam, "Sir Roger" (16,991).

George Garne, Churchill Heath, Chipping Norton, Oxfordshire: the *Reserve Number*, to "Pride of the Heath," roan, in-calf, 4 years 11 months-old; bred by exhibitor; sire, "Cynric" (19,542); dam, "Peach;" sire of dam, "Havelock" (19,676).

Shorthorns—Heifers, in-milk or in-calf, not exceeding Three Years old.

John Aubrey Mumford, Chilton Park Farm, Thame, Oxfordshire: First Prize, 15*l.*, for "Camilla," red, in-calf, 2 years 3 months 3 weeks 5 days-old; bred by exhibitor; sire, "Earl of Lancaster" (21,647); dam, "Criterion;" sire of dam, "Earl Ducie" (17,767).

Richard Eastwood, Thorneyholme, Clitheroe, Yorkshire: Second Prize, 10*l.*, for "Double Butterfly 3rd," roan, in-milk, 2 years 9 months 3 days-old; bred by exhibitor; sire, "The Hero" (20,988); dam, "Double Butterfly;" sire of dam, "Royal Butterfly" (16,862).

Richard Stratton, Burderop, Swindon, Wiltshire: Third Prize, 5*l.*, for "Peeress," roan, in-calf, 2 years 11 months 1 week 6 days-old; bred by exhibitor; sire, "Bude Light" (21,342); dam, "Parade;" sire of dam "Knight of the Lagan" (20,083).

James How, Broughton, Huntingdon: the *Reserve Number*, to "Windsor Butterfly," red and white, in calf, 2 years 4 months 2 weeks 5 days-old; bred by exhibitor; sire, "Heir of Windsor" (26,364); dam, "Alice Butterfly."

Shorthorns—Yearling Heifers above One and not exceeding Two Years old.

David M'Intosh, Havering Park, Romford, Essex: First Prize, 15*l.*, for "Knightley 2nd," roan, 1 year 8 months 3 weeks-old; bred by exhibitor; sire, "Duke of Geneva" (23,753); dam, "Dewdrop;" sire of dam, "Prince of Saxe-Coburg" (32,576).

Henry Dudding, Panton House, Wragby, Lincolnshire: Second Prize, 10*l.*, for "Countess of Yarborough," roan, 1 year 10 months 4 weeks 1 day-old; bred by Messrs. Dudding, Panton House; sire, "Baron Rosedale" (21,239); dam, "Countess of Wragby;" sire of dam, "Sir Roger" (16,991).

James How, Broughton, Huntingdon: Third Prize, 5*l.*, for "Vesper Queen," blood red, 1 year 5 months 1 week 1 day-old; bred by exhibitor; sire, "Victorious" (25,378); dam, "Jolly Queen;" sire of dam, "Prince of the Empire" (20,578).

Richard Stratton, Burderop, Swindon: the *Reserve Number*, to "Flower Girl," roan, 1 year 8 months 1 week 4 days-old; bred by exhibitor; sire, "James 1st (24,202);" dam, "April Rose;" sire of dam, "Warwick" (19,120).

Shorthorns—Heifer Calves, above Six and under Twelve Months old.

Colonel Charles Towneley, Towneley, Burnley, Lancashire: First Prize, 10*l.*, for "Baron Oxford's Duchess," red, 10 months, 2 weeks 1-day old; bred by exhibitor; sire, "Baron Oxford" (23,375); dam, "Duchess of Lancaster 2nd;" sire of dam, "Precedent" (11,918).

Richard Marsh, Little Offley House, Hitchin, Hertfordshire: Second Prize, 5*l.*, for "Blossom," rich roan, 10 months 4 weeks 1 day-old; bred by exhibitor; sire, "Prince Pearl;" dam "Bashful;" sire of dam, "British Baronet."

Thomas Statter, Jun., Stand Hill, Whitefield, Manchester: the *Reserve Number*, to "Stanley Rose," red and white, 11 months-old; bred by exhibitor; sire, "Thorndale Duke;" dam, "Stanley Roan;" sire of dam, "Garibaldi."

Herefords—Bulls above Three Years old.

Sir Joseph Russell Bailey, Bart., M.P., Glanusk Park, Crickhowell, Breconshire: First Prize, 25*l.*, for "Stanway" (2790), red, white face, 5 years 9 months 2 weeks 6 days-old; bred by Mr. William Tudge, Adforton, Ludlow; sire, "Pilot" (2156); dam, "Darling;" sire of dam, "Carbonel" (1525).

Her Majesty the Queen, Windsor Castle, Berkshire: Second Prize, 15*l.*, for "Prince Leopold," red, white face, 3 years 9 months 1 week-old; bred by Her Majesty, Flemish Farm, Windsor; sire, "Deception;" dam, "Maud;" sire of dam, "Windsor."

Thomas Thomas, Saint Hilary, Cowbridge, Glamorganshire: Third Prize, 5*l.*, for "Sir John 3rd" (3456), red, white face, 3 years 10 months 1 week 3 days-old; bred by Mr. John Rawlings, Stoke, Tenbury; sire, "Sir John 2nd;" dam, "Nutty;" sire of dam, "Cholstry."

John Morris, Town House, Madley, Hereford: the *Reserve Number*, to "Stowe," red and white, 3 years 7 months 2 weeks 5 days-old; bred by exhibitor; sire, "Sir Thomas (2228);" dam, "Rosalind;" sire of dam, "Chieftain" (930).

Herefords—Bulls above Two and not exceeding Three Years old.

Her Majesty the Queen, Windsor Castle, Berkshire: First Prize, 25*l.*, for "Prince Albert Edward," red, white face, 2 years 9 months 4 weeks 1 day-old; bred by Her Majesty, Flemish Farm, Windsor; sire, "Deception;" dam, "Maud;" sire of dam, "Windsor."

Warren Evans, Landowlais, Usk, Monmouthshire: Second Prize, 15*l.*, for "Monaughty the 3rd" (3262), red, 2 years 7 months 2 weeks 2 days-old; bred by exhibitor; sire, "Hopeful" (2045); dam, "Nena the 3rd;" sire of dam, "Monaughty" (2117).

Thomas Edwards, Wintercott, Leominster, Herefordshire: Third Prize, 5*l.*, for "Leominster 3rd," red, white face, 2 years 2 months 1 week 2 days-old; bred by exhibitor; sire, "Tomboy" (3546); dam, "Primrose;" sire o1 dam, "Adforton" (1839).

Henry Nicholas Edwards, Broadward, Leominster, Herefordshire: the *Reserve Number* to "Sir John," red, white face, 2 years 3 days-old; bred by exhibitor; sire, "Sir Hungerford" (3447); dam, "Amaranth;" sire of dam, "Luck's All" (1643.)

Herefords—Yearling Bulls above One and not exceeding Two Years old.

Philip Turner, Leen, Pembridge, Leominster, Herefordshire: First Prize, 25*l.*, for "Trojan," red, white face, 1 year 10 months 3 weeks 4 days-old; bred by exhibitor; sire, "Franky;" dam, "Nonpareil" sire of dam, "Bertram."

John Harding, Bicton, Shrewsbury, Salop: Second Prize, 15*l.*, for "Count Fosco," red, white face, 1 year 9 months 1 week 3 days-old; bred by exhibitor; sire, "Severus 2nd" (2747); dam, "Countess 2nd;" sire of dam, "Fencote."

Richard Hill, Orleton Court, Ludlow, Salop: Third Prize, 5*l.*, for "President" (3331), red, white face, 1 year 10 months 2 weeks 2 days-old; bred by exhibitor; sire, "Interest" (3172); dam, "Field Rose;" sire of dam, "Port" (1694).

John Morris, Town,House, Madley, Hereford: the *Reserve Number*, to "Cambridge," red and white, 1 year 2 months-old; bred by exhibitor; sire, "Stow" (3748); dam, "Hampton;" sire of dam, "Interest" (2046).

Herefords—Bull Calves above Six and not exceeding Twelve Months old.

William Taylor, Showle Court, Ledbury, Herefordshire: First Prize, 10*l.*, for "The Oxford Lad," red, white face, 10 months 6 days-old; bred by exhibitor; sire, "Triumph" (2836); dam, "Hazle;" sire of dam, "Tom Brown" (2828).

Richard Hill, Orleton Court, Ludlow, Salop: Second Prize, 5*l.*, for "Milton 2nd," red, white face, 11 months 6 days-old bred by exhibitor; sire, "Triumph" (2837); dam, "Orleton Lass;" sire of dam, "Milton" (2114).

Thomas Rogers, Coxall, Brampton Bryan, Herefordshire: the *Reserve Number*, to "Student," red, white face, 12 months-old; bred by exhibitor; sire, "Battenhall" (2406); dam, "Silk;" sire of dam, "Protection" (794).

Herefords—Cows above Three Years old.

Thomas Rogers, Coxall, Brampton Bryan, Herefordshire: First Prize, 20*l.*, for "Silk," red, white face, in-calf, 7 years 9 months-old; bred by the late Mr. David Rogers, The Rodd, Kington; sire, "Interest" (2046); dam, "Curly;" sire of dam, "Protection" (794).

George Pitt, Chadnor Court, Dilwyn, Leominster, Herefordshire: Second Prize, 10*l.*, for "Highlass the 4th," red, white face, in-milk, 3 years 7 months-old: bred by exhibitor; sire, "Foxwhelp;" dam, "Highlass the 3rd;" sire of dam, "Miliam."

Richard Tanner, Frodesley, Dorrington, Salop: Third Prize, 5*l.*, for "Queen," red, white face, in-milk, and in-calf, 6 years 10 months-old; bred by Mr. Edward Tanner, Aintree House, Bromfield; sire, "Bucton" (1891); dam, "Moss Rose;" sire of dam, "Superior" (1751).

Her Majesty the Queen, Windsor Castle, Berkshire: the *Reserve Number*, to "Flora," red, white face, in-milk, 8 years 5 months 3 days-old; bred by Her Majesty, Flemish Farm, Windsor; sire, "Deception;" dam, "Vienna;" sire of dam, "Venison the 2nd."

Herefords—Heifers in-milk or in-calf, not exceeding Three Years old.

William Tudge, Adforton, Leintwardine, Herefordshire: First Prize, 15*l.*, "Silver Star," in-calf, 2 years 10 months 2 weeks 6 days-old; bred by exhibitor; sire, "Stanway" (2790); dam, "Duchess 3rd;" sire of dam, "Harold" (2029).

Philip Turner, Leen, Pembridge, Leominster, Herefordshire: Second Prize, 10*l.*, for "Livia," red, white face, in-calf, 2 years 9 months 3 weeks 6 days-old; bred by exhibitor; sire, "Franky;" dam, "Dorcas the 2nd;" sire of dam, "Bolingbroke."

John Prosser, Honeybourne Grounds, Broadway, Gloucestershire: the *Reserve Number*, to "Snowdrop the 2nd," red, white face, in-calf, 2 years 1 month 3 weeks 5 days-old; bred by exhibitor; sire, "Bellingsley;" dam, "Snowdrop the 1st;" sire of dam, "The Jew."

Herefords—Yearling Heifers above One and not exceeding Two Years old.

Thomas Fenn, Stonebrook House, Ludlow: First Prize, 15*l.*, for "Leonora 2nd," red, white face, 1 year 11 months 3 weeks 6 days-old: bred by the exhibitor; sire, "Severus 2nd" (2747); dam, "Leonora;" sire of dam, "Dutiful."

William Tudge, Adforton, Leintwardine, Salop: Second Prize, 10*l.*, for "Lady Brandon," red, white face, 1 year 11 months 3 weeks 4 days-old; bred by exhibitor; sire, "Brandon" (2972); dam, "Lady Adforton;" sire of dam, "Pilot" (2156).

Thomas Thomas, St. Hilary, Cowbridge, Glamorganshire: Third Prize, 5*l.*, for "Sunbeam," red, white face, 1 year 10 months-old; bred by exhibitor; sire, "Sir John the 3rd" (2456); dam, "Lizzie;" sire of dam, "Young Royal" (1469).

John Harding, Bicton, Shrewsbury: the *Reserve Number*, to "Dahlia," red, white face, 1 year 2 months 3 weeks 3 days-old; bred by exhibitor; sire, "Symmetry" (2799); dam, "Burlington Daisy;" sire of dam, "Severus 2nd" (2747).

Herefords—Heifer Calves above Six and under Twelve Months old.

Henry Rawlins Evans, Jun., Swanstone Court, Leominster, Herefordshire: First Prize, 10*l.*, for his red, white face, 11 months 4 days-old; bred by exhibitor; sire, "Chieftain" (1917); dam, "Beauty 2nd;" sire of dam, "Sir Franklin" (1068).

Thomas Thomas, St. Hilary, Cowbridge, Glamorganshire: Second Prize, 5*l.*, for "Sunflower," red, white face, 11 months 2 weeks 3 days-old; bred by exhibitor; sire, "Sir John 3rd;" dam, "Curly 2nd;" sire of dam, "Goldfinder 2nd."

John Harding, Bicton, Shrewsbury: the *Reserve Number*, to "Lizzie Jeffreys," red, white face; 11 months 2 weeks 3 days-old; bred by exhibitor; sire, "Symmetry" (2799); dam, "Miss Jeffreys;" sire of dam, "Prince Alfred" (2169).

Devons—Bulls above Three Years old.

WALTER FARTHING, Stowey Court, Bridgwater: FIRST PRIZE, 25*l.*, for "Master Arthur," red, 3 years 2 months 5 days-old; bred by Sir A. A. Hood, Bart., St. Audries, Bridgwater; sire, "Master Ellie;" dam, "Miss Battersea;" sire of dam, "Sir Peregrine."

JAMES HOWARD BULLER, Downes, Crediton, Devon: SECOND PRIZE, 15*l.*, for his red, 3 years 9 months 4 weeks-old; bred by exhibitor.

WILLIAM TAYLOR, Glynley, Westham, Eastbourne, Sussex: the *Reserve Number*, to "Rifleman," (913), red, 4 years 8 months 1 week 1 day-old; bred by exhibitor; sire, "Brinsworthy," (572); dam, "Handsome;" sire of dam, "Fusilier."

Devons—Bulls above Two and not exceeding Three Years old.

VISCOUNT FALMOUTH, Tregothnan, Probus, Cornwall: FIRST PRIZE, 25*l.*, for "Narcissus," red, 2 years 9 months-old; bred by exhibitor; sire, "Sunflower," (937); dam, "Picture the 4th," (2224).

WALTER FARTHING, Stowey Court, Bridgwater, Somersetshire: SECOND PRIZE, 15*l.*, for "Sir George," red, 2 years 6 months 1 week 4 days-old; bred by exhibitor; sire, "Lord Donnington;" dam, "Lady;" sire of dam, "Perfection."

HER MAJESTY THE QUEEN, Windsor Castle, Berkshire: the *Reserve Number*, to "Napier," red, 2 years 8 months 1 week 3 days-old; bred by Mr. Walter Farthing, Stowey Court, Bridgwater; dam, "Julia;" sire of dam, "Lord Quantock."

Devons—Yearling Bulls above One and not exceeding Two Years old.

JAMES DAVY, Flitton-Barton, North Molton, Devon: FIRST PRIZE, 25*l.*, for "Duke of Flitton 5th," red, 1 year 9 months 3 weeks 3 days-old; bred by exhibitor; sire, "The President" (904); dam, "Actress" (1749); sire of dam, "Palmerston" (476).

VISCOUNT FALMOUTH, Tregothnan, Probus, Cornwall: SECOND PRIZE, 15*l.*, for his red, 1 year 9 months 3 weeks 5 days-old; bred by exhibitor; sire, "Sunflower" (937); dam, "Picture the 4th" (2224).

WILLIAM SMITH, Hoopern, Exeter, Devon: THIRD PRIZE, 5*l.*, for "Pensylvania," brown, 1 year 10 months 2 days-old; bred by exhibitor; sire, "Eclipse" (835); dam, "Musk" (2883); sire of dam, "Alabama" (774).

JOHN AZARIAH SMITH, Bradford Peverell, Dorchester: the *Reserve Number*, to "Duke of York," red, 1 year 7 months 4 weeks-old; bred by John Pitfield, Symondsbury, Bridport; sire, "Albert Victor" (776); dam, "Piccolominy;" sire of dam, "Duke."

Devons—Bull Calves above Six and not exceeding Twelve Months old.

JAMES DAVY, Flitton-Barton, North Molton, Devon: FIRST PRIZE, 10*l.*, for "Duke of Flitton 6th," red, 8 months 1 week 5 days-old; bred by exhibitor;" sire, "Norfolk Champion" (892); dam, "Actress the 2nd" (2478); sire of dam, "Duke of Flitton the 3rd" (826).

WALTER FARTHING, Stowey Court, Bridgwater, Somersetshire: SECOND PRIZE, 5*l.*, for "Master Harry," red, 6 months 3 weeks 2 days-old; bred by exhibitor; sire, "Master Arthur;" dam, "Lofty;" sire of dam, "Peregrine."

William Smith, Hoopern, Exeter, Devon: the *Reserve Number*, to "Duke of Beaufort," brown, 11 months-old; bred by exhibitor; sire, "Eclipse" (835); dam, "Dairymaid;" sire of dam, "Napoleon" (250).

Devons—Cows above Three Years old.

William Smith, Hoopern, Exeter, Devon: First Prize, 20*l.*, for "Musk," brown, 5 years 1 month 2 days-old, in-milk; bred by exhibitor; sire, "Alabama" (774); dam, "Pink" (2234); sire of dam, "Warrior" (548).

William Taylor, Glynley, Westham, Eastbourne, Sussex: Second Prize, 10*l.*, for "Frederica" (2714); red, in-milk and in-calf, 5 years 7 months 2 weeks 5 days-old; bred by exhibitor; sire, "Constitution;" dam, "Beauty;" sire of dam, "Napoleon."

William Taylor, Glynley: Third Prize, 5*l.*, for "Alice Maude" (2480), red, in-calf, 3 years 11 months 1 week 2 days-old; bred by exhibitor; sire, "Wicked Bill;" dam, "Profit" (992); sire of dam, "Nelson" (83).

John Azariah Smith, Bradford Peverell, Dorchester, Dorset: the *Reserve Number*, to "Pet," red, in-milk and in-calf, 4 years 6 months 2 days-old; bred by exhibitor; sire, "Hercules" (854); dam, "Pet;" sire of dam, "Royal George."

Devons—Heifers in-milk or in-calf, not exceeding Three Years old.

Walter Farthing, Stowey Court, Bridgwater, Somerset: First Prize, 15*l.*, for "Prettymaid," red, in-calf, 2 years 7 months 1 week 6 days-old; bred by exhibitor; sire, "St. Audries;" dam, "Young Pink;" sire of dam, "Viscount."

William Taylor, Glyneley, Westham, Eastbourne, Sussex: Second Prize, 10*l.*, for "Curly 4th," red, in-calf, 2 years 7 months 2 days-old; bred by Mr. George Shapland, Mead's Cottage, Newport, Barnstaple, Devon; sire, "Prince of Wales" (910); dam, "Countess;" sire of dam, "Nelson" (83).

John Azariah Smith, Bradford Peverell, Dorchester, Dorset: Third Prize, 5*l.*, for "Picture," red, in-milk, 2 years 9 months 1 week 2 days-old; bred by exhibitor; sire, "Augustus" (778); dam, "Picture;" sire of dam, "Nelson" (83).

Her Majesty the Queen, Windsor Castle, Berkshire: the *Reserve Number*, to "Verbena," red, in-calf, 2 years 2 months-old; bred by George Turner, Brampford Speke, Exeter; sire, "Albert Victor;" dam, "Marguerite."

Devons—Yearling Heifers above One and not exceeding Two Years old.

James Davy, Flitton Barton, North Molton, Devon: First Prize, 15*l.*, for "Temptress the 2nd" (3070), red, 1 year 11 months 1 week 3 days-old; bred by exhibitor; sire, "Duke of Cornwall" (820); dam, "Gold Medal Temptress" (1672); sire of dam, Davy's "Napoleon the 3rd" (464).

William Taylor, Glynley, Westham, Eastbourne, Sussex: Second Prize, 10*l.*, for his red, 1 year 9 months-old; bred by exhibitor; sire, "Alabama;" dam, "Frederica;" sire of dam, "Constitution."

William Smith, Hoopern, Exeter: Third Prize, 5*l.*, for "Duchess," red, 1 year 6 months 5 days-old; bred by Mr. George Turner, Brampford Speke, Exeter; sire, "Albert Victor" (776); dam, "Duchess" (2655); sire of dam, "Leotard" (866).

JAMES HOWARD BULLER, Downes, Crediton, Devon: the *Reserve Number*, to his red, 1 year 11 months 3 weeks-old; bred by exhibitor.

Devons—Heifer-Calves above Six and under Twelve Months old.

JAMES DAVY, Flitton Barton, North Molton, Devon: FIRST PRIZE, 10*l.*, for "Gay Lass," red, 11 months 3 weeks 1 day old; bred by exhibitor; sire, "The President" (904); dam, "Princess Alice the 2nd" (2971); sire of dam, "Duke of Flitton the 2nd" (825).

WILLIAM SMITH, Hoopern, Exeter: SECOND PRIZE, 5*l.*, for "Jessie," brown, 8 months 1 week 1 day old; bred by Mr. J. Pitfield, Symondsbury, Bridport, Dorset; sire, "Albert Victor;" dam, "Rosa;" sire of dam, "Prince Jerome."

WALTER FARTHING, Stowey Court, Bridgwater, Somerset: the *Reserve Number*, to "First Fruit," red, 11 months 3 weeks 4 days-old; bred by exhibitor; sire, "Master Arthur;" dam, "Verbena."

Channel Islands—Bulls above One Year old.

GEORGE DELLER, Greywell, Odiham, Hampshire: FIRST PRIZE, 15*l.*, for "Delhi," dark brown and white, 3 years 3 months-old; bred by Mr. Barnard, Wainford, Bishop's Waltham.

HENRY JOHN LE FEUVRE, Les Nièmes, St. Peter's, Jersey: SECOND PRIZE, 10*l.*, for "Duke 4th," fawn and white, 1 year 4 months 1 day-old; bred by exhibitor; sire, "Clement" (61); dam, "Queen Mab" (180).

WILLIAM GEORGE DUNCAN, Bradwell, Stoney Stratford, Bucks: the *Reserve Number* to his self-coloured, 1 year 5 months 2 weeks-old; bred by exhibitor; sire, "Bedesman;" dam, "Myrtle;" sire of dam, "The Gipsy."

Channel Islands—Cows above Three Years old.

JOSEPH PULLEY, JUN., Lower Eaton, Hereford: FIRST PRIZE, 15*l.*, for "Vixen," smutty fawn, in-milk, 6 years 7 months-old; bred by P. Dauncey, Esq.; sire, "Pedlar" dam, "Vanish."

PHILIP GAUDIN, Spring Farm, St. Martin's, Jersey: SECOND PRIZE, 10*l.*, for "Floribundus," red and white, in-milk, 7 years 2 months-old; bred by T. Filleul, Esq., Boulivot, Grouville, Jersey.

JOSEPH PULLEY, JUN., Lower Eaton, Hereford: the *Reserve Number* to "Spiteful," smutty fawn, in-milk, 4 years 1 month 1 week-old, bred by P. Dauncey, Esq., Horwood Rectory, Winslow; sire, "Vampire;" dam, "Vixen;" sire of dam, "Pedlar."

Heifers, in-milk or in-calf, not exceeding Three Years old.

PHILIP GAUDIN, Spring Farm, St. Martin's, Jersey: FIRST PRIZE, 15*l.*, for "Flora," brown and white, in-milk, 2 years 7 months 2 weeks-old; bred by T. Filleul, Esq., Boulivot, Grouville, Jersey.

GEORGE HUYSHE, Rosenheim, Guernsey: SECOND PRIZE, 10*l.*, for "Rosette," pale red and white, in-calf, 2 years 9 months 2 weeks-old; bred by exhibitor; sire, "Johnny."

HENRY MIDDLETON, Cutteslowe, Oxford: the *Reserve Number*, to "Ruby," dark fawn, in-calf, 1 year 2 months old; bred by exhibitor; sire, "Dolphin;" dam, "Ruth."

Norfolk and Suffolk Polled—Bulls above One Year old.

Benjamin Brown, Thursford, Thetford, Norfolk: First Prize, 15*l.*, for "Norfolk Duke," red, 5 years 5 days-old (Norfolk); bred by Mr. N. Powell, Fakenham.

Jeremiah James Colman, Carrow House, Norwich: Second Prize, 10*l.*, for "Cherry Duke," blood red, 2 years 4 months-old (Suffolk); bred by Mr. H. Wolton, Newbourn Hall, Woodbridge; sire, "Esquire;" dam, "Beauty."

Samuel Wolton, Newbourn Hall, Woodbridge: the *Reserve Number*, to "Broadback," blood red, 2 years 6 months-old (Suffolk); bred by exhibitor; sire, "Esquire of Suffolk;" dam, "Cowslip."

Norfolk and Suffolk Polled—Cows above Three Years old.

John Hammond, Bale, Thetford, Norfolk: First Prize, 15*l.*, for "Butler,' red, in-milk and in-calf, 5 years 5 months 2 weeks 1 day-old; bred by Mr. R. Butler, Houghton, Fakenham.

Samuel Wolton, Newbourn Hall, Woodbridge: Second Prize, 10*l.*, for "Sprightly," blood red, in-milk, 8 years 4 months-old (Suffolk); bred by Lord Rendelsham, Rendelsham Hall, Woodbridge; sire, "Nelson."

Benjamin Brown, Thursford, Thetford, Norfolk: the *Reserve Number*, to "Duchess," red, in-milk and in-calf, 4 years 3 weeks 3 days-old (Norfolk); bred by exhibitor; sire, "Tenant Farmer;" dam, "Hansom."

Norfolk and Suffolk Polled—Heifers, in-milk or in-calf, not exceeding Three Years old.

John Hammond, Bale, Thetford, Norfolk: First Prize, 15*l.*, for "Buttercup," red, in-milk, 2 years 10 months 1 week 4 days-old (Norfolk); bred by exhibitor; sire, "Sir Nicholas;" dam, "Butler."

Lord Sondes, Elmham Hall, Thetford, Norfolk: Second Prize, 10*l.*, for his red, in-calf, 2 years 9 months 3 weeks-old; bred by Mr. J. Hammond, Bale, Thetford.

Benjamin Brown, Thursford, Thetford: the *Reserve Number*, to his "Hansom," red, in-calf, 2 years 10 months 2 days-old (Norfolk); bred by exhibitor; sire, "Tenant Farmer."

Other established breeds—Bulls above One Year old.

The Duke of Buckingham and Chandos, Stowe, Buckingham: First Prize, 15*l.*, for "Young Conqueror," dark brown, 2 years 11 months-old (Longhorn); bred by exhibitor; sire, "Conqueror;" dam, "Luna."

Thomas Statter, Jun., Stand Hill, Whitefield, Manchester: Second Prize, 10*l.*, for his 3 years 8 months-old (Polled Angus or Aberdeen); bred by Mr. McCombie, Tillyfour, Aberdeen.

Richard Hemming Chapman, Upton, Nuneaton, Warwickshire: the *Reserve Number*, to "Earl of Rollright Redivivus," brindled, 6 years 5 months 3 weeks 2 days-old (Pure Longhorn); bred by the Hon. R. Curzon, Hagley Hill Farm, Rugeley; sire, "Hagley Farewell;" dam, "Jackdaw;" sire of dam, "Wyrley Tom."

Other established breeds—Cows above Three Years old.

John Godfrey, Wigston Parva, Hinckley, Leicestershire: First Prize, 15*l.*, for "Red Rose 2nd," coloured and white, in-calf, 6 years 3 months 1 week 4 days-old (Pure Longhorn); bred by exhibitor; sire, "The Bosworth Sparkenhoe;" dam, "Daisy;" sire of dam, "Perfection."

TILDEN SMITH, Beckley, Hawkhurst, Sussex: SECOND PRIZE, 10*l.*, for "Betty," red, in-milk and in-calf, 7 years 6 months 2 weeks-old (Sussex); bred by exhibitor; dam, "Old Betty."

RICHARD HEMMING CHAPMAN, Upton, Nuneaton: the *Reserve Number*, to "Brindled Beauty," brindled, in-milk, 6 years 4 months-old (Pure Longhorn); bred by exhibitor; sire, "Old Sparkenhoe;" dam, "Daisy;" sire of dam, "Lord Warner."

Other established breeds—Heifers, in-milk or in-calf, not exceeding Three Years old.

THOMAS STATTER, Jun., Stand Hill, Whitefield, Manchester: FIRST PRIZE, 15*l.*, for his black, in-calf, about 2 years 3 months-old (Polled Angus or Aberdeen); bred by exhibitor.

THE DUKE OF BUCKINGHAM AND CHANDOS, Stowe, Buckingham: SECOND PRIZE, 10*l.*, for "Lady Caroline," red, in-calf, 1 year 6 months 1 week 3 days-old (Longhorn); bred by exhibitor; sire, "Conqueror;" dam, "Lady."

GEORGE JENNER, Parsonage House, Udimore, Rye, Sussex: the *Reserve Number*, to "Young Cooke," red, in-calf, 2 years 5 months-old (Sussex); bred by exhibitor.

Pairs of Cows, to be shown in full milk, specially adapted for Dairy purposes; Special Prizes offered by the Oxfordshire and Banbury Agricultural Societies.

THOMAS STATTER, Jun., Stand Hill, Whitefield, Manchester: FIRST PRIZE, 10*l.*, for his Ayrshires; ages and breeders unknown.

HENRY MIDDLETON, Cutteslowe, Oxford: SECOND PRIZE, 8*l.*, one between 6 and 7 years-old, the other between 5 and 6 years-old (Jersey); breeder unknown.

HENRY MIDDLETON, Cutteslowe: the *Reserve Number*, to "Montillado" and "Lady," fawn, 5 years-old (Jersey); one bred by Mr. Pearman, Wallingford; the other breeder unknown.

SHEEP.

Special Prizes offered by the Oxfordshire and the Banbury Agricultural Societies marked thus (*).

Leicesters—Shearling Rams.

JOHN BORTON, Barton House, Barton-le-Street, Malton, Yorkshire: FIRST PRIZE, 20*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

The EXECUTOR of the late LIEUT.-COLONEL WILLIAM INGE, Thorpe Constantine, Tamworth: SECOND PRIZE, 10*l.*, for his 1 year 4 months-old; bred by the late Lieut.-Colonel W. Inge.

The EXECUTOR of the late LIEUT.-COLONEL WILLIAM INGE, Thorpe Constantine, THIRD PRIZE, 5*l.*, for his 1 year 4 months-old; bred by the late Lieut.-Colonel Inge.

TEASDALE H. HUTCHINSON, Manor House, Catterick: the *Reserve Number*, to his 1 year 3 months 1 week-old; bred by exhibitor.

Leicesters—Rams of any other Age.

JOHN BORTON, Barton House, Malton: FIRST PRIZE, 20*l.*, for "Blue Cap," 3 years 3 months-old; bred by exhibitor; sire, "Black Eye;" sire of dam, "Old Sledmore."

John Borton, Barton House: Second Prize, 10*l.*, for "Black Eye," 2 years 3 months old; bred by exhibitor; sire, "Old Black Eye;" sire of dam, "Sanday."

George Henry Sanday, Holme-Pierrepont, Notts: Third Prize, 5*l.*, for his 2 years 4 months-old; bred by exhibitor; sire, "Quid."

George Turner, Jun., Alexton Hall, Uppingham, Leicestershire: the *Reserve Number*, to his 3 years 3 months 2 weeks-old; bred by exhibitor.

Leicesters—Pens of Five Shearling Ewes of the same Flock.

The Executor of the late Lieut.-Colonel William Inge, Thorpe Constantine, Tamworth: First Prize, 15*l.*, for his 1 year 4 months-old; bred by the late Lieut.-Colonel Inge.

Teasdale H. Hutchinson, Manor House, Catterick, Yorkshire: Second Prize, 10*l.*, for his 1 year 3 months-old; bred by exhibitor; sire, "Blair Athol."

John Borton, Barton House, Barton-le-Street, Malton, Yorkshire: Third Prize, 5*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

George Henry Sanday, Holme-Pierrepont, Nottinghamshire: the *Reserve Number*, to his 1 year 4 months-old; bred by exhibitor; sire, "L. X."

Cotswolds—Shearling Rams.

Thomas Brown, Marham Hall Farm, Downham Market, Norfolk: First Prize, 20*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibtor.

Robert Lane, Cottage Farm, Eastington, Northleach: Second Prize, 10*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

Thomas Brown, Marham Hall Farm, Downham Market: Third Prize, 5*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

Thomas Brown, Marham Hall Farm, Downham Market: the *Reserve Number* to his 1 year 4 months 2 weeks-old; bred by exhibitor.

Cotswolds—Rams of any other Age.

T. Beale Browne, Salperton Park, Andoversford: First Prize, 20*l.*, for his 2 years 3 months 2 weeks-old; bred by exhibitor.

John Godwin, Troy Farm, Somerton, Deddington: Second Prize, 10*l.*, for his 2 years 2 months 3 weeks-old; bred by exhibitor.

John Godwin, Troy Farm: Third Prize, 5*l.*, for his 2 years 2 months 3 weeks-old; bred by exhibitor.

Thomas Brown, Marham Hall Farm, Downham Market: the *Reserve Number* to his 2 years 4 months 2 weeks-old; bred by exhibitor.

Cotswolds—Pens of Five Shearling Ewes of the same Flock.

John Gillett, Minster Lovell, Witney, Oxon: First Prize, 15*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

John Gillett, Minster Lovell: Second Prize, 10*l.*, for his 1 year 4 months-old; bred by exhibitor.

Robert Garne, Aldsworth, Northleach, Gloucestershire: Third Prize, 5*l.*, for his 1 year 4 months-old; bred by exhibitor.

John Gillett, Minster Lovell: the *Reserve Number* to his 1 year 4 months 2 weeks-old; bred by exhibitor.

**Cotswolds—For the best Ten Ewes, without reference to Age, who have suckled Lambs to June 1st.*

THE EXECUTORS of the late THOMAS GILLETT, Kilkenny Farm, Farringdon: FIRST PRIZE, 15*l.*; bred by the late Thomas Gillett.

JOHN WILLIAMS, Caercady, Cowbridge, Glamorganshire: the *Reserve Number*; bred by exhibitor.

**Cotswolds—For the best Ten Ram Lambs.*

JOHN GILLETT, Oaklands, Charlbury, Oxon: FIRST PRIZE, 10*l.*: bred by exhibitor.

CHARLES GILLETT, Lower Haddon, Bampton, Farringdon; the *Reserve Number*; bred by exhibitor.

Cotswolds—For the best Ram of any Age; Special Prize offered by the Right Hon. J. W. Henley, M.P.

JOHN GODWIN, Troy Farm, Somerton, Deddington, Oxon: FIRST PRIZE, 5*l.*, for his 2 years 3 months 2 weeks-old; bred by exhibitor.

WILLIAM COTHER, of Middle Aston: the *Reserve Number*, to his 5 years 4 months-old; bred by exhibitor.

Lincolns—Shearling Rams.

THOMAS GUNNELL, Milton, Cambridge: FIRST PRIZE, 20*l.*, for his 1 year 4 months-old; bred by exhibitor.

ROBERT WRIGHT, Nocton Heath, Nocton, Lincoln: SECOND PRIZE, 10*l.*, for his 1 year 4 months-old; bred by exhibitor.

ROBERT WRIGHT, Nocton Heath: THIRD PRIZE, 5*l.*, for his 1 year 4 months-old; bred by exhibitor.

ROBERT WRIGHT, of Nocton Heath: the *Reserve Number*, to his 1 year 4 months-old; bred by exhibitor.

Lincolns—Rams of any other Age.

HENRY DUDDING, Panton House, Wragby, Lincolnshire: FIRST PRIZE, 20*l.*, for his 2 years 3 months 3 weeks-old; bred by exhibitor.

HENRY DUDDING, Panton House: SECOND PRIZE, 10*l.*, for his 2 years 3 months 3 weeks-old; bred by exhibitor.

WILLIAM F. MARSHALL, Branston, Lincoln: THIRD PRIZE, 10*l.*, for his 4 years 4 months 2 weeks-old; bred by exhibitor.

HENRY DUDDING, Panton House: the *Reserve Number* to his 2 years 3 months 2 weeks-old; bred by exhibitor.

Lincolns—Pens of Five Shearling Ewes of the same Flock.

THOMAS CARTWRIGHT, Dunston Pillar, Lincoln: FIRST PRIZE, 15*l.*, for his 1 year 4 months 1 week-old; bred by exhibitor.

THOMAS CARTWRIGHT, Dunston Pillar: SECOND PRIZE, 10*l.*, for his 1 year 4 months 1 week-old; bred by exhibitor.

JOHN PEARS, Mere, Branston, Lincoln: the *Reserve Number* to his 1 year 4 months-old; bred by exhibitor.

Rylands and other Long-wools—Ram of any other Age than Shearling.

John Lynn, Church Farm, Stroxton, Grantham: First Prize, 20*l.*, for his 2 years 3 months old; bred by exhibitor.

John Thomas Pinches, Hardwick, Pembridge, Herefordshire: Second Prize, 10*l.*, for "Champion," 4 years 3 months 2 weeks 3 days-old; bred by exhibitor; sire "Tom Long," sire of dam "Heart of Oak."

Frederick Street, Harrowden House, Bedford: The *Reserve Number* to "Bury Royal," 4 years 4 months-old; bred by Mr. Hugh Aylmer, West Dereham, Stoke Ferry, Norfolk.

Rylands and other Long-wools.—Pens of Five Shearling Ewes, of the same Flock.

Thomas W. D. Harris, Wootton, Northamptonshire: First Prize, 15*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

Oxfordshire Downs—Shearling Rams.

George Wallis, Old Shifford, Bampton, Faringdon: First Prize, 20*l.*, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

George Wallis, Old Shifford: Second Prize, 10*l.*, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

Charles Hobbs, Maisey Hampton, Cricklade: Third Prize, 5*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

Frederick Street, Harrowden House, Bedford: The *Reserve Number*, to his 1 year 4 months-old; bred by exhibitor.

Oxfordshire Downs—Rams of any other Age.

George Wallis, Old Shifford: First Prize, 20*l.*, for his 2 years 5 months 2 weeks-old; bred by exhibitor.

George Wallis, Old Shifford: Second Prize, 10*l.*, for his 3 years 5 months 2 weeks-old; bred by exhibitor.

A. F. Milton Druce, Burghfield, Reading: Third Prize, 5*l.*, for his 2 years 5 months-old; bred by exhibitor.

James Longland, Crendon, Northampton: the *Reserve Number*, to his 3 year 4 months 1 week-old; bred by exhibitor.

Oxfordshire Downs—Pens of five Shearling Ewes of the same Flock.

George Wallis, Old Shifford: First Prize, 15*l.*, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

A. F. Milton Druce, Burghfield, Reading, Berkshire: Second Prize, 10*l.*, for his 1 year 5 months-old; bred by exhibitor.

Frederick Gillett, Upton Downs, Burford: Third Prize, 5*l.*, for his 1 year 3 months 3 weeks-old; bred by exhibitor.

Charles Gillett, Cote House, Bampton, Faringdon: the *Reserve Number*, to his 1 year 4 months 1 week 4 days old; bred by exhibitor.

**Oxfordshire Downs—For the best ten Ewes, without reference to Age, who have suckled Lambs to June 1st.*

John Treadwell, Upper Winchendon, Aylesbury: Prize, 15*l.*; bred by exhibitor.

Frederick Gillety, Upton Downs, Burford, Oxon: the *Reserve Number;* bred by exhibitor.

*Oxfordshire Downs—For the best ten Ram Lambs.

James Smith Parker, Iffley, Oxford: Prize, 10*l.*; bred by exhibitor.

William Chillingworth, Cuddesden, Wheatley, Oxon: the *Reserve Number;* bred by exhibitor.

*Oxfordshire Downs—For the best ten Ewe Lambs.

The Executors of the late W. Button, Eynsham, Oxon: Prize, 10*l.*; bred by exhibitor.

William Chillingworth, Cuddesden, Wheatley, Oxon: the *Reserve Number;* bred by exhibitor.

Southdowns—Shearling Rams.

Lord Walsingham, Merton Hall, Thetford: First Prize, 20*l.*, for his 1 year 4 months-old; bred by exhibitor.

Lord Walsingham: Second Prize, 10*l.*, for his 1 years 4 months-old; bred by exhibitor.

Lord Walsingham: Third Prize, 5*l.*, for his 1 year 4 months-old; bred by exhibitor.

Lord Walsingham: the *Reserve Number*, to his 1 year 4 months-old; bred by exhibitor.

Southdowns—Rams of any other Age.

Lord Walsingham, Merton Hall, Thetford: First Prize, 20*l.*, for his 2 years 4 months-old; bred by exhibitor.

Sir William Throckmorton, Bart., Buckland, Faringdon, Berks: Second Prize, 10*l.*, for his 2 years 3 months-old; bred by exhibitor; sire "Warwick."

Lord Walsingham, Merton Hall, Thetford: Third Prize, 5*l.*, for his 2 years 4 months-old; bred by exhibitor.

William Rigden, Hove, Brighton: the *Reserve Number*, to his 2 years 4 months old; bred by exhibitor.

Southdowns—Pens of five Shearling Ewes of the same Flock.

Lord Walsingham, Merton Hall, Thetford, Norfolk: First Prize, 15*l.*, for his 1 year 4 months-old; bred by exhibitor.

The Duke of Richmond, K.G., Goodwood, Chichester: Second Prize, 10*l.*, for his 1 year 4 months-old; bred by exhibitor.

William Rigden, Hove, Brighton: Third Prize, 5*l.*, for his 1 year 4 months-old; bred by exhibitor.

Lord Sondes, Elmham Hall, Thetford, Norfolk: the *Reserve Number*, to his 1 year 4 months-old; bred by exhibitor.

Shropshires—Shearling Rams.

John Coxon, Freeford Farm, Lichfield, Staffordshire: First Prize, 20*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor; sire "Commander," sire of dam "Novelty."

THOMAS MANSELL, Adcott Hall, Baschurch, Shropshire: SECOND PRIZE, 10*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor; sire of dam "Short-legged Patentee."

MRS. BEACH, the Hattons, Brewood, Penkridge, Staffordshire: THIRD PRIZE, 5*l.*, for her 1 year 3 months 1 week 4 days old; bred by exhibitor.

LORD CHESHAM, Latimer, Chesham, Bucks: the *Reserve Number*, to his 1 year 3 months 1 week-old; bred by exhibitor.

Shropshires—Rams of any other Age.

JOHN EVANS, Uffington, Shrewsbury: FIRST PRIZE, 20*l.*, for "Standard Bearer," 3 years 3 months 3 weeks-old; bred by Mr. R. H. Masfen, Pendeford, Wolverhampton; sire, Crane's "Corsair;" sire of dam, "Mainstay."

MRS. BEACH, The Hattons, Brewood, Penkridge: SECOND PRIZE, 10*l.*, for her 2 years 3 months 2 weeks-old; bred by the late Mr. Joseph Beach, The Hattons.

MRS. BEACH, The Hattons: THIRD PRIZE, 5*l.*, for her 2 years 3 months 3 weeks-old; bred by the late Mr. Joseph Beach.

THOMAS MANSELL, Adcott Hall, Baschurch, Salop; the *Reserve Number*, to his 2 years 4 months 3 weeks-old; sire, "Conservative."

Shropshires—Pens of Five Shearling Ewes of the same Flock.

LORD CHESHAM, Latimer, Chesham, Bucks: FIRST PRIZE, 15*l.*, for his about 1 year 3 months 2 weeks-old; bred by exhibitor.

JOHN HANBURY BRADBURNE, Pipe Place, Lichfield: SECOND PRIZE, 10*l.*, for his 1 year 4 months-old; bred by exhibitor; sires, "Cross Wood Hero" and "Pretender."

LORD SUDELEY, Toddington, Winchcombe, Gloucestershire: THIRD PRIZE, 5*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor; sire, "Commonwealth;" sire of dam, "Competition."

JOHN HANBURY BRADBURNE, of Pipe Place, Lichfield: the *Reserve Number* to his 1 year 4 months-old; bred by exhibitor; sires, "Cross Wood Hero" and "Pretender."

Hampshires and other Short Wools—Shearling Rams.

ALFRED MORRISON, Fonthill House, Tisbury, Wilts: FIRST PRIZE, 20*l.*, for his 1 year 5 months 1 week-old; bred by exhibitor.

JAMES RAWLENCE, Bulbridge, Wilton, Salisbury: SECOND PRIZE, 10*l.*, for his about 1 year 5 months 2 weeks-old; bred by exhibitor.

JAMES RAWLENCE, Bulbridge, Wilton: THIRD PRIZE, 10*l.*, for his about 1 year 5 months 2 weeks-old; bred by exhibitor.

ALFRED MORRISON, Fonthill: the *Reserve Number* to his 1 year 5 months 2 weeks-old; bred by exhibitor.

Hampshires and other Short Wools—Rams of any other Age.

JAMES RAWLENCE, Bulbridge, Wilton, Salisbury: FIRST PRIZE, 20*l.*, for his about 3 years 5 months 2 weeks-old; bred by exhibitor.

JOHN and MATTHEW ARNOLD, Westmeon, Petersfield, Hants: SECOND PRIZE, 10*l.*, for "Bluegown," 2 years 5 months-old; bred by exhibitors.

Stephen King, Bockhampton Farm, Lambourne, Berks: Third Prize, 5*l.*, for his 3 years 3 months 2 weeks-old; bred by exhibitor.

John Robson, Bymess, Rochester, Northumberland: the *Reserve Number*, to "Manchester," 2 years 2 months 2 weeks-old; bred by exhibitor; sire, "Harry."

Hampshires and other Short Wools—Pens of Five Shearling Ewes of the same Flock.

James Rawlence, Bulbridge, Wilton: First Prize, 15*l.*, for his about 1 year 5 months 2 weeks-old; bred by exhibitor.

James Rawlence, Bulbridge: Second Prize, 10*l.*, for his about 1 year 5 months 2 weeks-old; bred by exhibitor.

John Barton, Hackwood Farm, Basingstoke, Hampshire: Third Prize, 5*l.*, for his 1 year 5 months 2 weeks-old: bred by exhibitor.

John Pittman King, North Stoke, Wallingford, Berks: the *Reserve Number*, to his 1 year 4 months 3 weeks-old; bred by exhibitor.

Dorsets—Shearling Rams.

Henry Mayo, Cokers Frome, Dorchester: First Prize, 20*l.*, for his 1 year 6 mouths 2 weeks old; bred by exhibitor.

James William James, Mappowder Court, Blandford: Second Prize, 10*l.*, for his 1 year 6 months-old; bred by exhibitor.

Herbert Farthing, Nether Stowey, Bridgewater, Somerset: the *Reserve Number*, to "Duke of Stowey," 1 year 6 months-old; bred by exhibitor.

Dorsets—Pens of Five Shearling Ewes.

Herbert Farthing, Nether Stowey, Bridgewater: First Prize, 15*l.*, for his 1 year 6 months-old; bred by exhibitor.

Abraham Bond, Huntstile, Bridgewater: Second Prize, 5*l.*, for his 1 year 7 months-old; bred by exhibitor.

Henry Mayo, Cokers Frome, Dorchester: the *Reserve Number*, to his 1 year 6 months 1 week-old; bred by exhibitor.

PIGS.

Boars of a Large White Breed, above Twelve Months old.

James and Frederick Howard, Britannia Farm, Bedford: First Prize, 10*l.*, for "Victor 2nd," 2 years 1 week 1 day-old; bred by exhibitors; sire, "Victor 1st;" dam, "Longville;" sire of dam, "Gold Spur."

Richard Elmhirst Duckering, Northorpe, Kirton-Lindsey: Second Prize, 5*l*,, for "Cultivator 5th," 5 years 3 weeks-old; bred by exhibitor; sire, "Victor;" dam, "Princess Royal;" sire of dam, "Cultivator 1st."

Peter Eden, Cross Lane, Salford, Manchester: the *Reserve Number*, to "Sampson," 2 years 8 months old; bred by exhibitor; sire, "Hero;" dam, "Matchless;" sire of dam, "Fairwind."

Boars of a Large White Breed, above Six and not exceeding Twelve Months old.

Matthew Walker, Stockley Park, Anslow, Burton-on-Trent, Staffordshire: First Prize, 10*l.*, for "Hero," 9 months 2 weeks 6 days-old; bred by exhibitor; sire, "Sea Boy;" dam, "Bright Eve;" sire of dam, "Brutus."

Matthew Walker, Stockley Park: Second Prize, 5*l.*, for "Alfred the Great," 11 months 4 weeks 1 day-old; bred by exhibitor; sire, "Sea Boy;" dam, "Bright Eve;" sire of dam, "Brutus."

George Chapman, of Seamere, Scarborough, Yorkshire: the *Reserve Number*, to "Yorkshireman" 11 months 1 week 3 days-old; bred by exhibitor: sire, "Blair Athol;" dam, "The Village Pride;" sire of dam, "Fairwind."

Boars of a Small White Breed, above Twelve Months old.

Henry Neild, The Grange, Worsley, Manchester: First Prize, 10*l.*, for "The Doctor," 1 year 8 months 2 weeks 1 day-old; bred by W. E. Kershaw, Esq., Beech House, Middleton, Manchester; sire, "King of Trumps;" dam, "Kate."

Peter Eden, Cross Lane, Salford, Manchester: Second Prize, 5*l.*, for "Young King of the West," 3 years 3 weeks 5 days-old; bred by Mr. Hatton, Addingham, Leeds; sire, "Old King;" dam, "Miss Lucy."

William Hatton, Addingham, Leeds: the *Reserve Number*, to his 1 year 1 month-old; bred by exhibitor; sire, "Joseph 2nd;" dam, "Miss Lucy;" sire of dam, "Young King of the West."

Boars of Small White Breed, above Six and not exceeding Twelve Months old.

Peter Eden, Cross Lane, Salford, Manchester: First Prize, 10*l.*, for "Young Prince," 10 months 2 weeks 3 days-old; bred by exhibitor; sire, "Old Prince;" dam, "Violet;" sire of dam, "King Lear 1st."

William Hatton, Addingham, Leeds: Second Prize, 5*l.*, for "Dreadnought," 8 months 1 day-old; bred by exhibitor; sire, "Joseph 2nd." dam, "Rosebud:" sire of dam, "Old King of the West."

William Parker, Golden Lion Hotel, Leeds Road, Bradford, Yorkshire: the *Reserve Number*, to "Roger," 10 months 3 days-old; bred by Mr. W. Garnett, Idle, Leeds; sire, "Sagar's Pretender."

Boars of a Small Black Breed.

George M'Cann, Court Farm, Malvern, Worcestershire: First Prize, 10*l.*, for "Wallace," 1 year 1 month 1 week 4 days-old; bred by exhibitor.

Samuel Geater Stearn, Brandestone, Wickham Market, Suffolk: Second Prize, 5*l.*, for "The Parson," 11 months 4 weeks 1 day-old; bred by Mr. Herman Biddell, Playford, Ipswich.

George Mumford Sexton, Whersted Hall, Ipswich: the *Reserve Number*, to "Kingcraft," 10 months 1 week 5 days old; bred by exhibitor; sire, "Lord Lyons;" dam, "Princess of Wales;" sire of dam, "Battersea Prince."

Boars of the Berkshire Breed.

George Griggs, Oaklands, Romford, Essex: First Prize, 10*l.*, for "Prince," black, little white, 2 years 5 months 3 weeks old; bred by exhibitor; sire, "King of the Valley;" dam, "Princess."

Russell Swanwick, Royal Agricultural College Farm, Cirencester, Gloucestershire: Second Prize, 5*l.*, for Sambo 2nd," black and white, 1 year 1 month 1 day-old; bred by exhibitor; sire, "Othello;" dam, "Sally 3rd."

Heber Humfrey, Kingstone Farm, Shrivenham, Berkshire: the *Reserve Number*, to "No. 293 M," black, white points, 11 months 3 weeks 5 days-old; bred by exhibitor; sire, "Souse Genteel;" dam, "Butter-basket."

Boars of a Breed not eligible for the preceding classes.

John Edward Fox, Mansion House, Great Horton, Bradford, Yorkshire: First Prize, 10*l.*, for "Young Prince of Airedale," white, 1 year 1 month 6 days-old; bred by Sir Charles Tempest Bart., Broughton Hall, Skipton; sire, "Young Prince of Airedale."

Peter Eden, Cross Lane, Salford, Manchester: Second Prize, 5*l.*, for "King Lear 3rd," white, 1 year 11 months-old; bred by exhibitor; sire, "King Lear 2nd;" dam, "May Queen."

Richard Elmhirst Duckering, Northorpe, Kirton-in-Lindsey, Lincolnshire: the *Reserve Number*, to "Wallace 2nd," white, 1 year 10 months 2 weeks-old; bred by exhibitor; sire, "Cultivator 5th;" dam, "Minna;" sire of dam, "Cultivator 3rd."

Breeding Sows of a Large White Breed.

Matthew Walker, Stockley Park, Anslow, Burton-on-Trent, Staffordshire: First Prize, 10*l.*, for "Thalia," 2 years 5 months 1 week-old; bred by exhibitor; sire, "Robin Hood;" dam, "Perfume 2nd;" sire of dam, "Brutus."

James and Frederick Howard, Britannia Farms, Bedford: Second Prize, 5*l.*, for "Longville 2nd," 2 years 1 week 1 day old, in-pig; bred by exhibitors; sire, "Victor 1st.;" dam, "Longville;" sire of dam, "Golden Spur."

Richard Elmhirst Duckering, Northorpe, Kirton-Lindsey: the *Reserve Number*, to "Princess Royal," 1 year 10 months 2 days-old; bred by exhibitor; sire "Cultivator 4th;" dam, "Countess;" sire of dam, "Cultivator 1st."

Breeding Sows of a Small White Breed.

William Hatton, Addingham, Leeds: First Prize, 10*l.*, for "Pride of the Village," 1 year 10 months 2 weeks 1 day-old; bred by exhibitor; sire, "Young King of the West;" dam, "Lady Havelock;" sire of dam, "Joseph the First."

Peter Eden, Cross Lane, Salford, Manchester: Second Prize, 5*l.*, for "Sunshine," age and breeder unknown.

William Hatton, Addingham: the *Reserve Number*, to "Charming May," 2 years 1 month 1 day-old in-pig; bred by exhibitor; sire, "Young King of the West;" dam, "Queen of the West;" sire of dam, "Old King of the West."

Breeding Sows of a Small Black Breed.

Samuel Geater Stearn, Brandeston, Wickham Market, Suffolk: First Prize, 10*l.*, for "Aunt Hannah," 1 year 5 months-old (in pig); bred by Mr. H. Biddell, Playford, Woodbridge.

George Mumford Sexton, Wherstead Hall, Ipswich, Suffolk: Second Prize, 5*l.*, for "Hester," 1 year 2 months 4 weeks-old (in pig); bred by exhibitor; sire, "Stockwell;" dam, "Queen May."

George Mumford Sexton, Wherstead Hall, Ipswich: the *Reserve Number*, to "Sunshine," 1 year 2 months 4 weeks-old; bred by exhibitor; sire, "Stockwell;" dam, "Queen May."

Breeding Sows of the Berkshire Breed.

Arthur Stewart, Saint Bridge, Gloucester: First Prize, 10*l.*, for "Duchess," black, little white, 1 year 4 weeks-old (in-pig); bred by exhibitor; sire, "Sampson;" dam, "Old Sally."

Russell Swanwick, Royal Agricultural College Farm: Second Prize, 5*l.*, for "Sally 5th," black and white, 1 year 1 month 1 day-old (in-pig); bred by exhibitor; sire, "Othello 1st;" dam, "Sally 3rd."

Arthur Stewart, Saint Bridge, Gloucester: the *Reserve Number*, to "Princess," black, little white, 1 year 4 weeks-old (in-pig); bred by exhibitor; sire, "Sampson;" dam, "Old Sally."

Breeding Sows of a Breed not eligible for the preceding Classes.

Peter Eden, Cross Lane: First Prize, 10*l.*, for "Busy Bee," white, 3 years 5 months 4 days-old; bred by exhibitor; sire, "King Lear 1st;" dam, "Pride of the Village;" sire of dam, "King Lear 1st."

Richard Elmhirst Duckering, Northorpe, Kirton-Lindsey: Second Prize, 5*l.*, for "Primrose," white, blue spots, 2 years 2 months 1 week-old; bred by exhibitor; sire, "Dreadnought;" dam, "Primrose;" sire of dam, "Comet."

William Hatton, Addingham, Leeds, Yorkshire, the *Reserve Number*, to "Queen of the West," white, 2 years 6 months 1 day-old (in-pig); bred by exhibitor; sire, "Old King of the West."

Pens of Three Breeding Sow Pigs of a Large White Breed, of the same Litter, above Four and under Eight Months old.

Richard Elmhirst Duckering, Northorpe, Kirton-Lindsey, Lincolnshire; First Prize, 10*l.*, for his 7 months 3 weeks 6 days-old; bred by exhibitor: sire, "Samson;" dam, "British Queen;" sire of dam, "Cultivator 1st."

Matthew Walker, Stockley Park, Anslow, Burton-on-Trent, Staffordshire: Second Prize, 5*l.*, for "Three Graces," 7 months 4 weeks -old; bred by exhibitor; sire, "Forest Boy;" dam, "Duchess;" sire of dam, "Robin Hood."

James and Frederick Howard, Britannia Farms, Bedford: the *Reserve Number*, to their 7 months-old; bred by exhibitors; sire, "Emperor;" dam, "Longville 2nd;" sire of dam, "Victor 1st."

Pens of Three Breeding Sow Pigs of a Small White Breed, of the same Litter, above Four and under Eight Months old.

George Mumford Sexton, Wherstead Hall, Ipswich, Suffolk: First Prize, 10*l.*, for "We Challenge All," 7 months 3 weeks 4 days-old; bred by exhibitor; sire, "Bodger Crutchley;" dam, "Queen of the East;" sire of dam, "Sir Colin."

PETER EDEN, Cross Lane, Salford, Manchester: SECOND PRIZE, 5*l.*, for his 7 month 1 week 3 days-old; bred by exhibitor; sire, "Tommy Dodd;" dam, "Fairy;" sire of dam, "Lord Nelson."

Pens of Three Breeding Sows of a Small Black Breed, of the same Litter, above Four and under Eight Months old.

GEORGE TURNER, jun., Alexton, Uppingham, Leicestershire: FIRST PRIZE, 10*l.*, for his 6 months 2 weeks 3 days-old (Improved Essex); bred by exhibitor.

Pens of Three Breeding Sow Pigs of the Berkshire Breed, of the same Litter, above Four and under Eight Months old.

RUSSELL SWANWICK, Royal Agricultural College Farm, Cirencester: FIRST PRIZE, 10*l.*, for his black and white, 6 months 3 weeks 5 days-old; bred by exhibitor; sire, "Othello 1st;" dam, "Sally 3rd."

RICHARD FOWLER, Broughton Farm, Aylesbury, Buckinghamshire: SECOND PRIZE, 5*l.*, for his black and white, 6 months 3 weeks 2 days-old; bred by exhibitor.

RICHARD FOWLER, Broughton Farm, Aylesbury: the *Reserve Number*, to his black and white, 7 months 2 weeks-old; bred by exhibitor.

Pens of Three Breeding Sow Pigs of a Breed not eligible for the preceding Classes, of the same Litter, above Four and under Eight months old.

MATTHEW WALKER, Stockley Park, Anslow, Burton-on-Trent, Staffordshire: FIRST PRIZE, 10*l.*, for "Thalia," "Teresa," "Tiny," white, 7 months 3 weeks 6 days-old; bred by exhibitor; sire, "Forest Boy;" dam, "Thalia 2nd;" sire of dam, "Robin Hood.'

GEORGE CHAPMAN, Seamere, Scarborough, Yorkshire: SECOND PRIZE, 5*l.*, for "Three Lilies," white, 7 months 1 week 4 days-old; bred by exhibitor; sire, "The Boy in Blue;" dam, "Crocus 2nd; sire of dam, "King of the North."

For the best Berkshire Boar, Sow, and their Offspring; the latter to be under Twelve weeks old.

HEBER HUMFREY, Kingstone Farm, Shrivenham, Berkshire: PRIZE, 10*l.*, for his boar, "Royal Oak," 1 year 7 months 3 weeks 4 days-old; sire, "Rainbow;" dam, "No. 249 A;" sire of dam, "No 144: sow, "Beauty Bewitched," 3 years 1 month-old; bred by exhibitor.

SIR WILLIAM THROCKMORTON, Bart., Buckland, Farringdon, Berkshire: the *Reserve Number*, to his boar, 1 year 2 months 2 weeks-old; sow, 2 years 10 months-old; bred by exhibitor.

For the best Pair of Berkshire Boars, from one Litter, under Six Months old.

HEBER HUMFREY, Kingstone Farm, Shrivenham, Berkshire: PRIZE, 10*l.*, for "Nos. 314 M and N," 5 months 1 week 1 day-old; bred by exhibitor; sire, "No. 297 M;" dam, "No. 251 A."

The Executors of the late William Hewer, of Sevenhampton, Highworth, Wiltshire: the *Reserve Number* to their 5 months 4 weeks 1 day-old; bred by the late W. Hewer; sire, "Sennington Lad 5th;" dam, "Julia;" sire of dam, "Wiltshire Lad."

IMPLEMENTS.

Fixed Steam-Engines of Four-horse Power with Boiler combined.

Clayton and Shuttleworth, Lincoln: First Prize, 9*l.*, to No. 7171.
Brown and May, Devizes: Second Prize, 6*l.*, to No. 6891.
The Reading Iron Works Company, Reading: Third Prize, 5*l.*, to No. 4009.
Marshall, Sons, and Co., Gainsborough: Highly Commended, for No. 7081.
Robey and Co., Lincoln: Commended, for 7110.
Davey, Paxman, and Davey, Colchester: Commended, for 7100.

Fixed Steam-Engines above Four-horse and not exceeding Ten-horse Power, to be worked by an independent boiler.

Clayton and Shuttleworth .. } equal { 11*l.* 5*s.*, to No. 7172.
The Reading Iron Works Company } equal { 11*l.* 5*s.*, to No. 4010.
Marshall, Sons, and Co.: Third Prize, 7*l.* 10*s.*, to No. 7082.

Horse Gears for One Horse.

Woods, Cocksedge, and Warner, Stowmarket: First Prize, 5*l.*, to No. 4038.
Richmond and Chandler, Salford, Manchester } equal { 2*l.* 10*s.*, to No. 4889.
R. Hunt, Earl's Colne, Halstead, Essex .. .. } equal { 2*l.* 10*s.*, to No. 1099.
Hunt and Pickering, Leicester: Highly Commended, for No. 2024.
Coleman and Morton, Chelmsford: Commended, for No. 1697.
Thomas Corbett, Shrewsbury: Commended, for No. 6338.
The Reading Iron Works Company: Commended, for No. 4011.

Horse Gears for Two Horses.

Woods, Cocksedge and Warner: First Prize, 5*l.*, to No. 4042.
E. R. and F. Turner, Ipswich } equal { 2*l.* 10*s.*, to No. 4834.
Richmond and Chandler .. } equal { 2*l.* 10*s.*, to No. 4890.
R. Hunt: Highly Commended, for No. 1097.
Mellard's Trent Foundry, Rugeley: Highly Commended, for No. 5222.
Coleman and Morton: Commended, for No. 1698.
Woods, Cocksedge and Warner: Commended, for No. 4041.
Thomas Corbett: Commended, for No. 6339.
Williamson, Brothers, Kendal: Commended, for 6736.

Agricultural Mills with Stone Grinders, for Steam or Horse Power.

John Weighell, Pickering: First Prize, 8*l.*, to No. 6751.
E. R. and F. Turner: Second Prize, 7*l.*, to No. 4836.

Marshall, Sons, and Co.: Third Prize, 5*l.*, to No. 7083.
The Reading Iron Works Company: Commended, for No. 4014.

Agricultural Mills with Metal Grinders, for Steam or Horse Power.

Amies, Barford and Co., Peterborough: First Prize, 8*l.*, to No. 208.
Thomas Corbett: Second Prize, 7*l.*, to No. 6340.
E. and H. Roberts, Deanshanger, Stony Stratford: Third Prize, 5*l.*, to No. 5954.
Smith and Grace, Thrapston, Northampton: Commended, for No. 1671.

Corn Crushers for Steam or Horse Power.

Ransomes, Sims, and Head, Ipswich: First Prize, 6*l.*, to No. 1017.
E. H. Bentall, Heybridge, Maldon: Second Prize, 5*l.*, to No. 933.
Woods, Cocksedge, and Warner, Stowmarket: Third Prize, 4*l.*, to No. 4045.
E. R. and F. Turner: Commended, for No. 4838.

Corn Crushers for Hand-Power.

E. H. Bentall: First Prize, 6*l.*, to No. 934.
Woods, Cocksedge and Warner: Second Prize, 4*l.*, to No. 4047.

Linseed Crushers by Steam or Horse Power.

E. R. and F. Turner: The Prize, 5*l.*, to No. 4840.

Linseed Crushers for Hand Power.

E. R. and F. Turner: First Prize, 6*l.*, to No. 4841.
Woods, Cocksedge, and Warner: Second Prize, 4*l.*, to No. 4052.

Chaff-Cutters for Steam or Horse Power.

Richmond and Chandler: First Prize, 10*l.*, to No. 4881.
E. H. Bentall .. .. } equal { 5*l.*, to No. 959.
Picksley, Sims and Co., Leigh, Manchester } equal { 5*l.*, to No. 3182.
Carson and Toone: Highly Commended, for No. 2669.
Cornes and Co., Barbridge, Nantwich: Commended, for No. 2782.
T. Allcock, Ratcliffe-on-Trent, Commended, for No. 1690.

Chaff-Cutters for Hand Power.

Richmond and Chandler: First Prize, 6*l.*, to No. 4877.
Picksley, Sims and Co.: Second Prize, 4*l.*, to No. 3183.
Smith and Grace: Highly Commended, for No. 1673.
E. H. Bentall: Highly Commended, for No. 947.

Oilcake-Breakers for Steam or Horse Power.

Amies, Barford and Co.: First Prize, 6*l.*, to No. 214.
E. R. and F. Turner: Second Prize, 5*l.*, to No. 4842.
Hunt and Pickering: Third Prize, 4*l.*, to No. 2032.

Oilcake-Breakers for Hand Power.

Amies, Barford, and Co.: First Prize, 6*l.*, to No. 225.
Mellard's Trent Foundry Company: Second Prize, 4*l.*, to No. 5320.
S. Corbett and Son, Park Street, Wellington, Salop: Commended, for No. 6877.

Turnip and Root-Cutters.

R. Hornsby and Sons, Spittlegate, Grantham: First Prize, 7*l.*, to No. 1308.
Hunt and Pickering .. } equal { 4*l.*, to No. 2033.
R. Hunt .. .. .. } equal { 4*l.*, to No. 1105.

Root Pulpers.

R. Hornsby and Sons: First Prize, 7*l.*, to No. 1315, for steam or horse power.
Picksley, Sims and Co.: Second Prize, 4*l.*, to No. 3189, for steam or horse power.
R. Hornsby and Son: Prize, 4*l.*, to No. 1313, specially adapted for hand power.
Picksley, Sims and Co.: Highly Commended, for No. 3190, specially adapted for hand power.
T. Corbett: Commended, for No. 6346, for steam or horse power.
S. Corbett and Son: Commended, for No. 6879, specially adapted for hand power.

Steaming Apparatus for preparing Food for Stock.

Amies, Barford and Co.: First Prize, 12*l.*, to No. 232. Second Prize, 8*l.*, to No. 235.

Churns worked by Hand Power.

Robert Tinkler, Penrith: First Prize, 4*l.*, to No. 4416.
George Hathaway, Chippenham: Second Prize, 3*l.* 10*s.*, to No. 575.
Thomas Bradford and Co., 63, Fleet Street, London, Third Prize, 2*l.* 10*s.*, to No. 570.
Thomas and Taylor, Victoria Bridge, Salford, Manchester: Highly Commended, for No. 5184.
Robinson and Richardson, Highgate, Kendal: Commended, for No. 3549.
William Waide, 5, South Brook Street, Hunslet Lane, Leeds: Commended, for No. 2237.

Churns worked by any other power.

Robert Tinkler: First Prize, 4*l.* 10*s.*, to No. 4422.
Robinson and Richardson: Second Prize, 3*l.*, to No. 3550.
T. Bradford and Co: Third Prize, 2*l.* 10*s.*, to No. 572.

Churns specially adapted to small occupations.

T. Bradford and Co: First Prize, 4*l.*, to No. 564.
Philip Johnstone, 290, Oxford Street, London: Second Prize, 3*l.*, to No. 3412.

Cheese Tubs.

Mellard's Trent Foundry: a Prize, 3*l.*, to No. 5235.

Cheese Presses.

Southwell and Co., Rugeley: First Prize, 4*l.* 10*s.*, to No. 4187.
Mellard's Trent Foundry Company: Second Prize, 3*l.*, to 5236.
James Cornes and Co., Barbridge, Nantwich: Third Prize, 2*l.* 10*s.*, to No. 2798.

Miscellaneous Dairy Utensils.

James Cornes and Co.: Prize, 2*l.* 10*s.*, to No. 2798, Curd Drainer.
Southwell and Co: Prize, 2*l.* 10*s.*, to No. 4188, Curd Mills.
Carson and Toone, Warminster: Prize, 2*l.* 10*s.*, to No. 2690, Cheese Turner and for general collection of cheese-making apparatus.
Alway and Son, 37, Chapel Street, Pentonville, London: Prize, 2*l.* 10*s.*, for general collection of utensils for Butter Making.
W. and F. Richmond, Colne, Lancashire: Highly Commended, No. 5919 to 5946, Milk Tankards and Improved Milk Carriages.
The Atmospheric Churn Company, 119, New Bond Street, London: Highly Commended, No. 6436 to 6454, Atmospheric Churns.

Bone Mills.

The Beverley Iron and Waggon Company, Beverley: First Prize, 9*l.*, to No. 1504, and Second Prize, 6*l.*, to No. 1505.
W. Crosskill and Sons, Beverley: Third Prize, 5*l.*, to No. 623.

Coprolite Mills.

E. R. and F. Turner: The Prize, 10*l.*, to Nos. 4844-5-6.

Flax Breaking Machines.

John Eliot Hodgkin, West Derby, Liverpool: First Prize, 6*l.*, to No. 7199, for steam or horse power. Second Prize, 4*l.*, to No. 7202, for hand power.

Machines for the Manufacture of Draining Tiles.

J. D. Pinfold, Rugby: Prize, 8*l.*, to No. 6675, for steam or horse power.
John Whitehead, Preston, Lancashire: Prize, 7*l.*, to No. 6604, for hand power.
Edward Page and Co., Bedford: Commended, to No. 4439, for hand power.

Draining Tools.

Hunt and Pickering: First Prize, 6*l.*, to No. 2137.
Clarke and Son, Brackley: Second Prize, 4*l.*, to No. 5774.
F. Parkes and Co., Birmingham: Highly Commended, for No. 4576.

MISCELLANEOUS AWARDS.

Silver Medals.

Amies, Barford and Co., Peterborough: No. 196, Portable Metal Corn Grinding Mill with Dressing Apparatus.

Amies, Barford and Co.: Nos. 245-6, Campain's Patent Anchors for Steam Cultivation.

William Barton, Bargate, Boston, Lincolnshire: No. 5809, a Cottager's Patent Cooking Stove.

J. and F. Howard, Bedford: No. 5437, Patent Self-acting appliance to Horse-Rake.

Gilbert Murray, Estate Office, Elvaston Castle, Derby: Nos. 7747-8-9, a Collection of Models for a Cheese Factory.

Henry Pooley and Son, Albion Foundry, Liverpool: No. 6631, Automatic Grain Scale.

Robey and Co., Lincoln: No. 7113, Patent Self-feeding Apparatus for Threshing Machine.

J. and B. Sainty, Wisbeach: No. 3478, Patent Wood Covering for Temporary Buildings, Walls, &c.

James Sinclair, 46, Corporation Street, Manchester: Nos. 6696-7, Chemical Fire Engines.

Robert Maynard, Whittlesford, Cambridge: No. 3169, Patent Portable Steam-Power Sifting Chaff Engine.

Highly Commended.

Amies, Barford and Co.: No. 240, Steam Cooking Apparatus.

Thomas Baker, Compton, Newbury, No. 797, Tip-Cart for Scavenging.

William Ball and Son, Rothwell, Kettering: No. 2260, Patent Double Break on Waggon.

Barrows and Stewart, Banbury: No. 694, Improved Windlass for Steam Cultivation.

The Beverley Iron and Waggon Company: No. 1513, Self-Acting Sheaf Delivery to Reaping Machine.

Thomas Corbett, Shrewsbury: No. 6350, Improvement in Hand Clover-Seed Barrow.

James Davey, Eynsham, Oxford: No. 7552, Improved Cart Harness.

John Fowler and Co., Leeds: No. 2811, Traction Engine on Springs.

David Hart and Co., Wenlock Road, City Road, London: No. 1914, Patent Automatic Self-Acting and Self-Registering Corn-Weighing Machine.

Holmes and Son, Norwich: No. 2147, Improvement in Hay and Corn Elevator.

Hornsby and Sons, Spittlegate, Grantham: No. 1338, combined Corn Dressing and Screening Machine.

Thomas Hunter, Maybole, Ayr: No. 5913, Dickson's Patent Double Drill Turnip Cleaner.

T. M'Kenzie and Sons, 34, Dawson Street, Dublin, No. 6033, Reaper and Mower Knife Grinder.

G. W. Murray and Co., Banff, N.B., No. 5555, Double-Furrow Plough and Sub-soiler.

Thomas Perkins, Hitchin: No. 337, Patent Folding Shafts for Mowing Machines.

W. Rainforth and Son, Brayford Head, Lincoln: No. 4701, Improved Patent Corn Screen.

Richmond and Chandler, Salford, Manchester: No. 4883, a Litter Cutter.

J. and B. Sainty: No. 3472, Improved Cattle Crib.

Southwell and Co., Rugeley: No. 4201, Improvement in Ridging Plough.
William Smith, Foston Lowthorpe, Driffield: No. 3324, Self-Feeding Sheep Rack.
W. R. Thomson, 3, Moray Place, Edinburgh: No. 6747, Patent Road Steam-Engine.

Commended.

J. P. Barford, Banbury: No. 169, Improved Carriage Jack.
Henry Denton, Wolverhampton: No. 1477, improvement in Chain Harrow Carriage.
T. M'Kenzie and Sons, 34, Dawson Street, Dublin: No. 6044, improvements in Turnip and Mangold Drills.
H. J. and C. Major, Bridgwater: No. 7822, Roofing Tiles.
J. and B. Sainty: No. 3471, improvement in Field Gate, and No. 3476, Sheep Fencing.
Richard Winder, Farningham, Dartford: No. 3382, Machine for Tarring Sheep-fold Netting.

FARM PRIZES.

First Prize, a Silver Cup, value 100 Guineas, offered by James Mason, Esq., late High Sheriff of Oxfordshire, to Mrs. Mary Elizabeth Millington, of Ash Grove Farm, Ardley, Bicester.

Second Prize, of 50*l.*, offered by the Society, to Mr. John Treadwell, of Upper Winchendon, Aylesbury.

Third Prize, 25*l.*, to Robert Craddock, of Lyneham, Chipping Norton.

Commended, the Farms occupied by Mr. Nathaniel Stilgoe, of Adderbury Grounds, Adderbury; Mr. Zachariah Stilgoe, of Adderbury, near Banbury; and William Denchfield, of Easington, near Banbury.

The Judges consider the Sheep management of Thomas Latham, of Little Wittenham, Abingdon, worthy of the highest praise.

AGRICULTURAL EDUCATION.

Examination Papers, 1870.

EXAMINATION IN AGRICULTURE.

Maximum Number of Marks, 200. Pass Number, 100.

Tuesday, April 26th. Morning, 10 *a.m. till* 1 *p.m.*

1. Suppose a farm of 500 acres consisting of moderately light land, of which four-fifths are arable. Describe the best rotation of crops suitable for it. State the number of acres which should be under cultivation for roots per annum. Name the different kinds of roots, or other green crops in place of roots, which should be planted.

2. Describe the best manner of preparing light land for roots, from the time of taking away, or otherwise disposing of the previous crop, until the land is fit for the reception of the seed at the proper season. State also the proper time of sowing the seed, the quantity of manure (farmyard or artificial, or both), to be applied, and the quantity of mangold seed and of turnip seed per acre.

3. To what crops should you apply farmyard manure? and at what times?

4. What would be the horse-power required per 100 acres on such a farm as that described in No. 1 question?

5. What would be the horse-power required per 100 acres on a farm of 1000 acres (four-fifths arable) of heavy land, presuming a set of Fowler's double-engine steam-tackle to be also in use whenever required?

6. State the kinds of live-stock required, and the number of each kind, on a farm as described in question No. 1?

7. State the kinds of live-stock required, and the number of each kind, on a farm as described in question No. 5, presuming the grass-land be worth 50*s.* per acre.

8. Describe the best method of draining different descriptions of land, namely:—Clay soils, comparatively porous soils, and also wet gravel or other soil; giving depth, width between drains, and cost per acre.

9. When is the proper time for cutting grass intended for hay? Describe the best method of haymaking. What are the signs of the hay being fit for carting to the rick?

10. What general principles should guide us in the selection of cattle required for grazing?

11. Give in detail the best method to be pursued with weaning

calves until six months old, with their general management until two years old.

12. State the number of hands required at the rick in harvest time to keep two pitchers employed on a good crop of mown wheat, and also the number of horses and carts, or horses and waggons, supposing the field to be half a mile from the rick yard.

Afternoon, viva voce *examination commencing at* 2 *o'clock.*

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

I. General Chemistry.

Wednesday, April 27th; Morning, 10 *a.m. till* 1 *p.m.*

1. Explain the reason of the difference of the temperatures indicated by a thermometer with its bulb covered with wet muslin, and one which is uncovered. Under what circumstances will there be no difference in their indications?

2. Explain the formation of dew, and why there is so little dew on cloudy and on windy nights; also, why there is more dew usually on grass than on a gravel path.

3. Describe the elements nitrogen, phosphorus, and arsenic; compare them one with another as regards the compounds they form with other elements, particularly with hydrogen and oxygen. How may ammonia be obtained from nitric acid?

4. Describe the preparation of (1) hydrochloric acid, and (2) caustic soda. Explain fully how to determine the strength of a solution of caustic soda, stating the principle on which the method depends.

5. By what characters is it shown that the atmosphere is *not* a chemical compound? Point out the causes which tend to increase and to diminish, respectively, the proportion of carbonic acid gas in the atmosphere.

6. State the chemical composition of gypsum and of alum, and give the reactions by which they may severally be recognised. Explain the formation of the former during the weathering of some clays containing pyrites.

7. Explain how to determine (1) whether an organic substance contains nitrogen, and (2) in what proportion it is present. Ten parts of a compound gave, on combustion, 7·096 of CO^2, 5·807 of H^2O, and N equal in volume to half the CO^2; find a formula for it.

8. Explain the constitution of *fat* and of *soap*. Explain the action of the latter with hard water.

9. In what parts of plants is *albumen* met with? Of what elements does it consist? It is said to belong to the class of *colloids*, explain what is meant by this, and illustrate the characters of such compounds by examples of inorganic origin.

II. In Agricultural Chemistry.

Wednesday, April 27th; Afternoon 2 *p.m. till* 5 *p.m.*

1. State the method of determining the quantity of phosphoric acid present in a soil or in a rock.

2. Which are the chief differences in the composition of phosphatic guanos and Peruvian guano.

3. Explain the formation of nitrates in compost heaps.

4. Instead of Peruvian guano, a farmer wishes to dress his wheat with sulphate of ammonia, or with nitrate of soda; how much sulphate of ammonia, or how much nitrate of soda must he use in order to apply to his land the same quantity of nitrogen which is contained in 3 cwts. of Peruvian guano?

5. What is the reason that sulphate of ammonia may be applied to wheat with advantage during the months of December and January, whilst, as a rule, nitrate of soda should not be used before the end of March?

6. How do you estimate the nutritive and the manurial value of oilcake, corn, and other kinds of cattle food?

7. Describe briefly the properties of the principal constituents of milk.

8. How do you detect the adulteration of common salt in nitrate of soda.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS 200. PASS NUMBER 100.

Thursday, April 28th, from 10 *a.m. till* 1 *p.m.*

1. What is meant by the moment of a force with respect to a point? If a body is fixed at one point, round which it can move quite freely, and is kept at rest by forces acting in a plane passing through that point, what relation must exist between the forces?

2. A rod (AB), 12 feet long, can turn freely round one end (A); it is in a horizontal position; a force of 3 lbs. acts on it vertically downwards at a point 4 feet from A; a force of 7 lbs. acts on it vertically upwards at 8 feet from A; each foot of the length of the rod weighs $\frac{3}{4}$ lbs., what force acting vertically at B will keep the rod in a horizontal position; and does it act upward or downward?

3. A triangular board (ABC) is suspended by a string fastened to the angle (A). Show by a diagram the position of the triangle. If the triangle weighs 2 lbs., and if a weight of 2 lbs. is fastened to the angle B, show by a diagram what is now the position of the triangle.

4. State the law of the transmission of force through a fluid.

A bottle is 6 inches high, and has a base of 4 square inches, a straight tube 0·25 square inches in section is fitted to its neck. The whole is filled with water. Assuming that a cubic foot of water weighs 996 oz., find the length of the tube if the pressure on the bottom of the bottle is 83 oz., and the weight of the water which produces this pressure.

5. What is meant by the specific gravity of a solid or liquid? A solid weighs 30 oz. *in vacuo*, 19 oz. in water, and 20 oz. in a certain spirit. What is the specific gravity of the spirit?

6. Describe briefly the siphon. Explain why the legs must be of unequal length, and which must be the longer?

7. What is meant by "Centrifugal force?"

A body weighs 15 lbs.; it is tied to the end of a string 3 feet long, and is caused to describe a circle (whose radius is the string), uniformly 120 times a minute. What is the tension of the string ($g = 32$). If the string would just break under a tension of 50 lbs., what is the greatest velocity with which the body can move in the circle?

8. Describe briefly the Governor of the Steam-engine, and show by a diagram how it is made to "govern" the motion of the engine.

9. If the piston of a steam-engine 16 horse-power has a diameter of 2 feet, and stroke of $3\frac{1}{2}$ feet, and is worked by a mean net pressure of 12 lbs. per square inch, how many strokes does it make per minute?

10. State briefly what is meant by specific heat, and what by latent heat.

If, *first*, a pound of water at 32° F. (0° C.) and a pound of water at 212° F. (100° C.) are mixed, and *secondly*, if a pound of ice at 32° F. (0° C.) and a pound of water at 212° F. (100° C.) are mixed; state the results in these two cases, and explain the bearing of these facts on the question of the latency or disappearance of heat.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Thursday, April 28th, from 2 p.m. till 5 p.m.

1. What is the rule for determining the area of a circle? Write down to five places of decimals the number commonly denoted by π; if this number be taken to equal $3\frac{1}{7}$, would the area determined be greater or less than the true result? A carriage drive round a circular grass plot is 12 feet wide, and covers a quarter of an acre. What is the diameter of the grass plot?

2. What is a rod of brickwork? A square tower is 70 feet high,

and a side of the ground plan is 20 feet externally; it is built 2 bricks thick; how many rods of brickwork does it contain?

3. What is prismoid? and what the rule for finding its volume? A tank has a uniform depth of 10 feet, the top is a rectangle 50 feet by 20 feet; the bottom is also a rectangle with corresponding dimensions 40 feet and 10 feet; the remaining sides are trapezoids; how many cubic feet of water can it contain?

4. Two sides of a plane triangle are respectively 573 and 341 chains, and the angle included between the sides is 21° 18′ 30″; find its area in acres.

5. Given a wholly inaccessible point (say on the other side of a stream) and a line (on this side of the stream) marked out by two pickets; how would you find the foot of the perpendicular let fall from the point on the line, if you had nothing but a measuring tape and pickets?

6. Plot the following notes, and determine the area of the field (use as large a scale as your paper will admit).

	⊙ A	
0	1610	
25	1230	
15	500	
From	⊙ C	go E
	⊙ C	
	1240	0
	890	20
30	450	
0	0	
From	⊙ B	go N.
	⊙ B	
	1270	0
	750	15
	290	20
	0	0
Begin from	⊙ A	go W.

7. Plot the following notes, and determine the difference of the levels of the extreme stations (use as large a scale as your paper will admit).

Distances.	Backsight.	Foresight.
200	2·31	7·84
430	3·05	4·72
610	6·27	2·29
850	9·81	3·64
1127	3·79	12·56

8. If AB is a line 370 feet long, and if P is a distant point, given that the angle PAB is 71° 43′ 20″ and the angle PBA is 95° 12′ 40″, find the distance of P from A.

9. A, B, C, are three consecutive milestones in a straight line from a point P, the angle APB is 30° and BPC is 45°:—*first*, lay down the position of P by construction; *secondly*, calculate the distance AP.

EXAMINATION IN BOOKKEEPING.

Maximum Number of Marks, 200. Pass Number, 100.

Friday, April 10*th, from* 10 *a.m. till* 1 *p.m.*

Journalise in proper technical form and language the following facts and transactions, post the same into a ledger, and draw out Trial Balance thereof, and also a Balance Sheet accompanied by a Profit and Loss account.

John Simmons, Farmer, took stock on January 1st, 1869, and found that his affairs were in the following condition:—

	£	s.	d.
Assets.			
Cash at Bankers	1250	0	0
„ lent on mortgage of Fonthill Farm	3000	0	0
Live Stock and Grain, valued at	1650	0	0
Fixtures, Implements, Horses and Harness, ditto ..	1150	0	0
Debt due by Peter Wilkins, 418*l.*; estimated worth 10*s.* in the £	209	0	0
Debt due by John Soames	484	0	0
Petty cash in hand	62	0	0
Liabilities.			
His acceptance due 4th March	225	0	0
Amount owing to Howard and Co.	80	0	0

During the half year ending 30th June, 1869, the following transactions took place:—

Jan.	15.	Sold to Wm. Jones, 300 quarters of Wheat for	750	0	0
		Wm. Jones pays for such wheat by his acceptance at two months from this date ..	750	0	0
	17.	Bought of Ransomes & Sims, Farm Implements	175	0	0
	„	Accepted Ransomes & Sims' draft at three months' date	175	0	0
	18.	Paid Howard & Co. amount due to them ..	80	0	0
March	4.	Paid acceptance due this day	225	0	0
	„	Discounted W. Jones' acceptance for 750*l.* Received cash	748	11	3
		and allowed discount	1	8	9
	12.	Bought 100 Bullocks at 13*l.* 10*s.* each, and paid cash for same	1350	0	0
	„	Received from John Soames, Wm. Smith's acceptance due 3rd June	371	0	0
April	18.	Sold to Wm. Jones, 150 quarters Barley ..	262	10	0
	„	Received from Wm. Jones, Thomas Smart's acceptance due July 4th	200	0	0
	„	Received on account of mortgage of Fonthill	1000	0	0
	„	Bought 500 Sheep at 31*s.* each for cash ..	775	0	0
	20.	Paid acceptance due this day	175	0	0

Liabilities.			£	s.	d.
June	3.	Received cash for Wm. Smith's acceptance	371	0	0
	19.	Received composition in settlement of Peter Wilkin's debt	313	10	0
	25.	Received half year's interest on mortgage ..	63	3	10
	30.	Drawn out of Bank during the half year by sundry cheques to self	750	0	0
	„	Received during the half year for poultry, milk, and sundry articles	88	15	0
	„	Paid during the half year for wages	337	8	9
		Ditto for trade expenses and taxes	118	9	7
		Ditto for rent of farm	225	0	0
		Leaving petty cash in hand .. .. the residue having been expended in housekeeping.	43	10	0
		Value of Live Stock and Grain on hand ..	3200	0	0
		Value of Fixtures, Implements, Horses, &c., 1325*l.*, less 5 per cent. on 1150*l.*, for depreciation 57*l.* 10*s.*	1267	10	0

EXAMINATION IN ANATOMY AND ANIMAL PHYSIOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, April 29th, from 2 p.m. till 5 p.m.

1. Describe the circulation of the blood, and the changes which it undergoes within the vessels, the lungs, and those of the system in general?

2. Name the cavities of the heart, assigning to each its special function?

3. State the number of pulsations within a minute in the ox and sheep, and give a general description of the manner the pulse is produced?

4. Describe the chief uses of the several stomachs of the ox, and state how digestion and assimilation of the food are effected, and the benefits which immediately result therefrom to the animal body.

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, 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 sample 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 sample post. If the manure be very wet and lumpy, a larger boxful, weighing from 12 to 15 ozs., should be sent either by sample post or railway.

Samples not exceeding 4 ozs. in weight may be sent by sample post, by attaching two penny postage stamps to the parcel.

Samples not exceeding 8 ozs., for 4 postage stamps.

Samples not exceeding 16 ozs., for 8 postage stamps.

Samples not exceeding 24 ozs., for 1s. in postage stamps.

There must be no writing or printing in the packet or its cover in addition to the address: DR. AUGUSTUS VOELCKER, 11, SALISBURY SQUARE, FLEET STREET, LONDON, E.C., and the address of the sender of the parcel, and the number or mark of the article sent.

These particulars must in all cases be given not on loose pieces of paper but on small labels attached to the samples or packages containing them.

The samples must be sent in covers, open at the ends or in boxes, bags of linen or other materials, which may be fastened by string, but must not be sealed, so as to be easily examined. No parcel sent by sample post must exceed 1½ lb. in weight, or 2 feet in length, or 1 foot in width or 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 train 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, by sample post, 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 sample post. The piece should weigh from 12 to 15 ozs.; postage, 8*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 sample post.

On forwarding samples, separate letters should be sent by post to the laboratory, specifying the nature of the information required, and, if possible, the object in view.

H. M. JENKINS, *Secretary.*

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